Australian Government

MSL09 Laboratory Operations Training Package

Release: 1.2

CONTENTS

Modification History

Version Modification History

The version details of this endorsed Training Package are in the table below. The latest information is at the top of the table.

Version	Release Date	Comments
1.2	January 2011	Importation allowance added to one qualification and error corrected in packaging rules (MSL70109).
1.1	July 2010	ISC updates to comply with flexibility requirements: MSL20109, 30109, 40109, 50109 and 60109. Imported units updated: MSAENV272B, MSAENV472B and MSAENV672B Prerequisites corrected in MSL975007A and MSL975016A (qualifications affected – MSL40109, 50109 and 60109)
1	January 2010	Initial version

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Preliminary Information

Important Note to Users

Training Packages are not static documents; they are amended periodically to reflect the latest industry practices and are version controlled. It is essential that the latest version is always used.

Check the version number before commencing training or assessment

This Training Package is Version - check whether this is the latest version by going to the National Training Information Service (www.ntis.gov.au) and locating information about the Training Package. Alternatively, contact Manufacturing Industry Skills Council at http://www.mskills.com.au to confirm the latest version number.

Explanation of version number conventions

The primary release Training Package is Version 1. When changes are made to a Training Package, sometimes the version number is changed and sometimes it is not, depending on the extent of the change. When a Training Package is reviewed it is considered to be a new Training Package for the purposes of version control, and is Version 1. Do not confuse the version number with the Training Packages national code (which remains the same during its period of endorsement).

History

History
MSL09 Laboratory Training Package replaces and supersedes PML04 Laboratory Operations Training Package.

List of AQF Qualifications

List of AQF Qualifications

Qualification Code	Title
MSL20109	Certificate II in Sampling and Measurement
MSL30109	Certificate III in Laboratory Skills
MSL40109	Certificate IV in Laboratory Techniques
MSL50109	Diploma of Laboratory Technology
MSL60109	Advanced Diploma of Laboratory Operations

Qualification Code	Title
MSL70109	Vocational Graduate Certificate in Instrumental Analysis

List of ALL Units within Training Package

List of ALL Units within Training Package

Code	Name	Volume
MSL904001A	Perform standard calibrations	2
MSL905001A	Perform non-standard calibrations	2
MSL905002A	Create or modify calibration procedures	2
MSL905003A	Create or modify automated calibration procedures	2
MSL912001A	Work within a laboratory/field workplace (induction)	2
MSL913001A	Communicate with other people	2
MSL913002A	Plan and conduct laboratory/field work	2
MSL914001A	Prepare practical science classes and demonstrations	2
MSL915001A	Provide information to customers	2
MSL915002A	Schedule laboratory work for a small team	2
MSL916001A	Develop and maintain laboratory documentation	2
MSL916002A	Manage and develop teams	2
MSL916003A	Supervise laboratory operations in work/functional area	2
MSL916004A	Maintain registration and statutory or legal compliance in work/functional area	2
MSL916005A	Manage complex projects	2
MSL922001A	Record and present data	2
MSL924001A	Process and interpret data	2

Code	Name	Volume
MSL924002A	Use laboratory application software	2
MSL925001A	Analyse data and report results	2
MSL925002A	Analyse measurements and estimate uncertainties	2
MSL933001A	Maintain the laboratory/field workplace fit for purpose	2
MSL933002A	Contribute to the achievement of quality objectives	2
MSL933003A	Apply critical control point requirements	2
MSL933004A	Perform calibration checks on equipment and assist with its maintenance	2
MSL934001A	Contribute to the ongoing development of HACCP plans	2
MSL934002A	Apply quality system and continuous improvement processes	2
MSL934003A	Maintain and control stocks	2
MSL935001A	Monitor the quality of test results and data	2
MSL935002A	Assist in the maintenance of reference materials	2
MSL935003A	Authorise the issue of test results	2
MSL935004A	Maintain instruments and equipment	2
MSL936001A	Maintain quality system and continuous improvement processes within work/functional area	2
MSL936002A	Conduct an internal audit of the quality system	2
MSL943001A	Work safely with instruments that emit ionising radiation	2
MSL943002A	Participate in laboratory/field workplace safety	2
MSL944001A	Maintain laboratory/field workplace safety	2
MSL946001A	Implement and monitor OHS and environmental management systems	2
MSL952001A	Collect routine site samples	2

Code	Name	Volume
MSL952002A	Handle and transport samples or equipment	2
MSL953001A	Receive and prepare samples for testing	2
MSL953002A	Operate a robotic sample preparation system	2
MSL954001A	Obtain representative samples in accordance with sampling plan	2
MSL954002A	Prepare mineral samples for analysis	2
MSL955001A	Supervise a robotic sample preparation system	2
MSL963001A	Operate basic handblowing equipment	2
MSL963002A	Repair glass apparatus using simple glassblowing equipment	2
MSL965001A	Design and manufacture glass apparatus and glass systems	2
MSL965002A	Perform glass coating, grinding and finishing operations	2
MSL965003A	Construct, modify and maintain high vacuum systems	2
MSL972001A	Conduct routine site measurements	2
MSL973001A	Perform basic tests	2
MSL973002A	Prepare working solutions	2
MSL973003A	Prepare culture media	2
MSL973004A	Perform aseptic techniques	2
MSL973005A	Assist with fieldwork	2
MSL973006A	Prepare trial batches for evaluation	2
MSL973007A	Perform microscopic examination	2
MSL973008A	Perform histological procedures	2
MSL973009A	Conduct field-based acceptance tests for construction materials	2

Code	Name	Volume
MSL973010A	Conduct laboratory-based acceptance tests for construction materials	2
MSL973011A	Perform fire pouring techniques	2
MSL973012A	Assist with geotechnical site investigations	2
MSL974001A	Prepare, standardise and use solutions	2
MSL974002A	Conduct geotechnical site investigations	2
MSL974003A	Perform chemical tests and procedures	2
MSL974004A	Perform food tests	2
MSL974005A	Perform physical tests	2
MSL974006A	Perform biological procedures	2
MSL974007A	Undertake environmental field-based monitoring	2
MSL974008A	Capture and manage scientific images	2
MSL974009A	Undertake field-based, remote-sensing monitoring	2
MSL974010A	Perform mechanical tests	2
MSL974011A	Prepare tissue and cell cultures	2
MSL974012A	Perform tests to determine the properties of construction materials	2
MSL974013A	Monitor performance of structures	2
MSL975001A	Perform microbiological tests	2
MSL975002A	Perform haematological tests	2
MSL975003A	Perform histological tests	2
MSL975004A	Perform chemical pathology tests	2
MSL975005A	Conduct sensory analysis	2
MSL975006A	Perform immunohaematological tests	2
MSL975007A	Supervise sampling, inspections and testing at	2

Code	Name	Volume
	construction sites	
MSL975008A	Apply electrophoretic techniques	2
MSL975009A	Apply routine chromatographic techniques	2
MSL975010A	Perform fire assay techniques	2
MSL975011A	Design and supervise complex environmental field surveys	2
MSL975012A	Provide input to production trials	2
MSL975013A	Perform tissue and cell culture techniques	2
MSL975014A	Perform molecular biology tests and procedures	2
MSL975015A	Prepare animal and plant material for display	2
MSL975016A	Perform complex tests to measure engineering properties of materials	2
MSL975017A	Perform laboratory-based ecological techniques	2
MSL975018A	Perform complex tests to measure chemical properties of materials	2
MSL975019A	Apply complex instrumental techniques	2
MSL975020A	Apply routine spectrometric techniques	2
MSL975021A	Apply routine electrometric techniques	2
MSL975022A	Perform food analyses	2
MSL975023A	Supervise geotechnical site investigations	2
MSL976001A	Classify building sites	2
MSL976002A	Prepare plans and quality assurance procedures for environmental field activities	2
MSL976003A	Evaluate and select appropriate test methods and/or procedures	2
MSL977001A	Contribute to the development of products and applications	2

Code	Name	Volume
MSL977002A	Troubleshoot equipment and/or production processes	2
MSL977003A	Contribute to the validation of test methods	2
MSL977004A	Develop or adapt analyses and procedures	2
MSL977005A	Integrate data acquisition and interfacing systems	2
MSL977006A	Apply specialised knowledge of gas chromatography techniques to analysis	2
MSL977007A	Apply specialised knowledge of liquid chromatography techniques to analysis	2
MSL977008A	Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis	2
MSL977009A	Apply advanced ultraviolet, visible and near infra red spectroscopic techniques to analysis	2
MSL977010A	Apply advanced infra red spectroscopic techniques to analysis	2
MSL977011A	Contribute to the selection, commissioning and maintenance of analytical instruments	2
	Imported units	2
HLTPAT317A	Operate effectively within a pathology testing environment	2
HLTPAT419A	Perform pathology tests	2
MSAENV272B	Participate in environmentally sustainable work practices	2
MSAENV472B	Implement and monitor environmentally sustainable work practices	2
MSAENV672B	Develop workplace policy and procedures for environmental sustainability	2
TAADEL301C	Provide training through instruction and demonstration of work skills	2

Mapping to Previous Training Package

Mapping to Previous Training Package

Mapping of qualifications – MSL09v1.1/1.2 to MSL09v1 (ISC updates)

MSL09v1.1 qualifications	MSL09v1 qualifications	Comment – all equivalent
MSL20109 Certificate II in Sampling and Measurement	MSL20109 Certificate II in Sampling and Measurement	Accredited courses included in importation allowance, updated sustainability unit.
MSL30109 Certificate III in Laboratory Skills	MSL30109 Certificate III in Laboratory Skills	Accredited courses included in importation allowance, updated sustainability unit.
MSL40109 Certificate IV in Laboratory Techniques	MSL40109 Certificate IV in Laboratory Techniques	Accredited courses included in importation allowance, updated sustainability units, prerequisites corrected for MSL975007A and 5016A.
MSL50109 Diploma of Laboratory Technology	MSL50109 Diploma of Laboratory Technology	Accredited courses included in importation allowance, updated sustainability units, prerequisites corrected for MSL975007A and 5016A.
MSL60109 Advanced Diploma of Laboratory Operations	MSL60109 Advanced Diploma of Laboratory Operations	Accredited courses included in importation allowance, updated sustainability units, prerequisites corrected for MSL975007A and 5016A.
MSL70109 Vocational Graduate Certificate in Instrumental Analysis	MSL70109 Vocational Graduate Certificate in Instrumental Analysis	Reformatted June 2010. Included importation allowance and corrected error in number of electives. No actual change to packaging.

Mapping of qualifications – MSL09 to PML04

MSL09 qualifications	PML04 qualifications	Comment
MSL20109 Certificate II in	PML20104 Certificate II	Sustainability unit added to

Sampling and Measurement	in Sampling and Measurement	mandatory units – not equivalent.
MSL30109 Certificate III in Laboratory Skills	PML30104 Certificate III in Laboratory Skills	Sustainability unit added to mandatory units – not equivalent
MSL40109 Certificate IV in Laboratory Techniques	PML40104 Certificate IV in Laboratory Techniques	Sustainability unit added to mandatory units and additional electives - not equivalent
MSL50109 Diploma of Laboratory Technology	PML50104 Diploma of Laboratory Technology	Sustainability unit added to mandatory units – not equivalent
MSL60109 Advanced Diploma of Laboratory Operations	PML60104 Advanced Diploma of Laboratory Operations	Sustainability unit added to mandatory units and additional electives – not equivalent
New qualification		
MSL70109 Vocational Graduate Certificate in Instrumental Analysis		New qualification

Mapping of Units

MSL09v1.1 to MSL09v1 – changes to imported units

MSL09v1.1		**MSL09v1**		**Comment**
MSAENV272B	Participate in environmentally sustainable work practices	MSAENV272A	Participate in environmentally sustainable work practices	Terminology clarified and range expanded. Equivalent.
MSAENV472B	Implement and monitor environmentally sustainable work practices	MSAENV472A	Implement and monitor environmentally sustainable work practices	Terminology clarified and range expanded. Equivalent.
MSAENV672B	Develop workplace policy and procedures for environmental	MSAENV672A	Develop workplace policy and procedures	Terminology clarified and range expanded. Title corrected to include

	sustainability		for sustainability	'environmental'. Equivalent.

Mapping of units in MSL09, including pre-requisite requirements

PML04 to MSL09

Legend – sector competency field codes

CAL	90
COM/ORG	91
DATA	92
MAIN	93
OHS	94
SAMP	95
SCIG	96
TEST	97

118 units (20 new, 92 revised and 6 imported)

Unit code PML04	**Unit code MSL09**	**Unit title**	**Equivalence**	**Pre requisite**
PMLCAL400A	MSL904001A	Perform standard calibrations	E	
PMLCAL500A	MSL905001A	Perform non-standard calibrations	E	MSL904001A
PMLCAL501A	MSL905002A	Create or modify calibration procedures	E	MSL905001A, MSL904001A
PMLCAL502A	MSL905003A	Create or modify automated calibration procedures	E	MSL905002A, MSL905001A, MSL904001A
PMLCOM300B	MSL913001A	Communicate with other people	E	

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
PMLCOM500B	MSL915001A	Provide information to customers	E	
PMLCOM600B	MSL916001A	Develop and maintain laboratory documentation	E	
PMLDATA200A	MSL922001A	Record and present data	E	
PMLDATA400A	MSL924001A	Process and interpret data	E	
PMLDATA500B	MSL925001A	Analyse data and report results	E	MSL924001A
PMLDATA501B	MSL924002A	Use laboratory application software	E	
PMLMAIN300B	MSL933001A	Maintain the laboratory/field workplace fit for purpose	E	
PMLMAIN400A	MSL934003A	Maintain and control stocks	E	
PMLMAIN501B	MSL935002A	Assist in the maintenance of reference materials	E	
PMLMAIN502A	MSL935004A	Maintain instruments and equipment	E	
PMLOHS301B	MSL943001A	Work safely with instruments that emit ionising radiation	E	
PMLOHS302A	MSL943002A	Participate in laboratory/field workplace safety	E	
PMLOHS400A	MSL944001A	Maintain laboratory/field workplace safety	E	

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
PMLOHS601A	MSL946001A	Implement and monitor OHS and environmental management systems	E	
PMLORG200A	MSL912001A	Work within a laboratory/field workplace (induction)	E	
PMLORG301A	MSL913002A	Plan and conduct laboratory/field work	E	
PMLORG400A	MSL914001A	Prepare practical science classes and demonstrations	E	
PMLORG500B	MSL915002A	Schedule laboratory work for a small team	E	
PMLORG600B	MSL916003A	Supervise laboratory operations in work/functional area	E	
PMLORG601B	MSL916004A	Maintain registration and statutory or legal compliance in work/functional area	E	
PMLORG602B	MSL916005A	Manage complex projects	E	
PMLQUAL300B	MSL933002A	Contribute to the achievement of quality objectives	E	
PMLQUAL301B	MSL933003A	Apply critical control point requirements	E	
PMLQUAL400B	MSL934001A	Contribute to the ongoing development of HACCP plans	E	
PMLQUAL401B	MSL934002A	Apply quality system and continuous improvement	E	

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
		processes		
PMLQUAL500A	MSL935001A	Monitor the quality of test results and data	E	MSL924001A
PMLQUAL600B	MSL936001A	Maintain quality system and continuous improvement processes within work/functional area	E	
PMLQUAL601B	MSL936002A	Conduct an internal audit of the quality system	E	
PMLSAMP200A	MSL952001A	Collect routine site samples	E	
PMLSAMP201A	MSL952002A	Handle and transport samples or equipment	E	
PMLSAMP302A	MSL953001A	Receive and prepare samples for testing	E	
PMLSAMP400B	MSL954001A	Obtain representative samples in accordance with sampling plan	E	
PMLSAMP401A	MSL954002A	Prepare mineral samples for analysis	E	
PMLSCIG300B	MSL963001A	Operate basic handblowing equipment	E	
PMLSCIG301B	MSL963002A	Repair glass apparatus using simple glassblowing equipment	E	MSL963001A
PMLSCIG501B	MSL965001A	Design and manufacture glass apparatus and glass systems	E	MSL963001A, MSL963002A
PMLSCIG502B	MSL965002A	Perform glass coating,	E	MSL963001A

Unit code PML04	**Unit code MSL09**	**Unit title**	**Equivalence**	**Pre requisite**
		grinding and finishing operations		, MSL963002A
PMLSCIG503B	MSL965003A	Construct, modify and maintain high vacuum systems	E	MSL963001A , MSL963002A
PMLTEAM600B	MSL916002A	Manage and develop teams	E	
PMLTEST200A	MSL972001A	Conduct routine site measurements	E	
PMLTEST300B	MSL973001A	Perform basic tests	E	
PMLTEST303B	MSL973002A	Prepare working solutions	E	
PMLTEST304B	MSL973003A	Prepare culture media	E	
PMLTEST305B	MSL973004A	Perform aseptic techniques	E	
PMLTEST306B	MSL973005A	Assist with fieldwork	E	
PMLTEST307B	MSL973006A	Prepare trial batches for evaluation	E	
PMLTEST308A	MSL973007A	Perform microscopic examination	E	
PMLTEST310A	MSL973008A	Perform histological procedures	E	
PMLTEST402B	MSL974001A	Prepare, standardise and use solutions	E	
PMLTEST403B			Not carried forward – replaced by MSL973012A and MSL974002A . No equivalent unit.	

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
PMLTEST404A	MSL974003A	Perform chemical tests and procedures	E	
PMLTEST405A	MSL974004A	Perform food tests	E	
PMLTEST406A	MSL974005A	Perform physical tests	E	
PMLTEST407A	MSL974006A	Perform biological procedures	E	MSL973004A, MSL973007A
PMLTEST408A	MSL974007A	Undertake environmental field-based monitoring	E	
PMLTEST409A	MSL974008A	Capture and manage scientific images	E	
PMLTEST410A	MSL974009A	Undertake field-based, remote-sensing monitoring	E	
PMLTEST411A	MSL974010A	Perform mechanical tests	E	
PMLTEST412A	MSL974011A	Prepare tissue and cell cultures	E	MSL973004A
PMLTEST501B	MSL975001A	Perform microbiological tests	E	MSL974006A, MSL973004A, MSL973007A
PMLTEST502B	MSL975002A	Perform haematological tests	E	MSL974006A, MSL973004A, MSL973007A
PMLTEST503B	MSL975003A	Perform histological tests	E	MSL974006A, MSL973004A,

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
				MSL973007A
PMLTEST504B	MSL975004A	Perform chemical pathology tests	E	MSL974006A, MSL973004A, MSL973007A
PMLTEST505B	MSL975005A	Conduct sensory analysis	E	
PMLTEST509B	MSL975006A	Perform immunohaematological tests	E	MSL974006A, MSL973004A, MSL973007A
PMLTEST511B	MSL975007A	Supervise sampling, inspections and testing at construction sites	Not equivalent	MSL974002A, MSL973012A MSL954001A, MSL973009A
PMLTEST512A	MSL975008A	Apply electrophoretic techniques	E	MSL973002A OR MSL974001A, MSL974003A
PMLTEST513A	MSL975009A	Apply routine chromatographic techniques	E	MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
				OR MSL974001A
PMLTEST514A	MSL975010A	Perform fire assay techniques	E	MSL973011A or MSL954002A
PMLTEST515A	MSL975011A	Design and supervise complex environmental field surveys	E	MSL974007A
PMLTEST516A	MSL975012A	Provide input to production trials	E	MSL974003A OR MSL974004A OR MSL974005A OR MSL974010A
PMLTEST517A	MSL975013A	Perform tissue and cell culture techniques	E	MSL974006A, MSL973004A, MSL973007A
PMLTEST518A	MSL975014A	Perform molecular biology tests and procedures	E	MSL974006A, MSL973004A MSL973007A
PMLTEST519A	MSL975015A	Prepare animal and plant material for display	E	MSL974006A, MSL973004A MSL973007A
PMLTEST520A	MSL975016A	Perform complex tests to measure engineering properties of materials	E	MSL974012A AND MSL973001A OR MSL973010A

Unit code PML04	**Unit code MSL09**	**Unit title**	**Equivalence**	**Pre requisite**
PMLTEST521A	MSL975017A	Perform laboratory-based ecological techniques	E	MSL974006A, MSL973004A, MSL973007A
PMLTEST522A	MSL975018A	Perform complex tests to measure chemical properties of materials	E	MSL975009A OR MSL975020A AND MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A OR MSL974001A
PMLTEST523A	MSL975019A	Apply complex instrumental techniques	E	MSL975009A OR MSL975020A AND MSL974003A OR MSL974004A OR MSL974006A, MSL973004A and

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
				MSL973007A AND MSL973002A OR MSL974001A
PMLTEST524A	MSL975020A	Apply routine spectrometric techniques	E	MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A OR MSL974001A
PMLTEST525A	MSL975021A	Apply routine electrometric techniques	E	MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A OR MSL974001A
PMLTEST526A	MSL975022A	Perform food analyses	E	MSL974004A OR

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
				MSL974006A, MSL973004A, MSL973007A
PMLTEST601B	MSL976001A	Classify building sites	E	MSL975023A OR MSL975007A AND MSL954001A, MSL973009A
PMLTEST602A	MSL976002A	Prepare plans and quality assurance procedures for environmental field activities	E	MSL975011A, MSL974007A
PMLTEST603A	MSL976003A	Evaluate and select appropriate test methods and/or procedures	E	
PMLTEST700B	MSL977001A	Contribute to the development of products and applications	E	MSL976003A
PMLTEST701B	MSL977002A	Troubleshoot equipment and/or production processes	E	MSL976003A
PMLTEST702B	MSL977003A	Contribute to the validation of test methods	E	MSL976003A
PMLTEST703B	MSL977004A	Develop or adapt analyses and procedures	E	MSL976003A
PMLTEST704B	MSL977005A	Integrate data acquisition and	E	MSL924002A

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
		interfacing systems		
	HLTPAT317A	Operate effectively within a pathology testing environment	n/a	
	HLTPAT419A	Perform pathology tests	n/a	
	MSAENV272A	Participate in environmentally sustainable work practices	n/a	
	MSAENV472A	Implement and monitor environmentally sustainable work practices	n/a	
	MSAENV672A	Develop workplace policy and procedures for sustainability	n/a	
	MSL925002A	Analyse measurements and estimate uncertainties	n/a	MSL924001A
	MSL933004A	Perform calibration checks on equipment and assist with its maintenance	n/a	
	MSL935003A	Authorise the issue of test results	n/a	MSL925001A, MSL924001A
	MSL953002A	Operate a robotic sample preparation system	n/a	
	MSL955001A	Supervise a robotic sample preparation system	n/a	MSL953002A
	MSL973009A	Conduct field-based	n/a	

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
		acceptance tests for construction materials		
	MSL973010A	Conduct laboratory-based acceptance tests for construction materials	n/a	
	MSL973011A	Perform fire pouring techniques	n/a	
	MSL973012A	Assist with geotechnical site investigations	MSL973012A and MSL974002A replace PMLTEST403B – no equivalent unit equivalent	
	MSL974002A	Conduct geotechnical site investigations	MSL973012A and MSL974002A replace PMLTEST403B – no equivalent unit	MSL973012A
	MSL974012A	Perform tests to determine the properties of construction materials	n/a	MSL973001A **OR** MSL973010A
	MSL974013A	Monitor performance of structures	n/a	MSL973009A
	MSL975007A	Supervise sampling, inspections and testing at construction sites	Replaces PMLTEST511B – not equivalent	MSL954001A, MSL973009A
	MSL975023A	Supervise geotechnical site	n/a	MSL974002A,

Unit code PML04	Unit code MSL09	Unit title	Equivalence	Pre requisite
		investigations		MSL973012A
	MSL977006A	Apply specialised knowledge of gas chromatography techniques to analysis	n/a	
	MSL977007A	Apply specialised knowledge of liquid chromatography techniques to analysis	n/a	
	MSL977008A	Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis	n/a	
	MSL977009A	Apply advanced ultraviolet, visible and near infra red spectroscopic techniques to analysis	n/a	
	MSL977010A	Apply advanced infra-red spectroscopic techniques to analysis	n/a	
	MSL977011A	Contribute to the selection, commissioning and maintenance of analytical instruments	n/a	
	TAADEL301C	Provide training through instruction and demonstration of work skills	n/a	

MSL09 to PML04

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
HLTPAT317A	Operate effectively within a pathology testing environment	New	n/a	
HLTPAT419A	Perform pathology tests	New	n/a	
MSAENV272A	Participate in environmentally sustainable work practices	New	N/A	
MSAENV472A	Implement and monitor environmentally sustainable work practices	New	N/A	
MSAENV672A	Develop workplace policy and procedures for sustainability	New	N/A	
MSL904001A	Perform standard calibrations	PMLCAL400A	E	
MSL905001A	Perform non-standard calibrations	PMLCAL500A	E	MSL904001A
MSL905002A	Create or modify calibration procedures	PMLCAL501A	E	MSL905001A, MSL904001A
MSL905003A	Create or modify automated calibration procedures	PMLCAL502A	E	MSL905002A, MSL905001A, MSL904001A
MSL912001A	Work within a laboratory/field workplace (induction)	PMLORG200A	E	
MSL913001A	Communicate with other people	PMLCOM300B	E	

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
MSL913002A	Plan and conduct laboratory/field work	PMLORG301A	E	
MSL914001A	Prepare practical science classes and demonstrations	PMLORG400A	E	
MSL915001A	Provide information to customers	PMLCOM500B	E	
MSL915002A	Schedule laboratory work for a small team	PMLORG500B	E	
MSL916001A	Develop and maintain laboratory documentation	PMLCOM600B	E	
MSL916002A	Manage and develop teams	PMLTEAM600B	E	
MSL916003A	Supervise laboratory operations in work/functional area	PMLORG600B	E	
MSL916004A	Maintain registration and statutory or legal compliance in work/functional area	PMLORG601B	E	
MSL916005A	Manage complex projects	PMLORG602B	E	
MSL922001A	Record and present data	PMLDATA200A	E	
MSL924001A	Process and interpret data	PMLDATA400A	E	
MSL924002A	Use laboratory application software	PMLDATA501B	E	
MSL925001A	Analyse data and report results	PMLDATA500B	E	MSL924001A
MSL925002A	Analyse measurements and	New	n/a	MSL924001A

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
	estimate uncertainties			
MSL933001A	Maintain the laboratory/field workplace fit for purpose	PMLMAIN300B	E	
MSL933002A	Contribute to the achievement of quality objectives	PMLQUAL300B	E	
MSL933003A	Apply critical control point requirements	PMLQUAL301B	E	
MSL933004A	Perform calibration checks on equipment and assist with its maintenance	New	n/a	
MSL934001A	Contribute to the ongoing development of HACCP plans	PMLQUAL400B	E	
MSL934002A	Apply quality system and continuous improvement processes	PMLQUAL401B	E	
MSL934003A	Maintain and control stocks	PMLMAIN400A	E	
MSL935001A	Monitor the quality of test results and data	PMLQUAL500A	E	MSL924001A
MSL935002A	Assist in the maintenance of reference materials	PMLMAIN501B	E	
MSL935003A	Authorise the issue of test results	New	n/a	MSL925001A, MSL924001A
MSL935004A	Maintain instruments and equipment	PMLMAIN502A	E	
MSL936001A	Maintain quality	PMLQUAL600	E	

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
	system and continuous improvement processes within work/functional area	B		
MSL936002A	Conduct an internal audit of the quality system	PMLQUAL601 B	E	
MSL943001A	Work safely with instruments that emit ionising radiation	PMLOHS301B	E	
MSL943002A	Participate in laboratory/field workplace safety	PMLOHS302A	E	
MSL944001A	Maintain laboratory/field workplace safety	PMLOHS400A	E	
MSL946001A	Implement and monitor OHS and environmental management systems	PMLOHS601A	E	
MSL952001A	Collect routine site samples	PMLSAMP200 A	E	
MSL952002A	Handle and transport samples or equipment	PMLSAMP201 A	E	
MSL953001A	Receive and prepare samples for testing	PMLSAMP302 A	E	
MSL953002A	Operate a robotic sample preparation system	New	n/a	
MSL954001A	Obtain representative samples in accordance with sampling plan	PMLSAMP400 B	E	
MSL954002A	Prepare mineral samples for analysis	PMLSAMP401 A	E	

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
MSL955001A	Supervise a robotic sample preparation system	New	n/a	MSL953002A
MSL963001A	Operate basic handblowing equipment	PMLSCIG300B	E	
MSL963002A	Repair glass apparatus using simple glassblowing equipment	PMLSCIG301B	E	MSL963001A
MSL965001A	Design and manufacture glass apparatus and glass systems	PMLSCIG501B	E	MSL963001A, MSL963002A
MSL965002A	Perform glass coating, grinding and finishing operations	PMLSCIG502B	E	MSL963001A, MSL963002A
MSL965003A	Construct, modify and maintain high vacuum systems	PMLSCIG503B	E	MSL963001A, MSL963002A
MSL972001A	Conduct routine site measurements	PMLTEST200A	E	
MSL973001A	Perform basic tests	PMLTEST300B	E	
MSL973002A	Prepare working solutions	PMLTEST303B	E	
MSL973003A	Prepare culture media	PMLTEST304B	E	
MSL973004A	Perform aseptic techniques	PMLTEST305B	E	
MSL973005A	Assist with fieldwork	PMLTEST306B	E	
MSL973006A	Prepare trial batches for evaluation	PMLTEST307B	E	
MSL973007A	Perform microscopic examination	PMLTEST308A	E	

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
MSL973008A	Perform histological procedures	PMLTEST310A	E	
MSL973009A	Conduct field-based acceptance tests for construction materials	New	n/a	
MSL973010A	Conduct laboratory-based acceptance tests for construction materials	New	n/a	
MSL973011A	Perform fire pouring techniques	New	n/a	
MSL973012A	Assist with geotechnical site investigations	New	MSL973012A and MSL974002A replace PMLTEST403B – no equivalent unit	
MSL974001A	Prepare, standardise and use solutions	PMLTEST402B	E	
MSL974002A	Conduct geotechnical site investigations	New	MSL973012A and MSL974002A replace PMLTEST403B – no equivalent unit	MSL973012A
MSL974003A	Perform chemical tests and procedures	PMLTEST404A	E	
MSL974004A	Perform food tests	PMLTEST405A	E	
MSL974005A	Perform physical tests	PMLTEST406A	E	

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
MSL974006A	Perform biological procedures	PMLTEST407A	E	MSL973004A, MSL973007A
MSL974007A	Undertake environmental field-based monitoring	PMLTEST408A	E	
MSL974008A	Capture and manage scientific images	PMLTEST409A	E	
MSL974009A	Undertake field-based, remote-sensing monitoring	PMLTEST410A	E	
MSL974010A	Perform mechanical tests	PMLTEST411A	E	
MSL974011A	Prepare tissue and cell cultures	PMLTEST412A	E	MSL973004A
MSL974012A	Perform tests to determine the properties of construction materials	New	n/a	MSL973001A OR MSL973010A
MSL974013A	Monitor performance of structures	New	n/a	MSL973009A
MSL975001A	Perform microbiological tests	PMLTEST501B	E	MSL974006A, MSL973004A, MSL973007A
MSL975002A	Perform haematological tests	PMLTEST502B	E	MSL974006A, MSL973004A, MSL973007A
MSL975003A	Perform histological tests	PMLTEST503B	E	MSL974006A, MSL973004A,

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
				MSL973007A
MSL975004A	Perform chemical pathology tests	PMLTEST504B	E	MSL974006A, MSL973004A, MSL973007A
MSL975005A	Conduct sensory analysis	PMLTEST505B	E	
MSL975006A	Perform immunohaematological tests	PMLTEST509B	E	MSL974006A, MSL973004A, MSL973007A
MSL975007A	Supervise sampling, inspections and testing at construction sites	New	Replaces PMLTEST511B – not equivalent	MSL974002A, MSL973012A MSL954001A, MSL973009A
MSL975008A	Apply electrophoretic techniques	PMLTEST512A	E	MSL973002A OR MSL974001A, MSL974003A
MSL975009A	Apply routine chromatographic techniques	PMLTEST513A	E	MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
				OR MSL974001A
MSL975010A	Perform fire assay techniques	PMLTEST514A	E	MSL973011A OR MSL954002A
MSL975011A	Design and supervise complex environmental field surveys	PMLTEST515A	E	MSL974007A
MSL975012A	Provide input to production trials	PMLTEST516A	E	MSL974003A OR MSL974004A OR MSL974005A OR MSL974010A
MSL975013A	Perform tissue and cell culture techniques	PMLTEST517A	E	MSL974006A, MSL973004A, MSL973007A
MSL975014A	Perform molecular biology tests and procedures	PMLTEST518A	E	MSL974006A, MSL973004A MSL973007A
MSL975015A	Prepare animal and plant material for display	PMLTEST519A	E	MSL974006A, MSL973004A MSL973007A
MSL975016A	Perform complex tests to measure engineering properties of materials	PMLTEST520A	E	MSL974012A AND MSL973001A OR

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
				MSL973010A
MSL975017A	Perform laboratory-based ecological techniques	PMLTEST521A	E	MSL974006A, MSL973004A, MSL973007A
MSL975018A	Perform complex tests to measure chemical properties of materials	PMLTEST522A	E	MSL975009A or MSL975020A AND MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A OR MSL974001A
MSL975019A	Apply complex instrumental techniques	PMLTEST523A	E	MSL975009A OR MSL975020A AND MSL974003A OR MSL974004A OR MSL974006A, MSL973004A,

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
				MSL973007A AND MSL973002A OR MSL974001A
MSL975020A	Apply routine spectrometric techniques	PMLTEST524A	E	MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A OR MSL974001A
MSL975021A	Apply routine electrometric techniques	PMLTEST525A	E	MSL974003A OR MSL974004A OR MSL974006A, MSL973004A, MSL973007A AND MSL973002A OR MSL974001A
MSL975022A	Perform food analyses	PMLTEST526A	E	MSL974004A OR

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
				MSL974006A, MSL973004A, MSL973007A
MSL975023A	Supervise geotechnical site investigations	New	n/a	MSL974002A, MSL973012A
MSL976001A	Classify building sites	PMLTEST601B	E	MSL975023A OR MSL975007A AND MSL954001A, MSL973009A
MSL976002A	Prepare plans and quality assurance procedures for environmental field activities	PMLTEST602A	E	MSL975011A, MSL974007A
MSL976003A	Evaluate and select appropriate test methods and/or procedures	PMLTEST603A	E	
MSL977001A	Contribute to the development of products and applications	PMLTEST700B	E	MSL976003A
MSL977002A	Troubleshoot equipment and/or production processes	PMLTEST701B	E	MSL976003A
MSL977003A	Contribute to the validation of test methods	PMLTEST702B	E	MSL976003A
MSL977004A	Develop or adapt analyses and	PMLTEST703B	E	MSL976003A

Unit code MSL09	Unit title	Unit code PML04	Equivalence	Pre requisite
	procedures			
MSL977005A	Integrate data acquisition and interfacing systems	PMLTEST704B	E	MSL924002A
MSL977006A	Apply specialised knowledge of gas chromatography techniques to analysis	New	n/a	
MSL977007A	Apply specialised knowledge of liquid chromatography techniques to analysis	New	n/a	
MSL977008A	Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis	New	n/a	
MSL977009A	Apply advanced ultraviolet, visible and near infra red spectroscopic techniques to analysis	New	n/a	
MSL977010A	Apply advanced infra red spectroscopic techniques to analysis	New	n/a	
MSL977011A	Contribute to the selection, commissioning and maintenance of analytical instruments	New	n/a	
TAADEL301C	Provide training through instruction and demonstration of work skills	New	n/a	

Overview

What is a Training Package?

A Training Package is an integrated set of nationally endorsed competency standards, assessment guidelines and Australian Qualifications Framework (AQF) qualifications for a specific industry, industry sector or enterprise.

Each Training Package:

- provides a consistent and reliable set of components for training, recognising and assessing peoples skills, and may also have optional support materials
- enables nationally recognised qualifications to be awarded through direct assessment of workplace competencies
- encourages the development and delivery of flexible training which suits individual and industry requirements
- encourages learning and assessment in a work-related environment which leads to verifiable workplace outcomes.

How do Training Packages fit within the National Skills Framework?

The National Skills Framework applies nationally, is endorsed by the Ministerial Council for Vocational and Technical Education, and comprises the Australian Quality Training Framework 2010 (AQTF 2010), and Training Packages endorsed by the National Quality Council (NQC).

How are Training Packages developed?

Training Packages are developed by Industry Skills Councils or enterprises to meet the identified training needs of specific industries or industry sectors. To gain national endorsement of Training Packages, developers must provide evidence of extensive research, consultation and support within the industry area or enterprise.

How do Training Packages encourage flexibility?

Training Packages describe the skills and knowledge needed to perform effectively in the workplace without prescribing how people should be trained. Training Packages acknowledge that people can achieve vocational competency in many ways by emphasising what the learner can do, not how or where they learned to do it. For example, some experienced workers might be able to demonstrate competency against the units of competency, and even gain a qualification, without completing a formal training program.

With Training Packages, assessment and training may be conducted at the workplace, off-the-job, at a training organisation, during regular work, or through work experience, work placement, work simulation or any combination of these.

Who can deliver and assess using Training Packages?

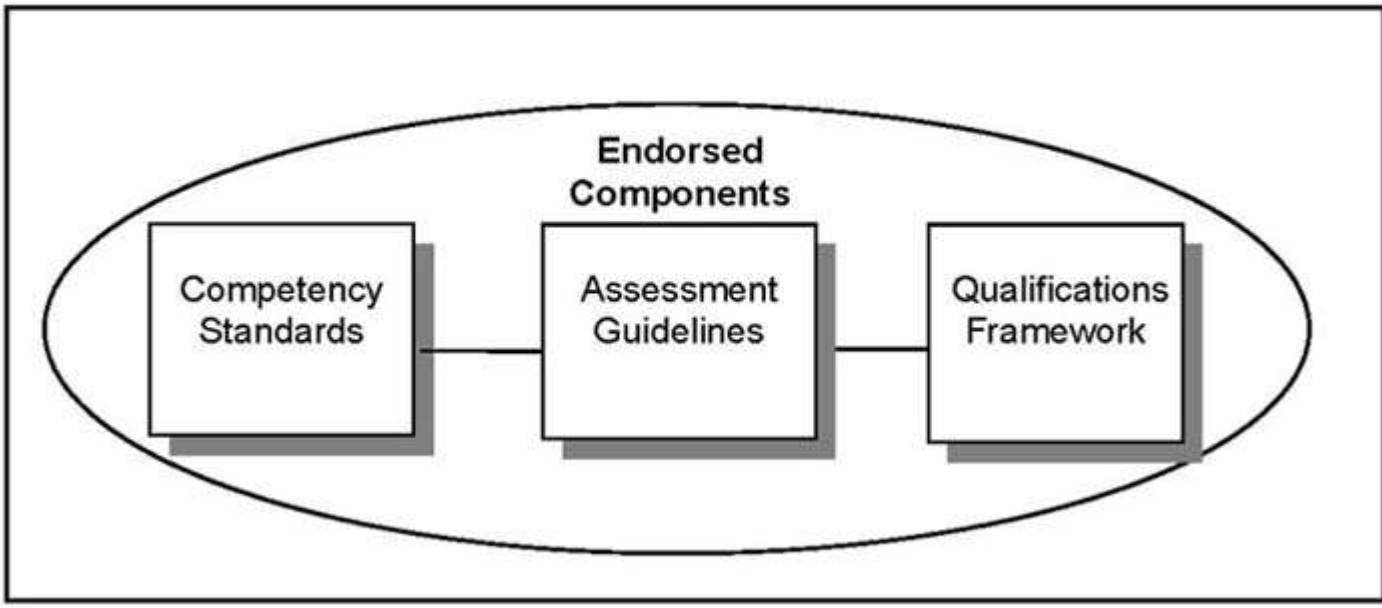
Training and assessment using Training Packages must be conducted by a Registered Training Organisation (RTO) that has the qualifications or specific units of competency on its scope of registration, or that works in partnership with another RTO, as specified in the AQTF 2010.

Training Package Components

Training Packages are made up of mandatory components endorsed by the NQC, and optional support materials.

Training Package Endorsed Components

The nationally endorsed components include the Competency Standards, Assessment Guidelines and Qualifications Framework. These form the basis of training and assessment in the Training Package and, as such, they must be used.



Competency Standards

Each unit of competency identifies a discrete workplace requirement and includes the knowledge and skills that underpin competency as well as language, literacy and numeracy; and occupational health and safety requirements. The units of competency must be adhered to in training and assessment to ensure consistency of outcomes.

Assessment Guidelines

The Assessment Guidelines provide an industry framework to ensure all assessments meet industry needs and nationally agreed standards as expressed in the Training Package and the AQTF 2010. The Assessment Guidelines must be followed to ensure the integrity of assessment leading to nationally recognised qualifications.

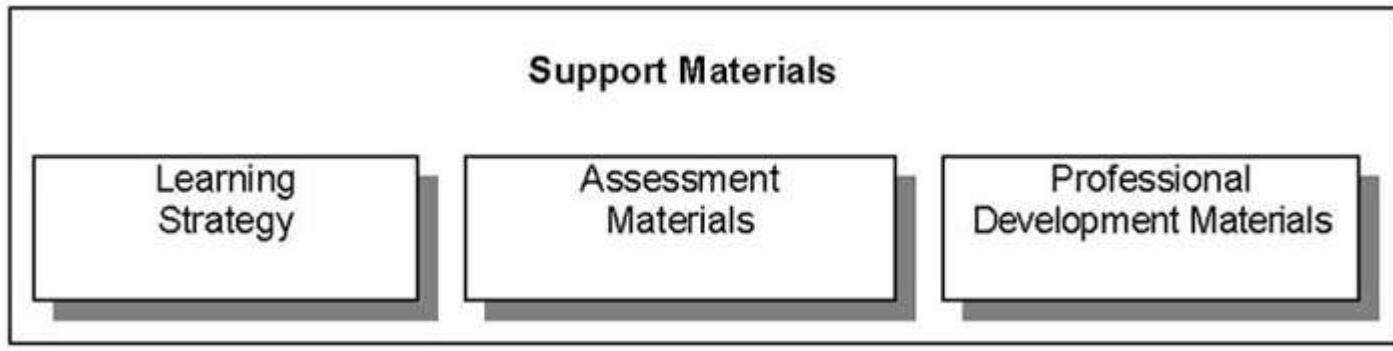
Qualifications Framework

Each Training Package provides details of those units of competency that must be achieved to award AQF qualifications. The rules around which units of competency can be combined to make up a valid AQF qualification in the Training Package are referred to as the "packaging rules". The packaging rules must be followed to ensure the integrity of nationally recognised qualifications issued.

Training Package Support Materials

The endorsed components of Training Packages are complemented and supported by optional support materials that provide for choice in the design of training and assessment to meet the needs of industry and learners.

Training Package support materials can relate to single or multiple units of competency, an industry sector, a qualification or the whole Training Package. They tend to fall into one or more of the categories illustrated below.



Training Package support materials are produced "by a range of stakeholders such as RTOs, individual trainers and assessors, private and commercial developers and Government agencies.

Where such materials have been quality assured through a process of "noting" by the NQC, they display the following official logo. Noted support materials are listed on the National Training Information Service (NTIS), together with a detailed description and information on the type of product and its availability < www.ntis.gov.au>.

It is not compulsory to submit support materials for noting; any resources that meet the requirements of the Training Package can be used.

Training Package, Qualification and Unit of Competency Codes

There are agreed conventions for the national codes used for Training Packages and their components. Always use the correct codes, exactly as they appear in the Training Package, and with the code always before the title.

Training Package Codes

Each Training Package has a unique five-character national code assigned when the Training Package is endorsed, for example MSL09. The first three characters are letters identifying the Training Package industry coverage and the last two characters are numbers identifying the year of endorsement.

Qualification Codes

Within each Training Package, each qualification has a unique eight-character code, for example MSL20109. Qualification codes are developed as follows:

- the first three letters identify the Training Package;
- the first number identifies the qualification level (noting that, in the qualification titles themselves, arabic numbers are not used);
- the next two numbers identify the position in the sequence of the qualification at that level; and
- the last two numbers identify the year in which the qualification was endorsed. (Where qualifications are added after the initial Training Package endorsement, the last two numbers may differ from other Training Package qualifications as they identify the year in which those particular qualifications were endorsed.)

Unit of Competency Codes

Within each Training Package, each unit of competency has a unique code. Unit of competency codes are assigned when the Training Package is endorsed, or when new units of competency are added to an existing endorsed Training Package. Unit codes are developed as follows:

- a typical code is made up of 12 characters, normally a mixture of uppercase letters and numbers, as in MSL904001A;
- the first three characters signify the Training Package - MSL09 - in the above example and up to eight characters, relating to an industry sector, function or skill area, follow;
- the last character is always a letter and identifies the unit of competency version. An "A" at the end of the code indicates that this is the original unit of competency. "B", or another incremented version identifier means that minor changes have been made. Typically this would mean that wording has changed in the range statement or evidence guide, providing clearer intent; and
- where changes are made that alter the outcome, a new code is assigned and the title is changed.

Training Package, Qualification and Unit of Competency Titles

There are agreed conventions for titling Training Packages and their components. Always use the correct titles, exactly as they appear in the Training Package, and with the code always placed before the title.

Training Package Titles

The title of each endorsed Training Package is unique and relates the Training Packages broad industry coverage.

Qualification Titles

The title of each endorsed Training Package qualification is unique. Qualification titles use the following sequence:

- first, the qualification is identified as either Certificate I, Certificate II, Certificate III, Certificate IV, Diploma, Advanced Diploma, Vocational Graduate Certificate, or Vocational Graduate Diploma;
- this is followed by the words "in" for Certificates I to IV, and "of" for Diploma, Advanced Diploma, Vocational Graduate Certificate and Vocational Graduate Diploma;
- then, the industry descriptor, for example Telecommunications; and
- then, if applicable, the occupational or functional stream in brackets, for example (Computer Systems).

For example:

- MSL20109 Certificate II in Sampling and Measurement

Unit of Competency Titles

Each unit of competency title is unique. Unit of competency titles describe the competency outcome concisely, and are written in sentence case.

For example:

- MSL904001A Perform standard calibrations
-

Historical and General Information

Background to the Laboratory Operations Training Package

The Laboratory Operations Training Package (MSL09) addresses the training and recognition needs of samplers, testers and laboratory personnel working in a wide range of enterprises and industry sectors including:

- process manufacturing
- construction materials testing
- food and beverage processing
- biotechnology, biomedical research, pathology testing
- environmental monitoring and technology
- mining, mineral assay
- calibration
- chemical, forensic, environmental analysis
- education.

The most appropriate ANZCO Classifications are:

- Major Class 3. Technicians and Trades Workers
- 311 Agricultural, Medical and Science Technicians
- 312 Building and Engineering Technicians
- 399 Miscellaneous Technicians and Trades Workers
- Class 2 Professionals.

- 234 Natural and Physical Science Professionals

However, these ANZCO classifications do not cover all relevant workers (eg. scientific glass blowers, samplers and testers).

PML99

The Laboratory Operations Training Package, which was initially endorsed in 1999, has been the principal vehicle for addressing the emerging training and education needs of the people involved in these occupations.

PML99 was developed by Manufacturing Learning Australia with funding provided by the Australian National Training Authority (ANTA). A consulting team led by the Centre for Training, Assessment and Development, Canberra Institute of Technology (CIT), undertook the development of the endorsed components.

Initially, this Training Package was designed to cater for laboratory and testing activities in the manufacturing, biomedical and food processing industries. In 2000, coverage was subsequently expanded to include construction materials testing and scientific glassblowing.

PML04

In October 2002 it was determined that PML99 should be expanded to cover biotechnology, mineral assaying, specialist calibration technicians and laboratory technicians in educational institutions, and that a Certificate II should be developed to cover the needs of personnel working in manufacturing and field based sampling and/or testing. The pace of change in knowledge and skills requirements in these occupations has been a significant driver for the expansion and redevelopment of PML99.

PML04 was endorsed in October 2004, with a review date of 31 October 2007.

MSL09 - Summary of changes

The Laboratory Operations Training Package has been fully reviewed and updated. Refer to Appendix 1 for details of the development process and people involved.

Units of competency

Existing units of competency and qualifications have been revised as follows:

all units have been revised to include the latest version of Australian Standards, updated underpinning knowledge and Evidence Guides.

existing qualifications have been revised to improve flexibility and encourage further uptake of this cross-industry Training Package by even more industry sectors.

Fourteen (14) new units of competency have been developed to address industry needs in:

construction materials testing

mineral assay

calibration checks

treatment of measurement uncertainties

the authorised issue of results.

Packaging rules

The packaging rules for all qualifications have been revised to improve flexibility and encourage further uptake of this cross-industry Training Package by even more industry sectors.

One new qualification (MSL70109 Vocational Graduate Certificate in Instrumental Analysis) has been developed with six (6) new units of competency aligned to the new qualification.

This qualification was developed in response to a widespread industry shortage of technicians who have more than "a black box" knowledge of analytical instruments and an ability to optimise them for specific analytical methods and samples. It replaces a NSW accredited course and other non-Training Package qualifications and has strong industry support.

Addition of mandatory sustainability units

In line with the MSA Board's agreed policy that sustainability units are to be included in the mandatory and elective banks of all qualifications, the three MSA sustainability units have been incorporated into the Laboratory Operations qualifications.

As a result, the number of mandatory units has been increased by one in each existing qualification which requires that the revised qualifications be deemed 'not equivalent'. The impact on delivery and funding should be minimal – feedback from the National TAFE Science Network is that delivery of the sustainability component can be integrated with existing units and co-assessed.

Revised Training Package code and unit codes

As the review of a Training Package automatically results in coding changes, MSA made the decision to take the opportunity to change the Laboratory Operations Training Package code to MSL to indicate the cross-industry coverage of this package, replacing the previous process manufacturing prefix.

It was also decided as part of MSA's rationalisation process, the units of competency would be coded in line with a common coding format that is to be adopted across all future manufacturing units of competency as the qualifications and units are reviewed.

MSA has agreed to use numeric industry field identifiers for all units of competency. This provides a more data-friendly model of coding and one that is based on a logical arrangement. We had previously used alpha characters for industry field identifiers in some of our units/Training Packages but found that there were considerable conflicts arising within our own taxonomy. Given the range of fields in manufacturing sectors, with the potential to use identical alpha characters and the meaningless association with some possible alpha combinations, we determined that a purely numerical system provides a more logical solution for coding of manufacturing units.

The table below indicates the industry field codes for MSL09:

PML04	**MSL09**	**Sector/competency field**
CAL	90	Calibration
COM/ORG/TEAM	91	Communication/organisation

DATA	92	Data/analysis
MAIN/QUAL	93	Quality/laboratory maintenance
OHS	94	Laboratory OHS
SAMP	95	Sampling
SCIG	96	Scientific Glassblowing
TEST	97	Testing

For example

PMLCAL400A	MSL904001A Perform standard calibrations
PMLCOM500B	MSL915001A Provide information to customers
PMLORG500B	MSL915002A Schedule laboratory work for a small team
PMLTEAM600B	MSL916002A Manage and develop teams
PMLDATA200A	MSL922001A Record and present data
PMLMAIN300B	MSL933001A Maintain the laboratory/field workplace fit for purpose
PMLQUAL301B	MSL933003A Apply critical control point requirements
PMLOHS301B	MSL943001A Work safely with instruments that emit ionising radiation
PMLSAMP302A	MSL953001A Receive and prepare samples for testing
PMLSCIG300B	MSL963001A Operate basic handblowing equipment
PMLTEST402B	MSL974001A Prepare, standardise and use solutions

Industry priorities and expectations

Industry representatives and RTOs are keen to see this latest version of the Laboratory Operations Training Package implemented as soon as possible. They consider that the expanded coverage and improved flexibility will enhance uptake of recognised training in many sectors. For example, some organisations (e.g QLD Main Roads) are currently aligning the career frameworks for their technical workforce with units of competence and qualifications in this Training Package.

New units of competence and a new Vocational Graduate Certificate in Instrumental Analysis have been developed in response to well defined industry needs. The new units will address gaps in coverage for several important industry sectors (i.e. construction materials testing, mineral assay).

The Vocational Graduate Certificate will replace an accredited program and will provide much needed training and a qualification for technical specialists/analysts in a highly significant and increasingly technology driven sector.

Impact of the changes

No changes have been made to the previous version of the units or qualifications that will cause significant impacts to RTOs. As a full review of a Training Package results in coding changes, there is minimal impact from the revised coding format.

While all existing units have been revised to improve their currency and reflect feedback from users, the bulk of revised units are equivalent to the units in the previous version of the Training Package. This information is including in the Training Package documentation.

Other than the addition of a sustainability unit in the mandatory groups for existing qualifications, the revised qualifications are considered equivalent in technical content. In the revised Certificate IV, the mandatory OHS unit has been replaced with an AQF 3 unit, in response to requests from the National TAFE Science Network. However, the technical outcomes of that qualification remain the same also.

Specialisations have been listed for the Certificate III and IV qualifications. RTO and industry representatives have argued that providing the opportunity for specialisations to be included below the title of the Certificate III and IV qualifications will greatly enhance the appeal to specific industry sectors and enterprises. These suggestions have been adopted and examples of specialisations include, but are not limited to:

- construction materials testing
- environmental monitoring
- food testing
- mineral assay
- scientific glassblowing
- wine testing.

Implementation of MSL09 is expected in all States and Territories. Many RTOs throughout Australia have delivered previous versions of the Laboratory Operations Training Package (PML99 and PML04) for almost a decade. These RTOs will now be able to expand their delivery to take advantage of the wider range of units and qualification specialisations. The trend of increasing uptake and interest by private RTOs is also likely to continue – particularly in the construction materials testing and mineral assay sectors.

Delivery of the new Vocational Graduate Certificate does require access to expensive equipment. However, the packaging rules for the new Vocational Graduate Certificate do not preclude RTOs that do not have all the analytical instruments and techniques addressed by the units of competence from delivering the qualification. Some large RTOs, with a history of delivering Diploma and Advanced Diploma qualifications from the existing package (PML04) have the equipment already. In NSW, where an accredited course has been delivered for some time, there should be a seamless implementation for these Institutes.

However, replacement of high cost equipment items in response to ever advancing technology is a challenge. For this reason, the most likely successful delivery and assessment model will involve partnering with companies/organisations that have modern laboratories and an interest in accredited training.

State and Territory Training Authorities, RTOs and industry stakeholders have been consulted during the development process and have been kept informed of the changes. MSA is not aware of any issues that need addressing to ensure successful implementation. It is expected RTOs with scope of existing PML04 qualifications will be seek automatic extension of scope for the revised qualifications.

Introduction to the Industry

The industry

This area covers a diverse group of technical and scientific occupations located across the whole of industry. In reality, the groups covered include scientific and technical employees involved in a variety of science-based occupations across many industries.

The Laboratory Operations Training Package (MSL09) addresses the training and recognition needs of samplers, testers and laboratory personnel working in a wide range of enterprises and industry sectors including:

- process manufacturing
- construction materials testing
- food and beverage processing
- wine making
- biotechnology, biomedical research, pathology testing
- environmental monitoring and technology
- mining, mineral assay
- calibration
- chemical, forensic, environmental analysis
- education.

The most appropriate ANZCO Classifications are:

- Major Class 3. Technicians and Trades Workers
- 311 Agricultural, Medical and Science Technicians
- 312 Building and Engineering Technicians
- 399 Miscellaneous Technicians and Trades Workers
- Class 2 Professionals.
- 234 Natural and Physical Science Professionals

However, these ANZCO classifications do not cover all relevant workers (eg. scientific glass blowers, samplers and testers).

Other classifications also include people whose work involves testing or monitoring of materials and processes using scientific methods and/or equipment.

In general terms, the occupations covered are those in which non-professional employees use scientific techniques and equipment to carry out tests, and to operate and manage scientific processes. The core of these jobs is the use of scientific techniques, equipment and related knowledge.

A range of factors has driven the need for Vocational Education and Training in these occupations. First amongst them is the increasing regulation of standards relating to use of materials and equipment. Testing and monitoring of environmental and health hazards in the food processing and rural sectors are typical areas where this is observed. Similarly, testing of product safety is particularly important in the manufacturing industry.

A second area of demand emerges particularly from the greater attention to quality within manufacturing and construction. Testing of materials and products is now an inherent part of design and product quality systems.

An estimation of the numbers of personnel in each occupational group is difficult. As there are no ANZCO occupations which wholly describe the work of technical assistants, laboratory assistants/aides/attendants, sampler/testers, and those operators who undertake limited quality control duties, it is not possible to accurately estimate the number of personnel in this group.

Qualifications Framework

The Australian Qualifications Framework

What is the Australian Qualifications Framework?

A brief overview of the Australian Qualifications Framework (AQF) follows. For a full explanation of the AQF, see the AQF Implementation Handbook. http://www.aqf.edu.au/Portals/0/Documents/Handbook/AQF_Handbook_07.pdf The AQF provides a comprehensive, nationally consistent framework for all qualifications in

post-compulsory education and training in Australia. In the vocational education and training (VET) sector it assists national consistency for all trainees, learners, employers and providers by enabling national recognition of qualifications and Statements of Attainment.

Training Package qualifications in the VET sector must comply with the titles and guidelines of the AQF. Endorsed Training Packages provide a unique title for each AQF qualification which must always be reproduced accurately.

Qualifications

Training Packages can incorporate the following eight AQF qualifications.

- Certificate I in ...
- Certificate II in ...
- Certificate III in ...
- Certificate IV in ...

- Diploma of ...
- Advanced Diploma of ...
- Vocational Graduate Certificate of ...
- Vocational Graduate Diploma of ...

Graduate Certificates and Graduate Diplomas can also be awarded in the vocational education and training sector under certain conditions see the AQF Implementation Handbook for details.

On completion of the requirements defined in the Training Package, a Registered Training Organisation (RTO) may issue a nationally recognised AQF qualification. Issuance of AQF qualifications must comply with the advice provided in the AQF Implementation Handbook and the AQTF 2010 Essential Standards for Initial and Continuing Registration. .

Statement of Attainment

A Statement of Attainment is issued by a Registered Training Organisation when an individual has completed one or more units of competency from nationally recognised qualification(s)/courses(s). Issuance of Statements of Attainment must comply with the advice provided in the current AQF Implementation Handbook and the AQTF 2010 Essential Standards for Initial and Continuing Registration..

Under the AQTF 2010, RTOs must recognise the achievement of competencies as recorded on a qualification testamur or Statement of Attainment issued by other RTOs. Given this, recognised competencies can progressively build towards a full AQF qualification.

AQF Guidelines and Learning Outcomes

The AQF Implementation Handbook provides a comprehensive guideline for each AQF qualification. A summary of the learning outcome characteristics and their distinguishing features for each VET related AQF qualification is provided below.

Certificate I

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and skills would prepare a person to perform a defined range of activities most of which may be routine and predictable.

Applications may include a variety of employment related skills including preparatory access and participation skills, broad-based induction skills and/or specific workplace skills. They may also include participation in a team or work group.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate knowledge by recall in a narrow range of areas;
- demonstrate basic practical skills, such as the use of relevant tools;
- perform a sequence of routine tasks given clear direction receive and pass on messages/information.
- receive and pass on messages/information.

Certificate II

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and skills would prepare a person to perform in a range of varied activities or knowledge application where there is a clearly defined range of contexts in which the choice of actions required is usually clear and there is limited complexity in the range of operations to be applied.

Performance of a prescribed range of functions involving known routines and procedures and some accountability for the quality of outcomes.

Applications may include some complex or non-routine activities involving individual responsibility or autonomy and/or collaboration with others as part of a group or team.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate basic operational knowledge in a moderate range of areas;
- apply a defined range of skills;
- apply known solutions to a limited range of predictable problems;
- perform a range of tasks where choice between a limited range of options is required;
- assess and record information from varied sources;
- take limited responsibility for own outputs in work and learning.

Certificate III

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and competencies would cover selecting, adapting and transferring skills and knowledge to new environments and providing technical advice and some leadership in resolution of specified problems. This would be applied across a range of roles in a variety of contexts with some complexity in the extent and choice of options available.

Performance of a defined range of skilled operations, usually within a range of broader related activities involving known routines, methods and procedures, where some discretion and judgement is required in the section of equipment, services or contingency measures and within known time constraints.

Applications may involve some responsibility for others. Participation in teams including group or team co-ordination may be involved.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate some relevant theoretical knowledge
- apply a range of well-developed skills
- apply known solutions to a variety of predictable problems
- perform processes that require a range of well-developed skills where some discretion and judgement is required
- interpret available information, using discretion and judgement

- take responsibility for own outputs in work and learning
- take limited responsibility for the output of others.

Certificate IV

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and competencies would cover a broad range of varied activities or application in a wider variety of contexts most of which are complex and non-routine. Leadership and guidance are involved when organising activities of self and others as well as contributing to technical solutions of a non-routine or contingency nature.

Performance of a broad range of skilled applications including the requirement to evaluate and analyse current practices, develop new criteria and procedures for performing current practices and provision of some leadership and guidance to others in the application and planning of the skills. Applications involve responsibility for, and limited organisation of, others.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate understanding of a broad knowledge base incorporating some theoretical concepts
- apply solutions to a defined range of unpredictable problems
- identify and apply skill and knowledge areas to a wide variety of contexts, with depth in some areas
- identify, analyse and evaluate information from a variety of sources
- take responsibility for own outputs in relation to specified quality standards
- take limited responsibility for the quantity and quality of the output of others.

Diploma

Characteristics of Learning Outcomes

Breadth, depth and complexity covering planning and initiation of alternative approaches to skills or knowledge applications across a broad range of technical and/or management requirements, evaluation and co-ordination.

The self directed application of knowledge and skills, with substantial depth in some areas where judgment is required in planning and selecting appropriate equipment, services and techniques for self and others.

Applications involve participation in development of strategic initiatives as well as personal responsibility and autonomy in performing complex technical operations or organising others. It may include participation in teams including teams concerned with planning and evaluation functions. Group or team co-ordination may be involved.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

- demonstrate understanding of a broad knowledge base incorporating theoretical concepts, with substantial depth in some areas
- analyse and plan approaches to technical problems or management requirements
- transfer and apply theoretical concepts and/or technical or creative skills to a range of situations
- evaluate information, using it to forecast for planning or research purposes
- take responsibility for own outputs in relation to broad quantity and quality parameters
- take some responsibility for the achievement of group outcomes.

Advanced Diploma

Characteristics of Learning Outcomes

Breadth, depth and complexity involving analysis, design, planning, execution and evaluation across a range of technical and/or management functions including development of new criteria or applications or knowledge or procedures.

The application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts in relation to either varied or highly specific functions. Contribution to the development of a broad plan, budget or strategy is involved and accountability and responsibility for self and others in achieving the outcomes is involved.

Applications involve significant judgement in planning, design, technical or leadership/guidance functions related to products, services, operations or procedures.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

- demonstrate understanding of specialised knowledge with depth in some areas
- analyse, diagnose, design and execute judgements across a broad range of technical or management functions
- generate ideas through the analysis of information and concepts at an abstract level
- demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills
- demonstrate accountability for personal outputs within broad parameters
- demonstrate accountability for personal and group outcomes within broad parameters.

Vocational Graduate Certificate

Characteristics of competencies or learning outcomes

- The self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Substantial breadth and complexity involving the initiation, analysis, design, planning, execution and evaluation of technical and management functions in highly varied and highly specialised contexts.

- Applications involve making significant, high-level, independent judgements in major broad or planning, design, operational, technical and management functions in highly varied and specialised contexts. They may include responsibility and broad-ranging accountability for the structure, management and output of the work or functions of others.
- The degree of emphasis on breadth, as opposed to depth, of knowledge and skills may vary between qualifications granted at this level.

Distinguishing features of learning outcomes

- Demonstrate the self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Initiate, analyse, design, plan, execute and evaluate major broad or technical and management functions in highly varied and highly specialised contexts.
- Generate and evaluate ideas through the analysis of information and concepts at an abstract level.
- Demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills in complex contexts.
- Demonstrate responsibility and broad-ranging accountability for the structure, management and output of the work or functions of others.

Vocational Graduate Diploma

Characteristics of competencies or learning outcomes

- The self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Substantial breadth, depth and complexity involving the initiation, analysis, design, planning, execution and evaluation of major functions, both broad and highly specialised, in highly varied and highly specialised contexts.
- Further specialisation within a systematic and coherent body of knowledge.
- Applications involve making high-level, fully independent, complex judgements in broad planning, design, operational, technical and management functions in highly varied and highly specialised contexts. They may include full responsibility and accountability for all aspects of work and functions of others, including planning, budgeting and strategy development.
- The degree of emphasis on breadth, as opposed to depth, of knowledge and skills may vary between qualifications granted at this level.

Distinguishing features of learning outcomes

- Demonstrate the self-directed development and achievement of broad and highly specialised areas of knowledge and skills, building on prior knowledge and skills.
- Initiate, analyse, design, plan, execute and evaluate major functions, both broad and within highly varied and highly specialised contexts.
- Generate and evaluate complex ideas through the analysis of information and concepts at an abstract level.
- Demonstrate an expert command of wide-ranging, highly specialised, technical, creative or conceptual skills in complex and highly specialised or varied contexts.
- Demonstrate full responsibility and accountability for personal outputs.

- Demonstrate full responsibility and accountability for all aspects of the work or functions of others, including planning, budgeting and strategy.
-

Vocational Graduate Certificate

Characteristics of competencies or learning outcomes

- The self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Substantial breadth and complexity involving the initiation, analysis, design, planning, execution and evaluation of technical and management functions in highly varied and highly specialised contexts.
- Applications involve making significant, high-level, independent judgements in major broad or planning, design, operational, technical and management functions in highly varied and specialised contexts. They may include responsibility and broad-ranging accountability for the structure, management and output of the work or functions of others.
- The degree of emphasis on breadth, as opposed to depth, of knowledge and skills may vary between qualifications granted at this level.

Distinguishing features of learning outcomes

- Demonstrate the self-directed development and achievement of broad and specialised areas of knowledge and skills, building on prior knowledge and skills.
- Initiate, analyse, design, plan, execute and evaluate major broad or technical and management functions in highly varied and highly specialised contexts.
- Generate and evaluate ideas through the analysis of information and concepts at an abstract level.
- Demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills in complex contexts.
- Demonstrate responsibility and broad-ranging accountability for the structure, management and output of the work or functions of others.
-

Qualification Pathways

Making the Laboratory Operations Training Package work for your industry

Where do you start? What qualifications or competencies in this Training Package might support your job role, or the different job roles in your organisation?

Because specialisation is a requirement in some industry sectors the MSL Certificates III, IV and Diploma qualifications can be packaged to suit a particular industry sector or specialisation. The specialisation can be included in brackets under the qualification title.

Industry sector/specialisations could include, but are not limited to:

- biological testing
- biological and environmental testing
- biotechnology

- calibration
- chemical testing
- construction materials testing
- environmental monitoring
- food testing
- wine testing
- manufacturing testing
- mineral assay
- pathology testing
- scientific glassblowing.

Many industries are not necessarily interested in delivering full qualifications. However, in those instances there are many units of competency that can be used to benchmark performance and upskill existing worders.

Many industry people will find this useful for:

- recruiting staff
- classifying staff
- designing on-the-job training to upskill existing workers
- buying training
- career pathways planning.

Examples of common job roles

We have identified seven common job roles that the MSL09 qualifications and units support:

- sampler/tester working in manufacturing or in a field environment
- laboratory/technical assistant working in construction materials testing
- laboratory assistant working in a food company
- technician working in a mineral assay laboratory
- technical assistant working in environmental monitoring
- technical officer working in biotechnology
- calibration technician.

Brief descriptions of these job roles follow. The relevant units of competency can be found in Volume 2 of MSL09.

If you are interested in full qualifications, refer to the packaging rules in Volume 2.

Sampler/Tester working in manufacturing or a field environment

Samplers and testers conduct limited sampling and measurement as part of their duties. In areas such as mineral assay for example, this work forms a whole job role. They apply a restricted range of skills and operational knowledge to perform these tasks and do not generally work inside a laboratory.

Examples of the work of samplers and testers are given below:

- An operator in a quarry may take samples from stockpiles and conveyors and conduct simple tests on different grades of aggregates.
- In the sample preparation facility of a mining company, field assistants collect, log and prepare samples to be forwarded for analysis in regional centres.

Some relevant units of competency required for this work include:

MSL952001A Collect routine site samples
MSL952002A Handle and transport samples or equipment
MSL972001A Conduct routine site measurements.

If you were interested in a full qualification, the most appropriate one would be the *MSL20109 Certificate II in Sampling and Measurement.*

Laboratory/Technical Assistant working in construction materials testing

Laboratory assistants perform straightforward sampling and testing. They follow set procedures and recipes, and apply well developed technical skills and basic scientific knowledge. The majority of their work involves a predictable flow of parallel or similar tasks within one scientific discipline.

For example a laboratory assistant working in construction materials testing receives and prepares soil samples for classification testing. Some relevant units of competency required for this work include:

MSL952001A Collect routine site samples
MSL952002A Handle and transport samples or equipment
MSL953001A Receive and prepare samples for testing
MSL973010A Conduct laboratory-based acceptance tests for construction materials
MSL974010A Perform mechanical tests.

If you were interested in a full qualification, the most appropriate would be the *MSL30109 Certificate III in Laboratory Skills (Construction Materials Testing).*

Laboratory Assistant working in a food company

As noted above, laboratory assistants perform straightforward sampling and testing. They follow set procedures and recipes, and apply well-developed technical skills and basic scientific knowledge. They generally work inside the laboratory, but may also perform technical tasks within the production plant.

For example, a laboratory assistant working at a dairy factory gathers samples from the milk tankers, vats and the processing line, and performs routine chemical and bacteriological tests on the samples. Some relevant units of competency required for this work include:

MSL933003A Apply critical control point requirements
MSL953001A Receive and prepare samples for testing
MSL973001A Perform basic tests
MSL973004A Perform aseptic techniques
MSL973007A Perform microscopic examination
MSL974004A Perform food tests.

If you were interested in full qualifications, the most appropriate would be the *MSL30109 Certificate III in Laboratory Skills (Food Testing).*

Technician working in a mineral assay laboratory

Technical assistants undertake a wide range of sampling and testing that requires the application of a broad range of technical skills and some scientific knowledge. Although technical assistants generally work in a laboratory, they often work closely with other personnel throughout the workplace. The work of technical assistants involves similar tasks within one scientific discipline with occasional peak periods and some interruptions.

For example, a technician who works in a mineral preparation plant receives and logs incoming ore samples and operates handling equipment to move samples to treatment points. In the laboratory, the technician conducts routine chemical and physical tests and redirects other subsamples for specialised analyses. Some relevant units of competency required for this work include:

MSL953001A Receive and prepare samples for testing
MSL954002A Prepare mineral samples for analysis
MSL974003A Perform chemical tests and procedures
MSL974005A Perform physical tests
MSL975010A Perform fire assay techniques
MSL973011A Perform fire pouring techniques.

If you were interested in full qualifications, the most appropriate would be the *MSL40109 Certificate IV in Laboratory Techniques (Mineral Assay).*

Technical Assistant working in environmental monitoring

As above, technical assistants undertake a wide range of sampling and testing that requires the application of a broad range of technical skills and some scientific knowledge. The work of technical assistants involves similar tasks within one scientific discipline with occasional peak periods and some interruptions. They may also assist other personnel to solve technical problems.

For example, a technician who works for an environmental consulting company conducts field sampling

and testing and operates/maintains several remote sensing sites. Some relevant units of competency required for this work include:

MSL973001A Perform basic tests
MSL954001A Obtain representative samples in accordance with sampling plan
MSL974007A Undertake environmental field-based monitoring
MSL974009A Undertake environmental field-based, remote-sensing monitoring.

If you were interested in full qualifications, the most appropriate would be the *MSL40109 Certificate IV in Laboratory Techniques (Environmental Monitoring).*

Technical Officers working in biotechnology, calibration, pathology and chemical analysis laboratories

Technical officers conduct a wide range of sampling and testing that requires the application of broad scientific-technical knowledge and skills, with substantial depth in some areas. Although technical officers generally work in a laboratory, they often work closely with personnel in other teams within a section of the workplace.

They may liaise with suppliers to troubleshoot product non-conformance at the direction of laboratory supervisors or managers. They gather information on non-conformance and events that may lead to the modification of workplace procedures. They may also demonstrate methods to others and train them to collect samples and conduct basic tests reliably.

The work of technical officers involves frequent peak periods and interruptions.

Biotechnology Technician

A technical officer working in a biotechnology laboratory prepares, maintains and preserves cells and cell lines for the large scale production of monoclonal antibodies. Some relevant units of competency required for this work include:

MSL973004A Perform aseptic techniques
MSL973007A Perform microscopic examination
MSL974011A Prepare tissue and cell cultures
MSL974006A Perform biological procedures
MSL975013A Perform tissue and cell culture techniques
MSL975014A Perform molecular biology tests.

Calibration Technician

A technical officer working in a calibration laboratory performs standard and non-standard calibrations of equipment provided by clients. Some relevant units of competency required for this work include:

MSL904001*A Perform standard calibrations*
MSL905001A Perform non-standard calibrations
MSL905002A Create or modify calibration procedures
MSL905003A Create or modify automated calibration procedures
MSL935001A Monitor the quality of test results and data.

Pathology Technician

Technical officers who work in pathology laboratories perform a range of tests on body tissues and fluids to measure quantities such as the amount of biological substances. They also prepare cultures, stained tissue sections and thin films to count and classify cells, bacteria and parasites. Some relevant units of competency required for this work include:

MSL975001A Perform microbiological tests
MSL975002A Perform haematological tests
MSL975003A Perform histological tests
MSL975004A Perform chemical pathology tests.

Chemical Technician/Analyst

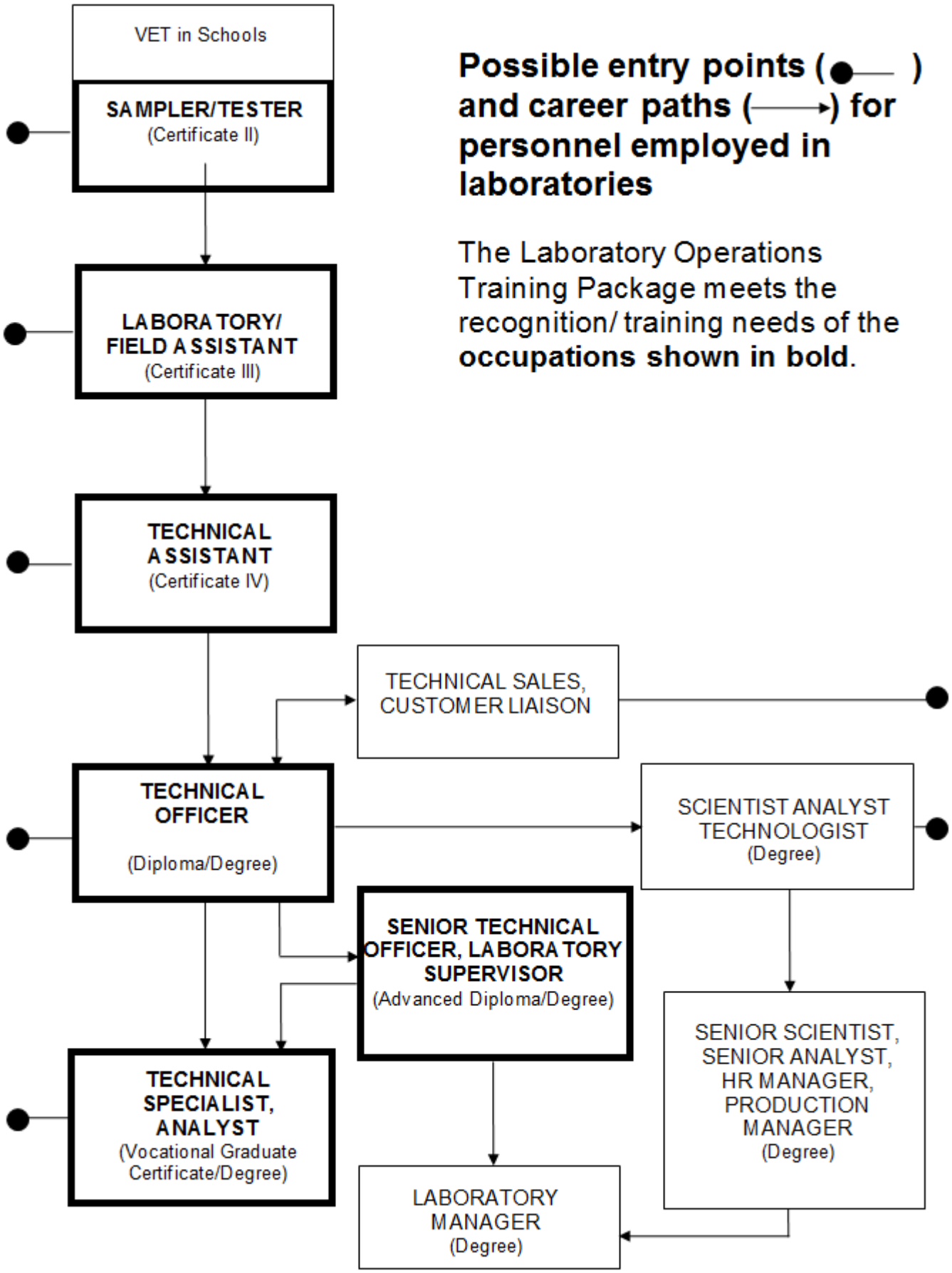
Technical officers working in analytical laboratories analyse samples using a range of techniques and instruments. They establish client needs for routine and non-routine samples, optimise enterprise procedures and instruments for specific samples, recognise atypical data and results and troubleshoot common analytical procedure and equipment problems. Some relevant units of competency required for this work include:

MSL975009A Apply routine chromatographic techniques
MSL975018A Perform complex tests to measure chemical properties of materials
MSL975019A Apply complex instrumental techniques
MSL975020A Apply routine spectrometric techniques
MSL975021A Apply routine electrometric techniques.

If you were interested in a full qualification, the most appropriate for the above four job roles would be the *MSL50109 Diploma of Laboratory Technology (plus relevant specialisation).*

Qualifications pathways chart

The following flowchart sets out possible learning and career paths for laboratory personnel. It provides an indication of possible sequencing of qualifications, multiple entry points, links between qualifications in the VET and higher education sectors, and the occupational roles within laboratory operations. Market forces will determine the availability of particular learning pathways and employment outcomes.



Possible entry points (●) and career paths (→) for personnel employed in laboratories

The Laboratory Operations Training Package meets the recognition/ training needs of the **occupations shown in bold**.

Skill Sets in this Training Package

Definition

Skill sets are defined as single units of competency, or combinations of units of competency from an endorsed Training Package, which link to a licence or regulatory requirement, or defined industry need.

Wording on Statements of Attainment

Skill sets are a way of publicly identifying logical groupings of units of competency which meet an identified need or industry outcome. Skill sets are not qualifications.

Where skill sets are identified in a Training Package, the Statement of Attainment can set out the competencies a person has achieved in a way that is consistent and clear for employers and others. This is done by including the wording "these competencies meet [insert skill set title or identified industry area] need" on the Statement of Attainment. This wording applies only to skill sets that are formally identified as such in the endorsed Training Package.

See the 2010 edition of the AQF Implementation Handbook for advice on wording on Statements of Attainment.
http://www.aqf.edu.au/Portals/0/Documents/Handbook/AQF_Handbook_07.pdf

Skill Sets in this Training Package

No Skill Sets have been developed for MSL09.

Employability Skills

Employability Skills

Employability Skills replacing Key Competency information from 2006

In May 2005, the approach to incorporate Employability Skills within Training Package qualifications and units of competency was endorsed. As a result, from 2006 Employability Skills will progressively replace Key Competency information in Training Packages.

Background to Employability Skills

Employability Skills are also sometimes referred to as generic skills, capabilities or Key Competencies. The Employability Skills discussed here build on the Mayer Committee's Key Competencies, which were developed in 1992 and attempted to describe generic competencies for effective participation in work.

The Business Council of Australia (BCA) and the Australian Chamber of Commerce and Industry (ACCI), produced the *Employability Skills for the Future* report in 2002 in consultation with other peak employer bodies and with funding provided by the Department of Education, Science and Training (DEST) and the Australian National Training Authority (ANTA). Officially released by Dr Nelson (Minister for Education, Science and Training) on 23 May 2002, copies of the report are available from the DEST website at:

The report indicated that business and industry now require a broader range of skills than the Mayer Key Competencies Framework and featured an Employability Skills Framework identifying eight Employability Skills*:

- communication
- teamwork
- problem solving
- initiative and enterprise
- planning and organising
- self-management
- learning
- technology.

The report demonstrated how Employability Skills can be further described for particular occupational and industry contexts by sets of facets. The facets listed in the report are the aspects of the Employability Skills that the sample of employers surveyed identified as being important work skills. These facets were seen by employers as being dependent both in their nature and priority on an enterprise's business activity.

*Personal attributes that contribute to employability were also identified in the report but are not part of the Employability Skills Framework.

Employability Skills Framework

The following table contains the Employability Skills facets identified in the report

Employability Skills for the Future.

Skill	**Facets** Aspects of the skill that employers identify as important. The nature and application of these facets will vary depending on industry and job type.
Communication that contributes to productive and harmonious relations across employees and customers	• listening and understanding • speaking clearly and directly • writing to the needs of the audience • negotiating responsively • reading independently • empathising • using numeracy effectively • understanding the needs of internal and external customers • persuading effectively • establishing and using networks

	• being assertive • sharing information • speaking and writing in languages other than English
Teamwork that contributes to productive working relationships and outcomes	• working across different ages irrespective of gender, race, religion or political persuasion • working as an individual and as a member of a team • knowing how to define a role as part of the team • applying teamwork to a range of situations e.g. futures planning and crisis problem solving • identifying the strengths of team members • coaching and mentoring skills, including giving feedback
Problem solving that contributes to productive outcomes	• developing creative, innovative and practical solutions • showing independence and initiative in identifying and solving problems • solving problems in teams • applying a range of strategies to problem solving • using mathematics, including budgeting and financial management to solve problems • applying problem-solving strategies across a range of areas • testing assumptions, taking into account the context of data and circumstances • resolving customer concerns in relation to complex project issues
Initiative and enterprise that contribute to innovative outcomes	• adapting to new situations • developing a strategic, creative and long-term vision • being creative • identifying opportunities not obvious to others • translating ideas into action • generating a range of options • initiating innovative solutions
Planning and organising that contribute to long and short-term strategic planning	• managing time and priorities - setting time lines, coordinating tasks for self and with others • being resourceful

	• taking initiative and making decisions • adapting resource allocations to cope with contingencies • establishing clear project goals and deliverables • allocating people and other resources to tasks • planning the use of resources, including time management • participating in continuous improvement and planning processes • developing a vision and a proactive plan to accompany it • predicting - weighing up risk, evaluating alternatives and applying evaluation criteria • collecting, analysing and organising information • understanding basic business systems and their relationships
Self-management that contributes to employee satisfaction and growth	• having a personal vision and goals • evaluating and monitoring own performance • having knowledge and confidence in own ideas and visions • articulating own ideas and visions • taking responsibility
Learning that contributes to ongoing improvement and expansion in employee and company operations and outcomes	• managing own learning • contributing to the learning community at the workplace • using a range of mediums to learn - mentoring, peer support and networking, IT and courses • applying learning to technical issues (e.g. learning about products) and people issues (e.g. interpersonal and cultural aspects of work) • having enthusiasm for ongoing learning • being willing to learn in any setting - on and off the job • being open to new ideas and techniques • being prepared to invest time and effort in learning new skills • acknowledging the need to learn in order to accommodate change
Technology that contributes to the	• having a range of basic IT skills • applying IT as a management tool

effective carrying out of tasks	• using IT to organise data • being willing to learn new IT skills • having the OHS knowledge to apply technology • having the appropriate physical capacity

Employability Skills Summary

An Employability Skills Summary exists for each qualification. Summaries provide a lens through which to view Employability Skills at the qualification level and capture the key aspects or facets of the Employability Skills that are important to the job roles covered by the qualification. Summaries are designed to assist trainers and assessors to identify and include important industry application of Employability Skills in learning and assessment strategies.

The following is important information for trainers and assessors about Employability Skills

Summaries.

- Employability Skills Summaries provide examples of how each skill is applicable to the job roles covered by the qualification.
- Employability Skills Summaries contain general information about industry context which is further explained as measurable outcomes of performance in the units of competency in each qualification.
- The detail in each Employability Skills Summary will vary depending on the range of job roles covered by the qualification in question.
- Employability Skills Summaries are not exhaustive lists of qualification requirements or checklists of performance (which are separate assessment tools that should be
- designed by trainers and assessors after analysis at the unit level).
- Employability Skills Summaries contain information that may also assist in building learners' understanding of industry and workplace expectations.
-

Industry Requirements for Employability Skills

This is a scientific and technology based industry. It is a key role of laboratory personnel to recognise and report non-conformance and maintain security and confidentiality of all client/enterprise data and information. They generally work under strict operating procedures and must be able to access, record and present information accurately. Initiative and planning is required at all levels.

Examples from this Training Package of Employability Skills embedded within unit components

Examples from this Training Package of Employability Skills embedded within unit components	
Unit component	**Example of embedded Employability Skill**
Unit Title	Prepare trial batches *(Planning, organising)*
Unit Descriptor	This unit of competency covers the ability to prepare trial batches of materials for evaluation. Materials can include soil, minerals and manufactured products, such as concrete, asphalt, food, plastics, paint and other industrial chemicals. *(Planning, initiative, problem solving)*
Element	Record description of the job to be undertaken, compare with specification and report any variations *(Planning, learning, initiative)* Evaluate properties of the mixture by inspection and standard test methods *(Problem solving, technology)* Clean equipment and dispose of materials *(Initiative, planning, organising)* Maintain a safe work environment *(Self management, organising)*
Performance Criteria	Record description of the job to be undertaken, compare with specification and report any variations *(Planning, communication, enterprise, learning)* Maintain confidentiality of enterprise information *(Initiative, self management)* Minimise the generation of wastes and environmental impacts *(Planning, enterprise, organising)* Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel

Examples from this Training Package of Employability Skills embedded within unit components	
Unit component	**Example of embedded Employability Skill**
	(Communication, planning, self management, teamwork)

Examples from this Training Package of Employability Skills embedded within unit components

Unit component	Example of embedded Employability Skill
Range Statement	Typical problems may include: • not following SOPs • measurement errors • calculation errors • materials of unreliable quality • insufficient mixing • poor sampling procedures • equipment breakdown and breakage • *(Technology, planning, initiative, self management)*
Required Skills and Knowledge	Required skills include: • performing simple calculations • making accurate measurements of volume and mass • representative sampling • working safely with equipment and hazardous materials • working safely in laboratory and field conditions • setting up and maintaining tools and equipment • using tools and equipment to perform basic sampling and testing techniques • observing and recording information on testing and sampling • handling, transporting and storing materials • observing interpreting and reporting atypical situations • *(Technology, learning, communication, initiative, problem solving)*
Evidence Guide	The assistant tests the aggregates to determine their grading properties. From these results, he/she designs a mix to satisfy the project specifications using a standard design method. *(Technology, initiative, problem solving)* Assessors should ensure that candidates can: perform operations in accordance with laboratory and/or enterprise procedures, and appropriate

Examples from this Training Package of Employability Skills embedded within unit components	
Unit component	**Example of embedded Employability Skill**
	legislative requirements • accurately measure, calculate and record batch quantities, concentrations and other relevant parameters • evaluate properties of the mixture by inspection and standard test methods • recognise and report problems and atypical situations to relevant personnel. • *(Communication, planning, self management, initiative, problem solving)*

Assessment Guidelines

Licensing/Registration Requirements

No licensing or registration requirements apply to RTOs, assessors or candidates for this Training Package.

There are no general licensing issues associated with any units of competency, however, there may be regulatory requirements in some industries and local regulations should be checked for details.

Requirements for Assessors

Assessors will be required to meet the AQTF requirements. This includes demonstrated technical competency for the MSL units assessed.

Assessment in the laboratory and testing industries

What criteria must be met when designing assessment?

The design of assessment needs to ensure that all aspects of competency are covered:

- task skills (performance of individual tasks)
- task management skills (managing a number of different tasks within the job)
- contingency management skills (responding to problems, breakdowns and changes in routine)
- job/role environment skills (dealing with the responsibilities and expectations of the workplace)
- relevant underpinning knowledge.

Evidence-gathering methods must be gender- and culturally-inclusive and take into account the language, literacy and numeracy skills of both candidate and assessor. Assessors may consider:

- incorporating a range of assessment techniques
- integrating the assessment of units related to the performance of 'whole of work' tasks, roles or functions
- using a holistic approach which combines knowledge, understanding, problem-solving, technical skills and applications to new situations into the assessment process
- assessing in the workplace (wherever possible), using familiar skills and materials
- eliminating any unnecessary reading or written assessment (if these skills are not required to do the job, they should not be part of the assessment)
- ensuring understanding of questions by rephrasing to clarify and using the language and terms of the job and the workplace
- encouraging the candidate to ask questions to clarify instructions
- providing clarification of purpose and process of assessment
- considering cultural and gender issues when setting up the assessment.

Conducting Assessments

Evidence-gathering methods must be appropriate to the context of the assessment, the assessor and the candidate. The collection of evidence must meet the principles of validity, authenticity, sufficiency, currency and consistency.

Valid evidence collection ensures that the assessment assesses what it claims to assess. The evidence collected must be relevant to the activity and focus on the knowledge and skills specified in the Evidence Guides and Performance Criteria.

Authentic assessment relates primarily to achieving 'a close correspondence between the assessment situation and the situation in which the candidate will one day operate'. A driving practical test is, in this sense, an authentic assessment process. In other contexts where complete authenticity will usually not be practical, every effort should be made to maximise authenticity. An assessor must also ensure that the evidence actually relates to the performance of the person being assessed, and not that of another person. Where this is an issue, validation of the evidence by a third party may be necessary.

A **sufficient** assessment requires that sufficient evidence is collected to demonstrate competency in the standard being assessed. Evidence should be gathered on a number of occasions, in a range of contexts and using different assessment methods.

Currency of evidence collection ensures that the evidence is not outdated and that the person is competent in terms of the most recent standards. This is of particular concern when assessing for the purposes of recognition of current competencies.

A **consistent** assessment ensures both that the evidence collected demonstrates consistent achievement of the specified standard by the person being assessed, and that the outcomes of the assessment process are substantially consistent irrespective of where, when and by whom the assessment is conducted.

Following the assessment process, assessment outcomes need to be recorded and securely stored, and feedback provided in terms of performance against the relevant competency standards.

Where assessment is occurring in the workplace:

Take into account that the person being assessed may have had little experience of structured training and assessment. Carefully explain the process of making judgements against the standards and make the candidate feel as relaxed as possible.

Consult on the assessment process with the parties involved.

The assessment should take place over a reasonable length of time so that the candidate has the opportunity to demonstrate work responsibility and contingency management. (Third party reports of workplace performance, if available, are helpful for this.)

Consider the other staff in the workplace likely to be affected by the process. All staff directly or indirectly involved in the process should be briefed on the factors which will impact on them, such as duration or changes in work routine.

Ensure that assessment is as compatible as possible with the normal pattern of work and causes minimal disruption. If the process involves candidates being away from their work area for a period of time, then arrangements should be made with their immediate supervisor to cover their duties for that period of time.

Assessment resources for this Training Package should provide ways in which to address these matters.

Where assessment is occurring out of the workplace, it is important to ensure that:

- the assessment takes place in a situation as close as possible to workplace reality
- all aspects of competency are assessed
- the assessment takes place over a reasonable length of time so that the candidate has the opportunity to demonstrate work responsibility and contingency management. Third party reports of workplace performance, if available, are helpful for this
- documents used in assessment closely reflect workplace reality.

Assessment considerations for technical/testing units

All units have been written with a focus on a workplace assessment environment. In institutional delivery this can be achieved through simulation of workplace activities, or through work placements.

Competence must be demonstrated in the ability to recognise and analyse potential situations requiring action and then in implementing appropriate corrective action.

The performance of testing units (code 97) relies on compliance with all the requirements of the organisation's quality management system. Where such systems are mandated by legislation or licensing then the context in which the competence is demonstrated/assessed must meet the requirements of that legislation or license to the satisfaction of the regulatory authority.

Consistent performance should be demonstrated. In particular, the assessor could:

- review test data/results obtained by the candidate over time, particularly to check accuracy, consistency and timeliness of results
- review test records and workplace documentation prepared by the candidate
- observe the candidate conducting sample preparation and a range of test procedures
- obtain feedback from clients, peers and supervisors
- question the candidate about relevant scientific/technical terms, test methods and enterprise procedures, common problems and corrective action
- conduct simulations and role plays to assess the candidate's ability to handle unforeseen problems, respond to simulated emergencies and to simulated working conductions where access to the workplace is not possible.

Designing Assessment Tools

This section provides an overview on the use and development of assessment tools.

Use of Assessment Tools

Assessment tools provide a means of collecting the evidence that assessors use in making judgments about whether candidates have achieved competency.

There is no set format or process for the design, production or development of assessment tools. Assessors may use prepared assessment tools, such as those specifically developed to support this Training Package, or they may develop their own.

Using Prepared Assessment Tools

If using prepared assessment tools, assessors should ensure these relate to the current version of the relevant unit of competency. The current unit of competency can be checked on the National Register < www.ntis.gov.au>.

Developing Assessment Tools

When developing assessment tools, assessors must ensure that they:

- are benchmarked against the relevant unit or units of competency
- are reviewed as part of the continuous improvement of assessment strategies as required under Standard 1 of the AQTF 2007
- meet the assessment requirements expressed in Standard 1 of the AQTF 2010 *Essential Standards for Initial and Continuing Registration*.

A key reference for assessors developing assessment tools is TAE10 Training and Education Training Package.

Language, Literacy and Numeracy

The design of assessment tools must reflect the language, literacy and numeracy competencies required for the performance of a task in the workplace and not exceed these expectations.

Conducting Assessment

This section details the mandatory assessment requirements and provides information on equity in assessment including reasonable adjustment.

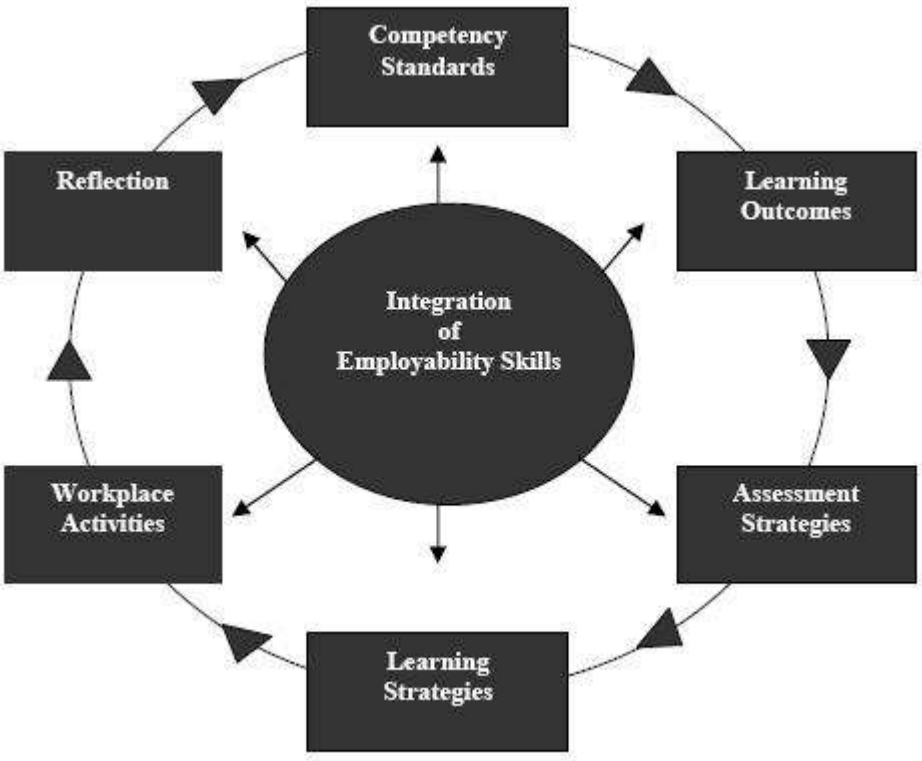
Mandatory Assessment Requirements

Assessments must meet the criteria set out in the 2010 *Essential Standards for Initial and Continuing Registration*. For information, the mandatory assessment requirements from Standard 1 from the AQTF 2010 *Essential Standards for Initial and Continuing Registration* are as follows:

1.5		Assessment, including Recognition of Prior Learning:
	a)	meets the requirements of the relevant Training Package or accredited course,
	b)	is conducted in accordance with the principles of assessment and the rules of evidence, and
	c)	meets workplace and, where relevant, regulatory requirements.
	d)	is systematically validated.

Assessment of Employability Skills

Employability Skills are integral to workplace competency. As such they must be considered in the design, customisation, delivery and assessment of vocational education and training programs in an integrated and holistic way, as represented diagrammatically below.



Employability Skills are embedded and explicit within each unit of competency, and an Employability Skills Summary is available for each qualification. Training providers must use Employability Skills information in order to design valid and reliable training and assessment strategies. This analysis could include:

- reviewing units of competency to locate relevant Employability Skills and determine how they are applied within the unit
- analysing the Employability Skills Summary for the qualification in which the unit or units are packaged to help clarify relevant industry and workplace contexts and the
- application of Employability Skills at that qualification outcome
- designing training and assessment to address Employability Skills requirements.

The National Quality Council has endorsed a model for assessing and reporting Employability Skills, which contains further suggestions about good practice strategies in teaching, assessing, learning and reporting Employability Skills. The model is available from < http://www.training.com.au/>.

The endorsed approach includes learners downloading qualification specific Employability Skills Summaries for Training Package qualifications from an online repository at < http://employabilityskills.training.com.au>

For more information on Employability Skills in Manufacturing Industry Skills Council Training

Packages go to the Manufacturing Industry Skills Council website at http://www.mskills.com.au.

Employability Skills are reported on each qualification using the following statement on the qualification testamur: "A summary of the Employability Skills developed through this qualification can be downloaded from http://employabilityskills.training.com.au "

Access and Equity

An individual"s access to the assessment process should not be adversely affected by restrictions placed on the location or context of assessment beyond the requirements specified in this Training Package: training and assessment must be bias-free.

Under the rules for their development, Training Packages must reflect and cater for the increasing diversity of Australia"s VET clients and Australia"s current and future workforce. The flexibilities offered by Training Packages should enhance opportunities and potential outcomes for all people so that we can all benefit from a wider national skills base and a shared contribution to Australia"s economic development and social and cultural life.

Reasonable adjustments

It is important that education providers take meaningful, transparent and reasonable steps to consult, consider and implement reasonable adjustments for students with disability.

Under the Disability Standards for Education 2005, education providers must make reasonable adjustments for people with disability to the maximum extent that those adjustments do not cause that provider unjustifiable hardship. While "reasonable adjustment" and "unjustifiable hardship" are different concepts and involve different considerations, they both seek to strike a balance between the interests of education providers and the interests of students with and without disability.

An adjustment is any measure or action that a student requires because of their disability, and which has the effect of assisting the student to access and participate in education and

training on the same basis as students without a disability. An adjustment is reasonable if it achieves this purpose while taking into account factors such as the nature of the student"s disability, the views of the student, the potential effect of the adjustment on the student and others who might be affected, and the costs and benefits of making the adjustment.

An education provider is also entitled to maintain the academic integrity of a course or program and to consider the requirements or components that are inherent or essential to its nature when assessing whether an adjustment is reasonable. There may be more than one adjustment that is reasonable in a given set of circumstances; education providers are required to make adjustments that are reasonable and that do not cause them unjustifiable hardship.

The Training Package Guidelines provides more information on reasonable adjustment, including examples of adjustments. Go to http://www.deewr.gov.au/tpdh/Pages/home.aspx.

Further Sources of Information

The section provides a listing of useful contacts and resources to assist assessors in planning, designing, conducting and reviewing of assessments against this Training PackageS.

Contacts

Manufacturing Skills Australia

PO Box 289

NORTH SYDNEY NSW 2059

Ph 02 9955 5500

Fax 02 9955 8044

Web: www.mskills.com.au

Email: info@mskills.com.au

Technical and Vocational Education and Training (TVET) Australia Limited

Level 21, 390 St Kilda Road, Melbourne VIC 3150

PO Box 12211, A"Beckett Street Post Office

Melbourne Victoria 8006

Ph: +61 3 9832 8100

Fax: +61 3 9832 8198

Email: sales@tvetaustralia.com.au

Web: www.tvetaustralia.com.au

For information on the TAE10 Training and Education Training Package contact:

Innovation & Business Skills Australia

Telephone: (03) 9815 7000

Facsimile: (03) 9815 7001

Email: virtual@ibsa.org.au

Web: www.ibsa.org.au

General Resources

AQF Implementation Handbook, Fourth Edition 2007. Australian Qualifications Framework Advisory Board, 2002 < www.aqf.edu.au>

Australian Quality Training Framework (AQTF) and AQTF 2010 Users" Guide to the Essential Standards for Registration
http://www.training.com.au/pages/menuitem5cbe14d51b49dd34b225261017a62dbc.aspx

For general information and resources go to http://www.training.com.au/

The National Register is an electronic database providing comprehensive information about RTOs, Training Packages and accredited courses - < www.ntis.gov.au>

The Training Package Development Handbook site provides National Quality Council policy for the development of Training Packages. The site also provides guidance material for the application of that policy, and other useful information and links.

http://www.deewr.gov.au/Skills/Overview/Policy/TPDH/Pages/main.aspx

Assessment Resources

Registered training organisations (RTOs) are at the forefront of vocational education and training (VET) in Australia. They translate the needs of industry into relevant, quality, client-focussed training and assessment.

RTOs should strive for innovation in VET teaching and learning practices and develop highly flexible approaches to assessment which take cognisance of specific needs of learners, in order to improve delivery and outcomes of training.

Resources can be purchased or accessed from: TVET Australia provides an integrated service to enable users of the national training system to identify and acquire training materials, identify copyright requirements and enter licenses for use of that material consistent with the scope and direction of the NQC. http://www.productservices.tvetaustralia.com.au/

Employability Skills are embedded and explicit within each unit of competency, and an Employability Skills Summary is available for each qualification. Training providers must use Employability Skills information in order to design valid and reliable training and assessment strategies. This analysis could include:

- reviewing units of competency to locate relevant Employability Skills and determine how they are applied within the unit
- analysing the Employability Skills Summary for the qualification in which the unit or units are packaged to help clarify relevant industry and workplace contexts and the

application of Employability Skills at that qualification outcome

- designing training and assessment to address Employability Skills requirements.

PO Box 289

NORTH SYDNEY NSW 2059

Ph 02 9955 5500

Fax 02 9955 8044

Web: www.mskills.com.au

Email: info@mskills.com.au

Competency Standards

What is competency?

The broad concept of industry competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency requires the application of specified skills, knowledge and attitudes relevant to effective participation in an industry, industry sector or enterprise.

Competency covers all aspects of workplace performance and involves performing individual tasks; managing a range of different tasks; responding to contingencies or breakdowns; and, dealing with the responsibilities of the workplace, including working with others. Workplace competency requires the ability to apply relevant skills, knowledge and attitudes consistently over time and in the required workplace situations and environments. In line with this concept of competency Training Packages focus on what is expected of a competent individual in the workplace as an outcome of learning, rather than focussing on the learning process itself.

Competency standards in Training Packages are determined by industry to meet identified industry skill needs. Competency standards are made up of a number of units of competency each of which describes a key function or role in a particular job function or occupation. Each unit of competency within a Training Package is linked to one or more AQF qualifications.

Contextualisation of Units of Competency by RTOs

Registered Training Organisation (RTOs) may contextualise units of competency to reflect local outcomes required. Contextualisation could involve additions or amendments to the unit of competency to suit particular delivery methods, learner profiles, specific enterprise equipment requirements, or to otherwise meet local needs. However, the integrity of the overall intended outcome of the unit of competency must be maintained.

Any contextualisation of units of competency in this endorsed Training Package must be within the bounds of the following advice. In contextualising units of competency, RTOs:

- must not remove or add to the number and content of elements and performance criteria
- may add specific industry terminology to performance criteria where this does not distort or narrow the competency outcomes
- may make amendments and additions to the range statement as long as such changes do not diminish the breadth of application of the competency and reduce its portability, and/or
- may add detail to the evidence guide in areas such as the critical aspects of evidence or resources and infrastructure required where these expand the breadth of the competency but do not limit its use.

Components of Units of Competency

The components of units of competency are summarised below, in the order in which they appear in each unit of competency.

Unit Title

The unit title is a succinct statement of the outcome of the unit of competency. Each unit of competency title is unique, both within and across Training Packages.

Unit Descriptor

competency from other endorsed Training Packages, summary information is provided. There may also be a brief second paragraph that describes its relationship with other units of competency, and any licensing requirements.

Employability Skills statement

A standard Employability Skills statement appears in each unit of competency. This statement directs trainers and assessors to consider the information contained in the Employability Skills Summary in which the unit of competency is packaged.

Prerequisite Units (optional)

If there are any units of competency that must be completed before the unit, these will be listed.

Application of the Unit

This sub-section fleshes out the unit of competency's scope, purpose and operation in different contexts, for example, by showing how it applies in the workplace.

Competency Field (Optional)

The competency field either reflects the way the units of competency are categorised in the Training Package or denotes the industry sector, specialisation or function. It is an optional component of the unit of competency.

Sector (optional)

The industry sector is a further categorisation of the competency field and identifies the next classification, for example an elective or supervision field.

Elements of Competency

The elements of competency are the basic building blocks of the unit of competency. They describe in terms of outcomes the significant functions and tasks that make up the competency.

Performance Criteria

The performance criteria specify the required performance in relevant tasks, roles, skills and in the applied knowledge that enables competent performance. They are usually written in passive voice. Critical terms or phrases may be written in bold italics and then defined in range statement, in the order of their appearance in the performance criteria.

Required Skills and Knowledge

The essential skills and knowledge are either identified separately or combined. Knowledge identifies what a person needs to know to perform the work in an informed and effective manner. Skills describe the application of knowledge to situations where understanding is converted into a workplace outcome.

Range Statement

The range statement provides a context for the unit of competency, describing essential operating conditions that may be present with training and assessment, depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts. As applicable, the meanings of key terms used in the performance criteria will also be explained in the range statement.

Evidence Guide

The evidence guide is critical in assessment as it provides information to the Registered Training Organisation (RTO) and assessor about how the described competency may be demonstrated. The evidence guide does this by providing a range of evidence for the

The unit descriptor broadly communicates the content of the unit of competency and the skill area it addresses. Where units of competency have been contextualised from units of assessor to make determinations, and by providing the assessment context. The evidence guide describes:

- conditions under which competency must be assessed including variables such as the assessment environment or necessary equipment
- relationships with the assessment of any other units of competency
- suitable methodologies for conducting assessment including the potential for workplace simulation
- resource implications, for example access to particular equipment, infrastructure or situations
- how consistency in performance can be assessed over time, various contexts and with a range of evidence, and expectations at the AQF qualification level involved

Employability Skills in units of competency

The detail and application of Employability Skills facets will vary according to the job-role requirements of each industry. In developing Training Packages, industry stakeholders are consulted to identify appropriate facets of Employability Skills which are incorporated into the relevant units of competency and qualifications.

Employability Skills are not a discrete requirement contained in units of competency (as was the case with Key Competencies). Employability Skills are specifically expressed in the context of the work outcomes described in units of competency and will appear in elements, performance criteria, range statements and evidence guides. As a result, users of Training Packages are required to review the entire unit of competency in order to accurately determine Employability Skills requirements.

How Employability Skills relate to the Key Competencies

The eight nationally agreed Employability Skills now replace the seven Key Competencies in Training Packages. Trainers and assessors who have used Training Packages prior to the introduction of Employability Skills may find the following comparison useful.

Employability Skills	**Mayer Key Competencies**
Communication	Communicating ideas and information
Teamwork	Working with others and in teams
Problem solving	Solving problems Using mathematical ideas and techniques
Initiative and enterprise	
Planning and organising	Collecting, analysing and organising information Planning and organising activities
Self-management	
Learning	
Technology	Using technology

When analysing the above table it is important to consider the relationship and natural overlap of Employability Skills. For example, using technology may involve communication skills and combine the understanding of mathematical concepts.

Explicitly embedding Employability Skills in units of competency

This Training Package seeks to ensure that industry-endorsed Employability Skills are explicitly embedded in units of competency. The application of each skill and the level of detail included in each part of the unit will vary according to industry requirements and the nature of the unit of competency.

Employability Skills must be both explicit and embedded within units of competency. This means that Employability Skills will be:

- embedded in units of competency as part of the other performance requirements that make up the competency as a whole
- explicitly described within units of competency to enable Training Packages users to identify accurately the performance requirements of each unit with regards to Employability Skills.

This Training Package also seeks to ensure that Employability Skills are well-defined and written into units of competency so that they are apparent, clear and can be delivered and assessed as an essential component of unit work outcomes.

The following table contains examples of embedded Employability Skills for each component of a unit of competency. Please note that in the examples below the bracketed skills are provided only for clarification and will not be present in units of competency within this Training Package.

Example Employability Skills unit

Unit component	Example of embedded Employability Skill
Unit Title	Prepare trial batches (Planning, organising)
Unit Descriptor	This unit of competency covers the ability to prepare trial batches of materials for evaluation. Materials can include soil, minerals and manufactured products, such as concrete, asphalt, food, plastics, paint and other industrial chemicals. (Planning, initiative, problem solving)
Element	Record description of the job to be undertaken, compare with specification and report any variations (Planning, learning, initiative) Evaluate properties of the mixture by inspection and standard test methods (Problem solving, technology) Clean equipment and dispose of materials (Initiative, planning, organising) Maintain a safe work environment (Self management, organising)
Performance Criteria	Record description of the job to be undertaken, compare with specification and report any variations (Planning, communication, enterprise, learning) Maintain confidentiality of enterprise information (Initiative, self management) Minimise the generation of wastes and environmental impacts (Planning, enterprise, organising) Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel (Communication, planning, self management, teamwork)
Range Statement	Typical problems may include: • • not following SOPs • • measurement errors • • calculation errors • • materials of unreliable quality • • insufficient mixing • • poor sampling procedures • • equipment breakdown and breakage

	(Technology, planning, initiative, self management)
Required Skills and Knowledge	Required skills include: • performing simple calculations • making accurate measurements of volume and mass • representative sampling • working safely with equipment and hazardous materials • working safely in laboratory and field conditions • setting up and maintaining tools and equipment • using tools and equipment to perform basic sampling and testing techniques • observing and recording information on testing and sampling • handling, transporting and storing materials • observing interpreting and reporting atypical situations (Technology, learning, communication, initiative, problem solving)
Evidence Guide	The assistant test the aggregates to determine their grading properties. From these results, he/she designs a mix to satisty the prohect specifications using a standard design method. (Technology, initiative, problem solving) • Assessors should ensure that candidates can • perform operations in accordance with laboratory and /or enterprise procedures, and appropriate legislative requirements • Accuratly measure, calculate and record batch quantities, concentrations and other relevant parameters • evaluate properties of the mixture by inspection and standard test methods • recognised and report problems and atypical situations to relevant personnel (Communication, planning, self management, initiative, problem solving) (communication , planning, self management, initiative, problem solving) accurately measure, calculate and record batch quantities, concentrations and other relevant parameters

Competency Standards - Industry Contextualisation

MSL09 – contextualisation guidelines

This Training Package is relevant to the broad spectrum of Australian industries, and users are encouraged to customise qualifications and contextualise units of competency to suit their enterprise or sector purposes, provided that the customisation rules are followed.

Customisation of this Training Package may be achieved by:

- choosing appropriate electives from units provided in this Training Package (refer to packaging rules for information on packaging for industry specialisations)
- importing elective units from other Training Packages
- contextualising units of competency to better suit an enterprise or industry context.

We welcome and encourage the export of these units to other Training Packages provided the rules below are observed.

Choosing appropriate electives

The electives listed within the Laboratory Operations Training Package provide for skill development in all areas identified by industry representatives during consultations.

All qualifications are able to be customised since candidates are able to choose particular combinations of elective units to suit their individual needs or work context.

Importing elective units from other Training Packages

To achieve maximum cross-industry application, the packaging rules enable units of competency to be imported from any Training Package that is directly relevant to the candidate's current or intended laboratory work environment. In providing this flexibility it is incumbent on RTOs to ensure that the integrity of qualifications in the Training Package is maintained. The following guidelines for importing units apply.

- Imported units must relate to core functions or roles in the candidate's current or intended laboratory work environment (for example, food production processes, process manufacturing operations, information technology, front line management, workplace training and assessment)
- The original title and code for the imported unit of competency must be retained.
- Imported units must come from other endorsed Training Packages.
- Imported units must have the same scope and similar degree of complexity as the elective units they replace.

Exporting competencies to other Training Packages

MSL09 is a cross-industry Training Package, with application across a wide range of industries. It is expected and encouraged that these units of competency will be imported to a number of other Training Packages. All MSL09 units may be used provided that:

- the original unit code and unit title are retained
- they are only contextualised to the extent outlined in the section on Competency Standards
- the user advises the appropriate Skills Council in writing of the specific competencies exported to enable input during future revisions and ongoing communication.

Contextualising of units of competency

It is vital that these cross-industry competencies are able to be used in a wide range of industry sectors and enterprises. To enable this, contextualising of the units of competency is actively encouraged provided the requirements outlined in the earlier section on Competency Standards are met.

Appendices

Appendix 1
Development of MSL09

Industry drivers for change

The major industry drivers for the improvements are outlined below:

- There are approximately 800 construction materials testing (CMT) facilities and laboratories accredited by NATA (National Association of Testing Authorities) for a wide range of tests. These tests cover field and laboratory testing of raw materials and production mixes as well as in situ tests for the purposes of quality control, assisting with design and monitoring of the deterioration of structures. Common materials tested include: aggregates, concrete, soils and road pavement. The PML04 version of the Laboratory Training Operations Training Package did not adequately address the competency needs of this largest laboratory sector and there was strong industry interest and commitment to extend the package in this area.
- The mineral sector is an important sector of the Australian economy. New technology is being continually being introduced to improve productivity. The advent of robotic sample preparation systems and automated analytical instruments is revolutionising how samples are handled and analysed. The improved version of the Training Package will now cover the competency needs of technicians who operate these systems.
- There is a widespread inability of employers to recruit technical personnel who are able to set-up, optimise and operate specialised analytical instruments to obtain reliable results for a range of samples and techniques. Many laboratory managers state that job seekers trained at Australian and overseas universities lack the required practical, instrumental analysis skills while technicians already in the workforce (who may have VET training) require further skills development. A new Vocational Graduate Certificate in Instrumental Analysis has been developed to address this skills shortage. This new qualification has application in a range of testing sectors such as: forensic, chemical, mineral/materials testing, environmental, and biomedical.

Project management

The project was overseen by a MSA Board Sub-Committee made up of major stakeholders and technical experts. The terms of reference were to:

- oversee and advise on consultation processes
- provide advice on underpinning knowledge and technical content
- act as a technical advisory group in the development of new units of competency

- assist with the resolution of any issues.

The individuals and enterprises/organisations represented on the MSA Board Sub-Committee are set out in the following table:

Name	**Enterprise/organisation**
David Graham (Chair) ,	Huntsman Chemicals
Gail Silman	Australian Industry Group
Duncan Jones	Australian Laboratory Managers Association and Science Industry Australia
Ian Curry/Anne Donnellan	Australian Manufacturing Workers' Union
Kim Peterson	TAFE NSW and Royal Australian Chemical Institute
Marian Haire	National Measurement Institute

Consultation and validation processes

Consultations during the development and validation process were undertaken with:

- technical experts working in the areas of construction materials testing, mineral assay, treatment of measurement uncertainties and the authorised issue of results
- representatives of RTOs who already offer current qualifications and/or are intending to offer the new qualification.

Small workshops involving technical experts were used to draft new units of competence prior to their revision by larger groups of interested parties. Existing units were revised with input from technical experts and experienced RTO representatives.

Drafts of all units of competence and qualifications were then posted on the MSA website for validation and stakeholders were advised by email about how to access the site and provide feedback. This included industry stakeholders listed on the MSA database, State industry advisory bodies, members of the National TAFE Science Teacher's Network, State Training Authorities and National ISCs.

This feedback was used to further refine the units and qualifications. In some cases, the feedback received and the units involved were reviewed again by technical experts prior to final editing.

The final drafts of the new units and qualification have been validated and signed off by all major stakeholders (both industry and RTOs) with no outstanding or unresolved issues. Validation and acceptance of final drafts was undertaken by email.

The following individuals and organisations participated in the development process. The great value of their expertise and input is gratefully acknowledged.

Name	Organisation	State
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David Royds	National Centre for Forensic Studies, University of Canberra	ACT
Simon Foster	Eco-Chemistry Section, Faculty of Applied Science, University of Canberra	ACT
Frank Krikowa	Eco-Chemistry Section, Faculty of Applied Science, University of Canberra	ACT
Marion Haire	National Measurement Institute (NMI) Sydney	NSW
Ian Bentley	National Measurement Institute (NMI) Sydney	NSW
Mathew Foot	National Measurement Institute (NMI) Sydney	NSW
Regina Robertson	National Association of Testing Authorities, Australia (NATA)	NSW
Kim Peterson	NSWTAFE Curriculum Centre - Chemical & Environmental Manufacturing, Engineering, Construction & Transport Industries	NSW
Leonie Woods	Nugan Estate and NSW TAFE (Riverina)	NSW
Tony Steffania	Westend Estate	NSW
Stephen Cork	Rockdale Beef	NSW
Laura Thompson	Casella Wines	NSW
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Henry Perez	De Bortoli Wines	NSW

Name	Organisation	State
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Peter Widelewski	QLD Department of Main Roads	QLD
Mark O'Hara	QLD Department of Main Roads	QLD
Craig Moss	QLD Department of Main Roads	QLD
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Name	Organisation	State
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Caroline Comino	Southbank TAFE	QLD
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Ernie Gmehling	Victorian Construction Materials Laboratory Association	VIC
Robyn Megna	Box Hill TAFE	VIC
Geoffrey Burge	Beckmann Australia & NZ	VIC
Keith Bratchford	Varian Australia Pty Ltd	VIC
Steve Lever	Varian Australia Pty Ltd	VIC
Margaret Kerr	Homesglen TAFE	VIC
Tracey Torney	Gordon TAFE	VIC
Martin Kean	Genalysis Laboratory services	WA
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John Reid	SGS Australia Pty Ltd	WA
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National TAFE Science Network

Members (26) of the National TAFE Science Network reviewed and provided feedback to draft units and qualifications. Their ongoing contribution and assistance in updating the package is gratefully acknowledged.

Professional bodies

The following professional bodies provided input to the development and validation process.

Name	**Organisation**
Dr Cathy Foley	Australian Institute of Physics (AIP)
President	Australian Institute of Biology (AIB)
President	Australian Institute of Food Science and Technology (AIFST)
Jan Noble	Australian Institute of Medical Science (AIMS)
President	Australasian Association of Clinical Biochemists
Dr Carol Ginns	The Australian Society for Microbiology
Jan Hosking	Royal Australian Chemical Institute
Edwina Hine	Royal Australian Chemical Institute NSW Branch
Sue Fletcher	Geological Society of Australia
President	Royal College of Pathologists of Australia (RCPA)
President	ARRB Group Australian Road Research Group

MSL20109 Certificate II in Sampling and Measurement

Modification History

Not applicable.

Description

This qualification covers the skills and knowledge required to perform a range of sampling and measurement as part of laboratory, production or field operations in the construction, manufacturing, resources and environmental industry sectors.

Job roles/employment outcomes

The Certificate II in Sampling and Measurement offers entry level training for sampling and measurement skills applied across a range of industries. Employment outcomes targeted by this qualification include samplers and testers, production personnel, plant operators, production operators, field assistants, drivers, sample couriers, and many others.

Samplers and testers conduct limited sampling and testing as part of their duties in their particular industry. In some industry sectors (for example, mineral assay) this work forms a whole job role. They apply a restricted range of skills and operational knowledge to perform these tasks and do not generally work inside a laboratory. They:

- follow set procedures to sample raw materials and products
- may package, label, store and transport samples
- use simple equipment (hydrometers, thermometers and pH meters) to make measurements and perform basic tests that take a short time and involve a narrow range of variables and easily recognised control limits
- may make visual inspection of products and packaging.

Examples of the work of sampler/testers are given below.

- A milk tanker driver conducts aseptic sampling of milk before loading and then conveys the samples to the laboratory.
- An operator in a quarry may take samples from stockpiles and conveyors and conduct simple tests on different grades of aggregates.
- A field officer working in environmental monitoring may visit a catchment area to collect water samples
- Sampler/testers take air samples for testing for microbial monitoring of air conditioning or cooling towers.

Application

This qualification is typically used to prepare new employees or develop the skills of existing workers within the construction, manufacturing, resources and environmental industry sectors.

Training programs for this qualification are suitable to be undertaken as part of a formal training contract with an employer under an Australian Traineeship or Apprenticeship arrangement.

Pathways into the qualification

This qualification may be accessed by direct entry. Credit for this qualification may include units contained within relevant skill sets.

Pathways from the qualification

Further training pathways from this qualification include the MSL30109 Certificate III in Laboratory Skills or MSA30208 Certificate III in Manufacturing Technology (Laboratory Operations Stream).

Licensing considerations

There are no specific licences that relate to this qualification. However, depending on the jurisdiction, licensing or regulatory requirements may apply to the use of some units in this qualification. Local regulations should be checked for details.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Receive and pass on written and oral messages, provide relevant information in response to requests and demonstrate effective interpersonal skills including conflict resolution techniques • Record and store data, perform basic calculations of scientific quantities and present information in tables and graphs • Report using verbal responses, data entry into laboratory information management system (LIMS) or enterprise databases and brief written reports using enterprise proformas • Communicate with team members, supervisors and customers effectively and courteously • Interpret work instructions • Complete workplace documentation such as reports
Teamwork	• Liaise with relevant personnel to arrange site access and permits • Seek advice and clarify instructions with supervisors
Problem solving	• Deal with inquiries in accordance with enterprise customer service requirements • Rectify obvious errors and atypical data using enterprise procedures • Identify site hazards and review enterprise safety procedures • Report problems accidents or incidents
Initiative and enterprise	• Identify and report opportunities for improvements in procedures, processes and equipment • Identify hazards associated with samples, preparation methods, reagents and equipment and implement enterprise control measures
Planning and organising	• Plan and organise daily work activities to ensure the timely completion of tasks • Modify work plans to suit changing conditions and priorities • Assemble and organise specified sampling equipment and materials and maintain own work area
Self-management	• Follow work instructions to perform scientific/technical tasks safely and efficiently • Follow enterprise procedures which reflect occupational health and safety (OHS), equal opportunity, anti-discrimination and non-harassment legislative requirements • Maintain confidentiality of all client/enterprise data and information • Use appropriate protective equipment to ensure personal safety when sampling, processing, transferring or disposing of samples

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Learning	• Clarify instructions with supervisors to ensure a complete understanding of the task • Identify training opportunities and career options • Seek advice if the required samples cannot be collected or if procedures require modification
Technology	• Use communication, emergency, data recording, sampling measuring and laboratory equipment • Use computers and software to collect and report information

Packaging Rules

Packaging Rules

To be awarded a Certificate II in Sampling and Measurement competency must be achieved in a total of eight (**8**) units of competency, consisting of:

- **four** (**4**) core units of competency
- **four** (**4**) elective units of competency.

Units listed under **core** are considered essential for all people who perform sampling and measurement. The units listed as **electives** may only apply to some personnel according to the size and scope of the organisation.

Note: Prerequisite units are listed and must be included in the total number of units chosen.

Core units of competency

Select all **four** (**4**) units of competency from this group.

Unit code	Unit title	Prerequisites
MSAENV272B	Participate in environmentally sustainable work practices	
MSL912001A	Work within a laboratory/field	

Unit code	Unit title	Prerequisites
	workplace (induction)	
MSL922001A	Record and present data	
MSL943002A	Participate in laboratory/field workplace safety	

Elective units of competency

Select **four** (**4**) elective units from Groups A and B as specified below:

- a minimum of **two** (**2**) units must be chosen from Group A
- the remainder may be chosen from Groups A and B to bring the total number of electives to **four** (**4**).

Note that **two** (**2**) of the elective units may be chosen from this Training Package, other endorsed Training Packages and accredited courses, where those units are available at Certificate II.

Group A

Unit code	Unit title	Prerequisites
MSL952001A	Collect routine site samples	
MSL952002A	Handle and transport samples or equipment	
MSL972001A	Conduct routine site measurements	

Group B

Unit code	Unit title	Prerequisites
MSL913001A	Communicate with other people	
MSL913002A	Plan and conduct laboratory/field work	
MSL933001A	Maintain the laboratory/field workplace fit for purpose	
MSL933002A	Contribute to the achievement of quality objectives	
MSL933003A	Apply critical control point requirements	
MSL933004A	Perform calibration checks on equipment and assist with its maintenance	
MSL943001A	Work safely with instruments that emit ionising radiation	
MSL953001A	Receive and prepare samples for testing	
MSL953002A	Operate a robotic sample preparation system	
MSL963001A	Operate basic handblowing equipment	
MSL963002A	Repair glass apparatus using simple glassblowing equipment	MSL963001A
MSL973001A	Perform basic tests	
MSL973002A	Prepare working	

Unit code	Unit title	Prerequisites
	solutions	
MSL973003A	Prepare culture media	
MSL973004A	Perform aseptic techniques	
MSL973005A	Assist with fieldwork	
MSL973006A	Prepare trial batches for evaluation	
MSL973007A	Perform microscopic examination	
MSL973008A	Perform histological procedures	
MSL973009A	Conduct field-based acceptance tests for construction materials	
MSL973010A	Conduct laboratory-based acceptance tests for construction materials	
MSL973011A	Perform fire pouring techniques	
MSL973012A	Assist with geotechnical site investigations	

MSL70109 Vocational Graduate Certificate in Instrumental Analysis

Modification History

Not applicable.

Description

This qualification covers the skills and knowledge required by technical specialists who already have a relevant higher education or vocational qualification, or have extensive vocational experience without formal qualifications and require the competence to develop or adapt analytical methods and operate and troubleshoot advanced analytical instruments.

This qualification was developed in response to a widespread industry shortage of technicians who have more than 'a black box' knowledge of analytical instruments and an ability to optimise them for specific analytical methods and samples. It replaces a non-Training Package qualification and has strong industry support.

Job roles/employment outcomes

The Vocational Graduate Certificate in Instrumental Analysis provides training in advanced instrumental analysis techniques for individuals who already have some previous training or work experience in laboratory operations at AQF V or higher. Employment outcomes targeted by this qualification include senior technical officers, senior technical specialists, analysts and similar personnel.

Senior technical officers who undertake analysis using advanced analytical instrumentation are able to:

- conduct a wide range of complex and specialised tests
- exercise considerable analytical and judgemental skills to determine appropriate methods and procedures from a range of alternatives
- install and configure a range of accessories that extend the capability of analytical instruments
- modify methods to cope with non-routine tests and analyses where unusual samples could be involved
- develop or adapt methods and procedures
- optimise and troubleshoot the performance of analytical instruments by applying a specialised knowledge of the sample characteristics, instrument sub-systems and analytical procedure problems/remedies
- maintain analytical instruments fit for purpose.

Senior technical officers require both broad and highly specialised knowledge and skills. For example, they need to be able to:

- apply complex chemical principles to prepare samples and separate species effectively
- apply complex principles associated with heat, temperature, fluid flow, behaviour of gases, ionisation, interaction of ionised particles with electric/magnetic fields and the electromagnetic spectrum to understand the design of sample injection systems, instrument pathways, detection and control systems
- interpret complex technical manuals and test methods and apply logical and lateral thinking, fault finding and troubleshooting skills to optimise instruments and methods
- apply a detailed knowledge of measurement principles (accuracy, precision and calculation of uncertainties),calibration and quality control procedures to instrumental analysis

Senior technical officers work under broad direction from scientists/medical staff/engineers and accept responsibility for the day-to-day operation of their work/functional area (This may include responsibility for conducting analyses using one or more specific instruments).

In the course of their normal work, they:

- plan, allocate and monitor resources for their work area and are responsible for their work group's outputs
- explain complex instructions and procedures to others
- define and solve complex problems by investigating, developing and testing alternatives in response to vague or ill-defined information which is not readily accessible and requires selective analysis
- liaise with clients, suppliers and contractors on technical matters
- provide technical information to internal and external customers.

An example of the work of a senior technical officer is given below.

- A senior technical officer works in forensic science laboratory and may use advanced chromatography techniques (GC-MS) and micro-spectrophotometric techniques (UV/VIS/NIR and FTIR) to analyse samples collected at crime scenes.
- A senior technical officer works in an environmental monitoring laboratory and may use ICP-MS to measure the presence of heavy metal ions in water.
- A senior technical officer works for a major pharmaceutical company and may undertake pharmacokinetic studies using LC-MS techniques to establish the time taken for selected company products to be eliminated from the human body.

Application

This qualification applies to experienced senior technical officers and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as forensic science, biomedical, environmental monitoring, food and beverage processing, pharmaceuticals and many other kinds of testing of manufactured products.

Pathways into the qualification

Entrants to the Vocational Graduate Certificate in Instrumental Analysis are required to have one of the following:

- relevant extensive vocational practice without formal qualifications
- a relevant Diploma or Advanced Diploma, such as MSL50109 Diploma of Laboratory Technology or MSL60109 Advanced Diploma of Laboratory Operations, together with significant relevant vocational practice
- a Bachelor Degree in Science in a relevant discipline, such as chemistry, biochemistry, forensic science, environmental science, physics, geology or food technology
- a relevant higher education qualification, with relevant vocational practice.

For the purposes of this qualification, the term 'vocational practice' is defined as experience of:

- performing a wide range of instrumental analysis in a laboratory that provides consultancy, research and development or quality assurance services
- installing, commissioning and maintaining analytical instruments for a company that manufactures/supplies instruments.

Licensing considerations

There are no specific licences that relate to this qualification. However, depending on the jurisdiction, licensing or regulatory requirements may apply to the use of some units in this qualification. Local regulations should be checked for details.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Liaise with clients, suppliers and other laboratory personnel about technical matters (e.g. samples, testing methods, advanced analytical equipment) • Interpret complex test methods and technical procedures • Explain complex technical problems, issues and possible solutions • Prepare complex technical reports and submissions • Obtain 'sign off' for results and/or outputs from relevant persons
Teamwork	• Work autonomously or as part of a team • Contribute to developing and/or validating test methods and analytical procedures • Contribute to improving the quality of laboratory services
Problem solving	• Analyse data quality issues • Determine root causes of problems with sample preparation, testing procedures and/or advanced analytical instrument performance • Evaluate options for quality improvements, corrective and/or preventative actions
Initiative and enterprise	• Research current and new technical developments and assess their significance for the laboratory or own job role • Network with other technical specialists to extend own knowledge • Recognise opportunities for quality improvements and recommend improvement strategies
Planning and organising	• Prioritise work activities • Determine resource requirements and organise/optimise resource use in work area • Organise schedules to optimise work outputs without sacrificing quality • Adjust plans to suit new information, changing conditions and priorities

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Self-management	• Manage own time and establish own work schedule • Monitor and evaluate own work quality • Maintain professional and ethical standards in own work • Comply with legislative requirements, codes of practice and organisational policies and procedures
Learning	• Identify opportunities for own learning • Maintain current technical knowledge of instrumental analytical techniques used in job role
Technology	• Set up and optimise advanced analytical instruments to obtain reliable results • Conduct routine maintenance of advanced analytical instruments used in job role • Use instrument control software, laboratory information management systems, information directories, databases, online data search facilities and computer networks.

Packaging Rules

Packaging Rules

To be awarded a Vocational Graduate Certificate in Instrumental Analysis, competency must be achieved in a total of **eleven** (**11**) units of competency, consisting of:

- **seven** (**7**) core units of competency
- **four** (**4**) elective units of competency.

Units listed under **core** are considered essential for all technical specialists. The units listed as **electives** may only apply to some personnel according to the size and scope of the particular enterprise and the instrumental techniques employed in the laboratory.

Core units of competency

- Select all **seven** (**7**) units of competency listed below.

Unit code	Unit title	Prerequisites

Unit code	Unit title	Prerequisites
MSL944001A	Maintain laboratory/field safety	
MSL974001A	Prepare, standardise and use solutions	
MSL924001A	Process and interpret data	
MSL925002A	Analyse measurements and estimate uncertainties	MSL924001A
MSL976003A	Evaluate and select appropriate test methods and/or procedures	
MSL977003A	Contribute to the validation of test methods	MSL976003A
MSL977004A	Develop or adapt analyses and procedures	MSL976003A

Elective units of competency

Select **four** (**4**) elective units of competency from Groups A and B, as specified below:

- a minimum of **one** (**1**) unit must be chosen from Group A
- the remainder may be chosen from Groups A and B, to bring the total number of electives to **four** (**4**).

Group A

Unit code	Unit title	Prerequisites
MSL977006A	Apply specialised knowledge of gas chromatography techniques to analysis	
MSL977007A	Apply specialised knowledge of liquid chromatography	

Unit code	Unit title	Prerequisites
	techniques to analysis	
MSL977008A	Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis	

Group B

Unit code	Unit title	Prerequisites
MSL977009A	Apply advanced ultraviolet, visible and near infra red spectroscopic techniques to analysis	
MSL977010A	Apply advanced infra red spectroscopic techniques to analysis	
MSL977011A	Contribute to the selection, commissioning and maintenance of analytical instruments	

Two electives relevant to instrumental analysis may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available at Diploma or above.

Registered Training Organisations should seek a determination from Manufacturing Skills Australia regarding the suitability of any unit proposed for use in this qualification.

MSL30109 Certificate III in Laboratory Skills

Modification History

Not applicable.

Description

This qualification covers the skills and knowledge required to perform a limited range of laboratory operations across all industry sectors.

Job roles/employment outcomes

The Certificate III in Laboratory Skills offers entry level technical training in laboratory skills across a range of industries. Employment outcomes targeted by this qualification include laboratory technicians, instrument operators and similar personnel.

Laboratory technicians perform straightforward laboratory work. They follow set procedures and recipes, and apply well developed technical skills and basic scientific knowledge. They generally work inside a laboratory but may also perform technical tasks in the field or within production plants. They may also perform a range of laboratory maintenance and office tasks.

The majority of their work involves a predictable flow of parallel or similar tasks within one scientific discipline. They:

- perform straightforward technical tasks to prepare and test samples using relevant procedures, Australian standards and readily available advice. These tasks generally require close attention to detail and to the accuracy and precision of measurements. They may require the use of manual or semi-automated techniques
- operate test equipment and instruments and make limited adjustments to their controls
- process and record data and recognise trends and out of control conditions
- solve predictable problems using clear information or known solutions. Where alternatives exist, they are limited and apparent
- work under close and regular supervision, although they may have autonomy for specific tasks and responsibility for their own outputs
- take decisions within defined limits of responsibility
- work as part of a team.

Examples of the work of laboratory technician are given below.

- A laboratory technician working at a dairy factory may gather samples from the milk tankers, vats and the processing line, and perform routine chemical and bacteriological tests on the samples.
- A laboratory technician in a pathology laboratory may receive and prepares tissue samples.

- A school laboratory technician may set up for classes, prepare chemicals and instruments for students to undertake practical work.

Application

This qualification is typically used to prepare new employees or develop the skills of existing workers performing a laboratory technician or instrument operator role across all industry sectors.

MSL30109 Certificate III in Laboratory Skills is designed to maximise the portability of this qualification, which is the entry level required for laboratory personnel across all industry sectors.

Training programs for this qualification are suitable to be undertaken as part of a formal training contract with an employer under an Australian Traineeship or Apprenticeship arrangement.

Pathways into the qualification

This qualification may be accessed by direct entry. Credit for this qualification may include units contained within relevant skill sets.

Pathways from the qualification

Further training pathways from this qualification include MSL40109 Certificate IV in Laboratory Techniques or MSA40108 Certificate IV in Manufacturing Technology (Laboratory Operations Stream).

Additional qualification advice

Because specialisation is a requirement in some industry sectors for the Certificate III in Laboratory Skills, Registered Training Organisations (RTOs) may choose to issue a generic:

- Certificate III in Laboratory Skills

or, where elective units of competency are packaged to suit a particular industry sector or specialisation, RTOs might issue a:

- Certificate III in Laboratory Skills

  (specialising in xxxxxxx)

Industry sector/specialisations could include, but are not limited to:

- construction materials testing
- environmental monitoring

- food testing
- pathology testing
- mineral assay
- scientific glassblowing
- wine testing.

It should be noted that a qualification with a specialisation does not change the title of the qualification, although RTOs may choose to record the specialisation. The AQTF requirements must be complied with and the qualification or Statement of Attainment should clearly specify the units of competency achieved and where appropriate, the specialisation.

Licensing considerations

There are no specific licences that relate to this qualification. However depending on the jurisdiction, licensing or regulatory requirements may apply to the use of some units in this qualification. Local regulations should be checked for details.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Receive and pass on written and oral messages, provide relevant information in response to requests and demonstrate effective interpersonal skills including conflict resolution techniques • Record and store data, perform basic calculations of scientific quantities and present information in tables and graphs • Report using verbal responses, data entry into laboratory

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
	information management system (LIMS) or enterprise databases and brief written reports using enterprise proformas • Communicate with team members, supervisors and customers
Teamwork	• Work effectively with team members who may have diverse work styles, cultures and perspectives when reporting problems, hazards and incidents and results or contributing to productivity improvements • Promote cooperation and good relations in the team
Problem solving	• Deal with inquiries in accordance with enterprise customer service requirements • Rectify errors in data using enterprise procedures • Resolve simple customer requirements, such as mismatched request forms and specimens
Initiative and enterprise	• Access and provide relevant information that meets own authorisation and confidentiality requirements • Recognise potential incidents and take appropriate corrective action • Identify and report opportunities for improvements in procedures, processes and equipment • Identify hazards associated with samples, preparation methods, reagents and equipment and implement enterprise control measures
Planning and organising	• Plan and organise daily work activities to ensure the timely completion of tasks • Modify work plans to suit changing conditions and priorities • Assemble and organise specified laboratory equipment and materials
Self-management	• Follow enterprise procedures which reflect equal opportunity, anti-discrimination and non-harassment legislative requirements • Maintain enterprise standards of personal hygiene • Conduct work based on ethical values and principles • Review own strengths, weaknesses and work practices for opportunities to continuously improve performance • Maintain confidentiality of all client/enterprise data and information • Use appropriate protective equipment to ensure personal safety when sampling, processing, transferring or disposing of samples
Learning	• Clarify instructions with supervisors to ensure a complete understanding of the task • Update knowledge and skills and take advantage of skill development opportunities

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Technology	• Use communication, emergency, data recording and laboratory equipment. Laboratory equipment includes items such as microscopes, weigh balances, LIMS and centrifuges • Use computers and software to collect and report information

Packaging Rules

Packaging Rules

To be awarded a Certificate III in Laboratory Skills, competency must be achieved in a total of **thirteen** (**13**) units of competency, consisting of:

- **six** (**6**) core units
- **seven** (**7**) elective units from Groups A and B, chosen as specified below.

Units listed under **core** are considered essential for all laboratory assistants. The units of competency listed as **electives** may only apply to some personnel according to the size and scope of the particular enterprise and laboratory.

Note: Prerequisite units are listed and must be included in the total number of units chosen.

Core units of competency

Select **all six** (**6**) units of competency from this list.

Unit code	**Unit title**	**Prerequisites**
MSAENV272B	Participate in environmentally sustainable work practices	
MSL913001A	Communicate with other people	
MSL913002A	Plan and conduct laboratory/field work	
MSL922001A	Record and present	

Unit code	Unit title	Prerequisites
	data	
MSL933002A	Contribute to the achievement of quality objectives	
MSL943002A	Participate in laboratory/field workplace safety	

Elective units of competency

Select **seven** (**7**) elective units from Groups A and B, as specified below:

- a minimum of **four** (**4**) units must be chosen from Group A.
- the remainder may be chosen from Groups A and B, to bring the total number of electives to **seven** (**7**).

Note that **two** (**2**) of the electives units may be chosen from this Training Package, other endorsed Training Packages and accredited courses, where those units are available at Certificate III.

Group A

Unit code	Unit title	Prerequisites
MSL933001A	Maintain the laboratory/field workplace fit for purpose	
MSL933003A	Apply critical control point requirements	
MSL933004A	Perform calibration checks on equipment and assist with its maintenance	
MSL943001A	Work safely with instruments that emit ionising	

Unit code	Unit title	Prerequisites
	radiation	
MSL953001A	Receive and prepare samples for testing	
MSL953002A	Operate a robotic sample preparation system	
MSL963001A	Operate basic handblowing equipment	
MSL963002A	Repair glass apparatus using simple glassblowing equipment	MSL963001A
MSL973001A	Perform basic tests	
MSL973002A	Prepare working solutions	
MSL973003A	Prepare culture media	
MSL973004A	Perform aseptic techniques	
MSL973005A	Assist with fieldwork	
MSL973006A	Prepare trial batches for evaluation	
MSL973007A	Perform microscopic examination	
MSL973008A	Perform histological procedures	
MSL973009A	Conduct field-based acceptance tests for construction materials	

Unit code	Unit title	Prerequisites
MSL973010A	Conduct laboratory-based acceptance tests for construction materials	
MSL973011A	Perform fire pouring techniques	
MSL973012A	Assist with geotechnical site investigations	
HLTPAT317A	Operate effectively within a pathology testing environment	
TAADEL301C	Provide training through instruction and demonstration of work skills	

Group B

Unit code	Unit title	Prerequisites
MSL912001A	Work within a laboratory/field workplace (induction)	
MSL952001A	Collect routine site samples	
MSL952002A	Handle and transport samples or equipment	
MSL972001A	Conduct routine site measurements	
MSL904001A	Perform standard calibrations	

Unit code	Unit title	Prerequisites
MSL914001A	Prepare practical science classes and demonstrations	
MSL924001A	Process and interpret data	
MSL924002A	Use laboratory application software	
MSL934001A	Contribute to the ongoing development of HACCP plans	
MSL934002A	Apply quality system and continuous improvement processes	
MSL934003A	Maintain and control stocks	
MSL944001A	Maintain laboratory/field workplace safety	
MSL954001A	Obtain representative samples in accordance with sampling plan	
MSL954002A	Prepare mineral samples for analysis	
MSL974001A	Prepare, standardise and use solutions	
MSL974002A	Conduct geotechnical site investigations	MSL973012A
MSL974003A	Perform chemical tests and procedures	

Unit code	Unit title	Prerequisites
MSL974004A	Perform food tests	
MSL974005A	Perform physical tests	
MSL974006A	Perform biological procedures	MSL973004A, MSL973007A
MSL974007A	Undertake environmental field-based monitoring	
MSL974008A	Capture and manage scientific images	
MSL974009A	Undertake field-based, remote-sensing monitoring	
MSL974010A	Perform mechanical tests	
MSL974011A	Prepare tissue and cell cultures	MSL973004A
MSL974012A	Perform tests to determine the properties of construction materials	MSL973001A **OR** MSL973010A
MSL974013A	Monitor performance of structures	MSL973009A
MSAENV472B	Implement and monitor environmentally sustainable work practices	
HLTPAT419A	Perform pathology tests	HLTPAT317A

Unit code	Unit title	Prerequisites

MSL40109 Certificate IV in Laboratory Techniques

Modification History

Not applicable.

Description

This qualification covers the skills and knowledge required to perform a range of laboratory techniques to conduct tests and sampling in a variety of industry sectors.

Job roles/employment outcomes

The Certificate IV in Laboratory Techniques offers technical training in laboratory techniques across a range of industries. Employment outcomes targeted by this qualification include laboratory technicians, instrument operators and similar personnel.

Laboratory technicians undertake a wide range of sampling and testing that requires the application of a broad range of technical skills and some scientific knowledge. Although laboratory technicians generally work in a laboratory, they often work closely with other personnel throughout the workplace and with suppliers. They may assist other personnel to solve technical problems and to adjust formulations and production mixes. They may also train them to collect samples and conduct basic tests reliably.

The work of laboratory technicians involves similar tasks within one scientific discipline with occasional peak periods and some interruptions. They may:

- work according to established procedures in a structured environment
- collect and prepare samples
- conduct a wide range of basic tests and a limited range of specialised tests and measurements using manual, semi-automated and fully automated techniques
- define and solve problems of limited complexity where the information available is less obvious, but not contradictory, and can be determined by direct reasoning
- work under the direction and regular supervision of senior technical staff, laboratory or quality managers, or scientific/medical personnel. The work of laboratory technicians is normally subject to frequent progress and quality checks
- work in a team and may have responsibility for their own work outputs.

An example of the work of laboratory technicians is given below.

- A laboratory technician who works in a mineral preparation plant may receive and log incoming ore samples and operate handling equipment to move samples to treatment points. In the laboratory, the laboratory technician conducts routine chemical and physical tests and redirects other sub-samples for specialised analyses.

Application

This qualification is typically used to prepare new employees or develop the skills of existing workers performing a laboratory technician role in a variety of industry sectors.

This qualification recognises that some industry sectors employ technicians who have broad technical-scientific knowledge and skills, but without substantial depth in one specialisation as provided by the Diploma of Laboratory Technology. This qualification also addresses the concerns of industry representatives who stated that a gap between the Certificate III and Diploma in the Qualifications Framework could represent a barrier to career progression in some sectors.

Training programs for this qualification are suitable to be undertaken as part of a formal training contract with an employer under an Australian Traineeship or Apprenticeship arrangement.

Pathways into the qualification

This qualification may be accessed by direct entry. Credit may be granted towards this qualification by those who have completed the MSL30109 Certificate III in Laboratory Skills. Credit for this qualification may include units contained within relevant skill sets.

Pathways from the qualification

Further training pathways from this qualification include MSL50109 Diploma of Laboratory Technology.

Additional qualification advice

Because specialisation is a requirement in some industry sectors for the Certificate IV, Registered Training Organisations (RTOs) may choose to issue a generic:

- Certificate IV in Laboratory Techniques

or, where elective units of competency are packaged to suit a particular industry sector or specialisation, RTOs might issue a:

- Certificate IV in Laboratory Techniques

  (specialising in xxxxxxx)

Industry sector/specialisations could include, but are not limited to:

- biological testing
- chemical testing

- construction materials testing
- environmental monitoring
- food testing
- wine testing
- manufacturing testing
- mineral assay
- pathology testing
- scientific glassblowing.

Licensing considerations

There are no specific licences that relate to this qualification. However, depending on the jurisdiction, licensing or regulatory requirements may apply to the use of some units of competency in this qualification. Local regulations should be checked for details.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Receive and pass on written and oral messages, provide relevant information in response to requests and demonstrate effective interpersonal skills including conflict resolution techniques • Record and store data, perform basic calculations of scientific quantities and present information in tables and graphs • Report using verbal responses, data entry into laboratory information management system (LIMS) and brief written reports

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
	• Communicate with team members, supervisors and customers • Interpret standard operating procedures (SOPs) and material safety data sheets (MSDS)
Teamwork	• Work effectively with team members who may have diverse work styles, cultures and perspectives when reporting problems, hazards and incidents and results or contributing to productivity improvements • Promote cooperation and good relations in the team
Problem solving	• Deal with inquiries in accordance with enterprise customer service requirements • Rectify errors in data using enterprise procedures • Recognise and report non-conformances or problems to appropriate personnel
Initiative and enterprise	• Access and provide relevant information that meets own authorisation and confidentiality requirements • Recognise potential incidents and take appropriate corrective action • Identify and report opportunities for improvements in procedures, processes, quality and equipment • Identify hazards associated with samples, preparation methods, reagents and equipment and implement enterprise control measures
Planning and organising	• Plan and organise daily work activities to ensure the timely completion of tasks • Modify work plans to suit changing conditions and priorities • Assemble and organise specified laboratory equipment and materials
Self-management	• Follow enterprise procedures which reflect equal opportunity, anti-discrimination and non-harassment legislative requirements • Maintain enterprise standards of personal hygiene • Conduct work based on ethical values and principles and ensure quality and integrity of own work • Review own strengths, weaknesses and work practices for opportunities to continuously improve performance • Maintain security and confidentiality of all client/enterprise data and information • Use appropriate personal protective equipment to ensure personal safety when sampling, processing, transferring or disposing of samples
Learning	• Clarify instructions with supervisors to ensure a complete understanding of the task • Update knowledge and skills and take advantage of skill

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
	development opportunities • Coach others in participating in occupational health and safety (OHS) and environmental management issues
Technology	• Use communication, emergency, data recording and equipment, including items such as instruments that emit ionising radiation, calibration standards, laboratory information management systems and earth moving equipment. • Select and use computers and software to collect and report information

Packaging Rules

Packaging Rules

To be awarded a Certificate IV in Laboratory Techniques competency must be achieved in a total of **seventeen** (**17**) units of competency, consisting of:

- **six** (**6**) core units of competency
- **eleven** (**11**) elective units of competency.

Units listed under **core** are considered essential for all technical assistants. The units listed as **electives** may only apply to some personnel according to the size and scope of the particular enterprise and laboratory.

Note: Prerequisite units are listed and must be considered in the total number of units chosen.

Core units of competency

Select **all six** (**6**) units of competency listed below.

Unit code	**Unit title**	**Prerequisites**
MSAENV272B	Participate in environmentally sustainable work practices	
MSL913001A	Communicate with other people	

Unit code	Unit title	Prerequisites
MSL913002A	Plan and conduct laboratory/field work	
MSL924001A	Process and interpret data	
MSL934002A	Apply quality system and continuous improvement processes	
MSL943002A	Participate in laboratory/field workplace safety	

Elective units of competency

Select **eleven** (**11**) elective units from Groups A, B and C as specified below:

- a minimum of **five** (**5**) units must be selected from Group A
- the remainder may be chosen from Groups A, B and C, with a maximum of **four** (**4**) from Group B and a maximum of **three** (**3**) from Group C, to bring the total number of electives to **eleven** (**11**).

Note that **three** (**3**) of the elective units may be chosen from this Training Package, other endorsed Training Packages and accredited courses, where those units are available at Certificate IV.

Group A

Unit code	Unit title	Prerequisites
MSL904001A	Perform standard calibrations	
MSL914001A	Prepare practical science classes and demonstrations	
MSL924002A	Use laboratory application software	

Unit code	Unit title	Prerequisites
MSL934001A	Contribute to the ongoing development of HACCP plans	
MSL934003A	Maintain and control stocks	
MSL944001A	Maintain laboratory/field workplace safety	
MSL954001A	Obtain representative samples in accordance with sampling plan	
MSL954002A	Prepare mineral samples for analysis	
MSL974001A	Prepare, standardise and use solutions	
MSL974002A	Conduct geotechnical site investigations	MSL973012A
MSL974003A	Perform chemical tests and procedures	
MSL974004A	Perform food tests	
MSL974005A	Perform physical tests	
MSL974006A	Perform biological procedures	MSL973004A, MSL973007A
MSL974007A	Undertake environmental field-based monitoring	
MSL974008A	Capture and manage scientific images	

Unit code	Unit title	Prerequisites
MSL974009A	Undertake field-based, remote-sensing monitoring	
MSL974010A	Perform mechanical tests	
MSL974011A	Prepare tissue and cell cultures	MSL973004A
MSL974012A	Perform tests to determine the properties of construction materials	MSL973001A **OR** MSL973010A
MSL974013A	Monitor performance of structures	MSL973009A
MSAENV472B	Implement and monitor environmentally sustainable work practices	
HLTPAT419A	Perform pathology tests	HLTPAT317A

Group B

Unit code	Unit title	Prerequisites
MSL933001A	Maintain the laboratory/field workplace fit for purpose	
MSL933003A	Apply critical control point requirements	

Unit code	Unit title	Prerequisites
MSL933004A	Perform calibration checks on equipment and assist with its maintenance	
MSL943001A	Work safely with instruments that emit ionising radiation	
MSL953001A	Receive and prepare samples for testing	
MSL953002A	Operate a robotic sample preparation system	
MSL963001A	Operate basic handblowing equipment	
MSL963002A	Repair glass apparatus using simple glassblowing equipment	MSL963001A
MSL973001A	Perform basic tests	
MSL973002A	Prepare working solutions	
MSL973003A	Prepare culture media	
MSL973004A	Perform aseptic techniques	
MSL973005A	Assist with fieldwork	
MSL973006A	Prepare trial batches for evaluation	
MSL973007A	Perform microscopic examination	

Unit code	Unit title	Prerequisites
MSL973008A	Perform histological procedures	
MSL973009A	Conduct field-based acceptance tests for construction materials	
MSL973010A	Conduct laboratory-based acceptance tests for construction materials	
MSL973011A	Perform fire pouring techniques	
MSL973012A	Assist with geotechnical investigations	
TAADEL301C	Provide training through instruction and demonstration of work skills	
HLTPAT317A	Operate effectively within a pathology testing environment	

Group C

Unit code	Unit title	Prerequisites
MSL905001A	Perform non-standard calibrations	MSL904001A
MSL905002A	Create or modify calibration procedures	MSL905001A, MSL904001A
MSL905003A	Create or modify automated calibration procedures	MSL905002A, MSL905001A, MSL904001A

Unit code	Unit title	Prerequisites
MSL915001A	Provide information to customers	
MSL915002A	Schedule laboratory work for a small team	
MSL925001A	Analyse data and report results	MSL924001A
MSL925002A	Analyse measurements and estimate uncertainties	MSL924001A
MSL935001A	Monitor the quality of test results and data	MSL924001A
MSL935002A	Assist in the maintenance of reference materials	
MSL935003A	Authorise the issue of test results	MSL925001A, MSL924001A
MSL935004A	Maintain instruments and equipment	
MSL955001A	Supervise a robotic sample preparation system	MSL953002A
MSL965001A	Design and manufacture glass apparatus and glass systems	MSL963001A, MSL963002A
MSL965002A	Perform glass coating, grinding and finishing operations	MSL963001A, MSL963002A
MSL965003A	Construct, modify and maintain high vacuum systems	MSL963001A, MSL963002A
MSL975001A	Perform microbiological tests	MSL974006A, MSL973004A, MSL973007A

Unit code	Unit title	Prerequisites
MSL975002A	Perform haematological tests	MSL974006A, MSL973004A, MSL973007A
MSL975003A	Perform histological tests	MSL974006A, MSL973004A, MSL973007A
MSL975004A	Perform chemical pathology tests	MSL974006A, MSL973004A, MSL973007A
MSL975005A	Conduct sensory analysis	
MSL975006A	Perform immunohaematological tests	MSL974006A, MSL973004A, MSL973007A
MSL975007A	Supervise sampling, inspections and testing at construction sites	MSL954001A, MSL973009A
MSL975008A	Apply electrophoretic techniques	MSL973002A **OR** MSL974001A, MSL974003A
MSL975009A	Apply routine chromatographic techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975010A	Perform fire assay techniques	MSL973011A **OR** MSL954002A
MSL975011A	Design and supervise complex environmental field	MSL974007A

Unit code	Unit title	Prerequisites
	surveys	
MSL975012A	Provide input to production trials	MSL974003A **OR** MSL974004A **OR** MSL974005A **OR** MSL974010A
MSL975013A	Perform tissue and cell culture techniques	MSL974006A, MSL973004A, MSL973007A
MSL975014A	Perform molecular biology tests and procedures	MSL974006A, MSL973004A, MSL973007A
MSL975015A	Prepare animal and plant material for display	MSL974006A, MSL973004A, MSL973007A
MSL975016A	Perform complex tests to measure engineering properties of materials	MSL974012A **AND** MSL973001A **OR** MSL973010A
MSL975017A	Perform laboratory-based ecological techniques	MSL974006A, MSL973004A, MSL973007A
MSL975018A	Perform complex tests to measure chemical properties of materials	MSL975009A **OR** MSL975020A **AND** MSL974003A **OR** MSL974004A **OR**

Unit code	Unit title	Prerequisites
		MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975019A	Apply complex instrumental techniques	MSL975009A **OR** MSL975020A **AND** MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975020A	Apply routine spectrometric techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975021A	Apply routine electrometric techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND**

Unit code	Unit title	Prerequisites
		MSL973002A **OR** MSL974001A
MSL975022A	Perform food analyses	MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A
MSL975023A	Supervise geotechnical site investigations	MSL974002A, MSL973012A

MSL50109 Diploma of Laboratory Technology

Modification History

Not applicable.

Description

This qualification covers the skills and knowledge required to apply a range of laboratory technologies to conduct scientific-technical tests and sampling in most industry sectors.

Job roles/employment outcomes

The Diploma of Laboratory Technology offers broad or specialised technical training in a range of laboratory technologies. Employment outcomes targeted by this qualification include technical officers, laboratory technicians, analysts and similar personnel.

Laboratory technicians conduct a wide range of sampling and testing that requires the application of broad scientific-technical knowledge and skills, with substantial depth in some areas. Although laboratory technicians generally work in a laboratory, they often work closely with personnel in other teams within a section of the workplace.

They may liaise with suppliers to troubleshoot product non-conformance at the direction of laboratory supervisors or managers. They gather information on non-conformance and events that may lead to the modification of workplace procedures. They may also demonstrate methods to others and train them to collect samples and conduct basic tests reliably.

The work of laboratory technicians involves frequent peak periods and interruptions. They may:

- work according to established procedures in a structured environment
- collect and prepare samples and communicate sample requirements to other personnel
- conduct a wide range of routine and specialised tests where atypical samples may be involved and the instrumentation used has a wide range of operating variables
- contribute to the modification of standard operating procedures (SOPs) and enterprise methods when necessary
- define and solve problems where alternatives are not obvious and where investigations and trials may be required and the implications of various solutions considered
- work under the direction and supervision of senior technical staff, laboratory or quality managers, or scientific/medical professionals
- work as part of a team and may have a role in the planning of schedules and monitoring of resources in their work area.

Examples of the work of laboratory technicians are given below.

- A laboratory technician who works in a pathology laboratory may perform a range of tests on body tissues and fluids to measure quantities such as:
  - the amount of biological substances, (for example, cholesterol or creatine)
  - biological function (for example, clotting)
  - the presence of drugs (for example, heparin or alcohol).

They may also prepare cultures, stained tissue sections and thin films to count and classify cells, bacteria and parasites.

They may also perform routine calibration and maintenance of instruments.

- A laboratory technician who works in a major food processing plant may conduct a range of tests on the company products to measure:
  - the concentration of nutrients and food additives, such as dyes and flavourings
  - the concentration of contaminants, such as heavy metals and microbial toxins
  - pH, salt, moisture and fat content.

The laboratory technician also conducts a range of tests on the packaging material used for the company's products.

Application

This qualification is typically used to prepare new employees or develop the skills of existing workers performing specialised scientific-technical tests and sampling in most industry sectors.

Training programs for this qualification are suitable to be undertaken as part of a formal training contract with an employer under an Australian Traineeship or Apprenticeship arrangement.

Pathways into the qualification

This qualification may be accessed by direct entry. Credit may be granted towards this qualification by those who have completed the MSL40109 Certificate IV in Laboratory Techniques. Credit for this qualification may include units contained within relevant skill sets.

Pathways from the qualification

Further training pathways from this qualification include MSL60109 Advanced Diploma of Laboratory Operations.

Particular attention has been given to stating the critical aspects of competency and essential knowledge required for each unit of competency in sufficient detail to maximise articulation and credit transfer arrangements between the vocational education and training (VET) and higher education sectors.

Additional qualification advice

Because specialisation is an industry requirement for the Diploma, Registered Training Organisations (RTOs) may choose to issue a generic:

- Diploma of Laboratory Technology

or, where elective units of competency are packaged to suit a particular industry sector or specialisation, RTOs might issue a:

- Diploma of Laboratory Technology

  (specialising in xxxxxxx)

Industry sector/specialisations could include, but are not limited to:

- biological testing
- biological and environmental testing
- biotechnology
- calibration
- chemical testing
- construction materials testing
- environmental monitoring
- food testing
- wine testing
- manufacturing testing
- mineral assay
- pathology testing
- scientific glassblowing.

It should be noted that a qualification with a specialisation does not change the title of the qualification, although RTOs may choose to record the specialisation. The AQTF requirements must be complied with and the qualification or Statement of Attainment should clearly specify the units of competency achieved and where appropriate, the specialisation.

Licensing considerations

There are no specific licences that relate to this qualification. However, some units in this qualification may have licensing or regulatory requirements. Local regulations should be checked for details.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Communicate appropriately with internal and external customers in order to respond effectively to requests of a specialised technical nature • Write procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements • Record and store data, perform calculations of scientific quantities and present information in tables and graphs • Report using verbal responses, data entry into laboratory information management system (LIMS) and brief written reports
Teamwork	• Work effectively with team members who may have diverse work styles, cultures and perspectives when reporting problems, hazards and incidents and results or contributing to productivity improvements • Promote cooperation and good relations in the team • Liaise with peers and technical staff from other laboratories
Problem solving	• Modify and revise existing procedures or substitute alternative instruments and measurement standards • Detect potential or actual non-conformances, assess their significance and recommend preventative or corrective actions • Apply specialised technical knowledge to critically analyse and resolve complex problems and non-conformances where solutions are not obvious or readily available
Initiative and enterprise	• Recommend appropriate preventative/corrective actions to improve sampling, testing and/or calibration activities • Identify hazards associated with samples, preparation methods, reagents and equipment and implement enterprise control measures • Research current, alternative methods and equipment

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
	• Suggest improvements in productivity and quality
Planning and organising	• Modify work plans to suit changing conditions and priorities • Assemble, organise, check and optimise specified laboratory/ filed equipment and materials • Plan/adjust maintenance schedules in accordance with operational requirements • Plan work sequences to optimise throughput of multiple samples
Self-management	• Communicates in an efficient and polite manner, taking into account cultural diversity and disabilities • Follow enterprise procedures which reflect equal opportunity, anti-discrimination and non-harassment legislative requirements • Conduct work based on ethical values and principles and ensure quality and integrity of own work • Review own strengths, weaknesses and work practices for opportunities to continuously improve performance • Maintain security and confidentiality of all client/enterprise data and information • Use appropriate personal protective equipment to ensure personal safety when sampling, processing, transferring or disposing of samples
Learning	• Review feedback from other laboratories to assess acceptance of newly created calibration procedures • Update knowledge and skills and take advantage of skill development opportunities • Coach others in participating in occupational health and safety (OHS) and environmental management issues
Technology	• Create, edit, test and document computer controlled calibration procedures for test and measurement instruments • Select and use computers and software to collect and report information • Select, use and optimise laboratory/filed equipment, such as calibration equipment, autoanalysers, containment facilities and spectrometers

Packaging Rules

Packaging Rules

To be awarded a Diploma of Laboratory Technology competency must be achieved in a total of **twenty one** (**21**) units of competency, consisting of:

- **nine** (**9**) core units of competency
- **twelve** (**12**) elective units of competency.

Units listed under **core** are considered essential for all technical officers. The units listed as **electives** may only apply to some personnel according to the size and scope of the particular enterprise and laboratory.

Note: Prerequisite units are listed and must be considered in the total number of units chosen.

Core units of competency

Select **all nine** (**9**) units of competency listed below.

Unit code	Unit title	Prerequisites
MSAENV472B	Implement and monitor environmentally sustainable work practices	
MSL913001A	Communicate with other people	
MSL913002A	Plan and conduct laboratory/field work	
MSL915001A	Provide information to customers	
MSL924001A	Process and interpret data	
MSL924002A	Use laboratory application software	
MSL925001A	Analyse data and report results	MSL924001A
MSL934002A	Apply quality system and continuous	

Unit code	Unit title	Prerequisites
	improvement processes	
MSL944001A	Maintain laboratory/field workplace safety	

Elective units of competency

Select **twelve** (**12**) elective units from Groups A, B, C and D as specified below:

- a minimum of **five** (**5**) units must be selected from Group A.
- the remainder may be chosen from Groups A, B, C and D, with a maximum of **three** (**3**) units from Group B, a maximum of **five** (**5**) units from Group C and a maximum of **two** (**2**) units from Group D, to bring the total electives to **twelve** (**12**).

Note that **four** (**4**) of the elective units may be chosen from this Training Package, other endorsed Training Packages and accredited courses, where those units are available at Diploma.

Group A

Unit code	Unit title	Prerequisites
MSL905001A	Perform non-standard calibrations	MSL904001A
MSL905002A	Create or modify calibration procedures	MSL905001A, MSL904001A
MSL905003A	Create or modify automated calibration procedures	MSL905002A, MSL905001A, MSL904001A
MSL915002A	Schedule laboratory work for a small team	
MSL925002A	Analyse measurements and estimate uncertainties	MSL924001A

Unit code	Unit title	Prerequisites
MSL935001A	Monitor the quality of test results and data	MSL924001A
MSL935002A	Assist in the maintenance of reference materials	
MSL935003A	Authorise the issue of test results	MSL925001A, MSL924001A
MSL935004A	Maintain instruments and equipment	
MSL955001A	Supervise a robotic sample preparation system	MSL953002A
MSL965001A	Design and manufacture glass apparatus and glass systems	MSL963001A, MSL963002A
MSL965002A	Perform glass coating, grinding and finishing operations	MSL963001A, MSL963002A
MSL965003A	Construct, modify and maintain high vacuum systems	MSL963001A, MSL963002A
MSL975001A	Perform microbiological tests	MSL974006A, MSL973004A, MSL973007A
MSL975002A	Perform haematological tests	MSL974006A, MSL973004A, MSL973007A
MSL975003A	Perform histological tests	MSL974006A, MSL973004A, MSL973007A
MSL975004A	Perform chemical pathology tests	MSL974006A, MSL973004A, MSL973007A
MSL975005A	Conduct sensory analysis	
MSL975006A	Perform immunohaematological tests	MSL974006A, MSL973004A, MSL973007A

Unit code	Unit title	Prerequisites
MSL975007A	Supervise sampling, inspections and testing at construction sites	MSL954001A, MSL973009A
MSL975008A	Apply electrophoretic techniques	MSL973002A **OR** MSL974001A, MSL974003A
MSL975009A	Apply routine chromatographic techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975010A	Perform fire assay techniques	MSL973011A **OR** MSL954002A
MSL975011A	Design and supervise complex environmental field surveys	MSL974007A
MSL975012A	Provide input to production trials	MSL974003A **OR** MSL974004A **OR** MSL974005A **OR** MSL974010A
MSL975013A	Perform tissue and cell culture techniques	MSL974006A, MSL973004A, MSL973007A

Unit code	Unit title	Prerequisites
MSL975014A	Perform molecular biology tests and procedures	MSL974006A, MSL973004A, MSL973007A
MSL975015A	Prepare animal and plant material for display	MSL974006A, MSL973004A, MSL973007A
MSL975016A	Perform complex tests to measure engineering properties of materials	MSL974012A **AND** MSL973001A **OR** MSL973010A
MSL975017A	Perform laboratory-based ecological techniques	MSL974006A, MSL973004A, MSL973007A
MSL975018A	Perform complex tests to measure chemical properties of materials	MSL975009A **OR** MSL975020A **AND** MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975019A	Apply complex instrumental techniques	MSL975009A **OR** MSL975020A **AND** MSL974003A **OR**

Unit code	Unit title	Prerequisites
		MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975020A	Apply routine spectrometric techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975021A	Apply routine electrometric techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975022A	Perform food analyses	MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A

Unit code	Unit title	Prerequisites
MSL975023A	Supervise geotechnical site investigations	MSL974002A, MSL973012A

Group B

Unit code	Unit title	Pre-requisites
MSL933001A	Maintain the laboratory/field workplace fit for purpose	
MSL933003A	Apply critical control point requirements	
MSL933004A	Perform calibration checks on equipment and assist with its maintenance	
MSL943001A	Work safely with instruments that emit ionising radiation	
MSL953001A	Receive and prepare samples for testing	
MSL953002A	Operate a robotic sample preparation system	
MSL963001A	Operate basic handblowing equipment	
MSL963002A	Repair glass apparatus using simple glassblowing equipment	MSL963001A
MSL973001A	Perform basic tests	
MSL973002A	Prepare working solutions	
MSL973003A	Prepare culture media	
MSL973004A	Perform aseptic techniques	
MSL973005A	Assist with fieldwork	
MSL973006A	Prepare trial batches for	

Unit code	Unit title	Pre-requisites
	evaluation	
MSL973007A	Perform microscopic examination	
MSL973008A	Perform histological procedures	
MSL973009A	Conduct field-based acceptance tests for construction materials	
MSL973010A	Conduct laboratory-based acceptance tests for construction materials	
MSL973011A	Perform fire pouring techniques	
MSL973012A	Assist with geotechnical site investigations	
HLTPAT317A	Operate effectively within a pathology testing environment	
TAADEL301C	Provide training through instruction and demonstration of work skills	

Group C

Unit code	Unit title	Prerequisites
MSL904001A	Perform standard calibrations	
MSL914001A	Prepare practical science classes and demonstrations	
MSL934001A	Contribute to the ongoing development of	

Unit code	Unit title	Prerequisites
	HACCP plans	
MSL934003A	Maintain and control stocks	
MSL954001A	Obtain representative samples in accordance with sampling plan	
MSL954002A	Prepare mineral samples for analysis	
MSL974001A	Prepare, standardise and use solutions	
MSL974002A	Conduct geotechnical site investigations	MSL973012A
MSL974003A	Perform chemical tests and procedures	
MSL974004A	Perform food tests	
MSL974005A	Perform physical tests	
MSL974006A	Perform biological procedures	MSL973004A, MSL973007A
MSL974007A	Undertake environmental field-based monitoring	
MSL974008A	Capture and manage scientific images	
MSL974009A	Undertake field-based, remote-sensing monitoring	
MSL974010A	Perform mechanical tests	

Unit code	Unit title	Prerequisites
MSL974011A	Prepare tissue and cell cultures	MSL973004A
MSL974012A	Perform tests to determine the properties of construction materials	MSL9730001A **OR** MSL973010A
MSL974013A	Monitor performance of structures	MSL973009A
HLTPAT419A	Perform pathology tests	HLTPAT317A

Group D

Unit code	Unit title	Prerequisites
MSL916001A	Develop and maintain laboratory documentation	
MSL916002A	Manage and develop teams	
MSL916003A	Supervise laboratory operations in work/functional area	
MSL916004A	Maintain registration and statutory or legal compliance in work/functional area	
MSL916005A	Manage complex projects	
MSL936001A	Maintain quality system and continuous improvement processes within	

Unit code	Unit title	Prerequisites
	work/functional area	
MSL936002A	Conduct an internal audit of the quality system	
MSL946001A	Implement and monitor OHS and environmental management systems	
MSL976001A	Classify building sites	MSL975023A **OR** MSL975007A **AND** MSL974002A, MSL973012A
MSL976002A	Prepare plans and quality assurance procedures for environmental field activities	MSL975011A, MSL974007A
MSL976003A	Evaluate and select appropriate test methods and/or procedures	
MSL977001A	Contribute to the development of products and applications	MSL976003A
MSL977002A	Troubleshoot equipment and/or production processes	MSL976003A
MSL977003A	Contribute to the validation of test methods	MSL976003A
MSL977004A	Develop or adapt analyses and procedures	MSL976003A

Unit code	Unit title	Prerequisites
MSL977005A	Integrate data acquisition and interfacing systems	MSL924002A
MSAENV672B	Develop workplace policy and procedures for environmental sustainability	

MSL60109 Advanced Diploma of Laboratory Operations

Modification History

Not applicable.

Description

This qualification covers the skills and knowledge required to apply specialist technical skills or to supervise laboratory operations within a work area or project team.

Job roles*/*employment outcomes

The Advanced Diploma of Laboratory Operations offers training in the coordination of day-to-day laboratory operations. Employment outcomes targeted by this qualification include laboratory supervisors, laboratory technical officers and similar personnel.

Laboratory supervisors are generally responsible for the planning, allocation of tasks, coordination, quality assurance, recording and reporting of laboratory outputs within their section. This requires significant judgement about work sequences, choice of appropriate technology and procedures to ensure that products and services meet customer expectations and are provided safely and efficiently in keeping with enterprise business plan.

Laboratory technical officers apply specialist technical skills in addition to the full range of laboratory skills to specific projects with minimal supervision. Laboratory technical officers are required to apply considerable technical insight, well developed analytical skills and possess the ability to apply in-depth specialist technical knowledge to determine methods of approach from a range of possible alternatives.

Under broad direction from scientists/medical staff/engineers the laboratory technical officer/supervisor accepts responsibility for the day-to-day operation of his/her work/functional area.

They are often responsible for the effective implementation of operational policies and the technical training of personnel in their work area. They also contribute significantly to the development of these policies through the application of specialised technical knowledge.

The work of laboratory supervisors involves frequent peak periods, multiple and competing demands and frequent interruptions. Immediate decisions are often required. They must be adaptable to deal with the demands brought about by any of a number of causes. For example:

- a range of demanding clients, suppliers or contractors

- changes in technology
- regularly changing priorities.

In the course of their normal work, they:

- plan, allocate and monitor resources for their work area and are responsible for their work group's outputs
- apply the full range of laboratory skills to individual projects and services associated with the work area
- explain instructions and procedures to others
- make significant contributions to the development of technical and operational policy and procedures within a function or work area
- liaise with outside organisations, customers, suppliers and contractors on technical matters
- provide technical information to internal and external customers
- often provide workplace training and assessment
- implement, maintain and promote OHS, quality and other compliance requirements and conduct audits
- work under the general direction of laboratory or quality managers, or scientific/medical personnel.

An example of the work of a laboratory supervisor is given below.

- A laboratory supervisor in a large water and sewerage utility company has been a senior technical officer for more than five years. The officer supervises technical personnel in the environmental testing section, monitors the quality of their work, oversees their training and ensures that regulatory and NATA requirements are met. The officer assists with the planning of the section's work program and advises management and customers about test schedules, results and methodology.

The senior laboratory technical officer applies specialised technical skills to specific projects with minimal supervision, in addition to exercising the full range of laboratory skills. They undertake a range of complex technical tasks. For example:

- conduct complex and specialised tests for a specific project
- define and solve complex problems by investigating, developing and testing alternatives in response to vague or ill-defined information which is not readily accessible and requires selective analysis
- exercise considerable analytical and judgemental skills to determine appropriate methods and procedures from a range of alternatives
- modify methods to cope with non-routine tests and analyses where unusual samples could be involved and/or where the instrumental controls require optimisation
- develop or adapt methods and procedures.

Application

This qualification is typically used to develop existing workers to coordinate day-to-day laboratory operations.

Training programs for this qualification are suitable to be undertaken as part of a formal training contract with an employer under an Australian Traineeship or Apprenticeship arrangement.

Pathways into the qualification

To enter the Advanced Diploma of Laboratory Operations, entrants must have completed a Diploma of Laboratory Technology or be able to demonstrate equivalent competency. It is also recommended that entrants have had an appropriate period of employment at an occupational level commensurate with the Diploma of Laboratory Technology prior to entry to this Advanced Diploma qualification.

Pathways from the qualification

Career paths for senior technicians, technical specialists and laboratory supervisors are becoming increasingly constrained unless technicians undertake university study. With this in mind, particular attention has been given to stating the critical aspects of competency and essential knowledge required for each unit of competency in sufficient detail to maximise articulation and credit transfer arrangements between the vocational education and training (VET) and higher education sectors.

Licensing considerations

There are no specific licences that relate to this qualification. However, depending on the jurisdiction, licensing or regulatory requirements may apply to the use of some units in this qualification. Local regulations should be checked for details.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Employability Skill	**Industry/enterprise requirements for this qualification include**:
Communication	• Establish and maintain effective communication and consultation with all personnel and clients to ensure smooth and efficient operations • Prepare and maintain quality documentation and keep accurate data records
Teamwork	• Discuss development opportunities with appropriate personnel to assess and confirm requirements • Implement and maintain appropriate participative occupational health and safety (OHS) processes with employees and their representatives • Empower work groups/teams in dealing with technical and work flow problems and suggest improvements • Develop team members through motivating, mentoring, coaching and promoting team cohesion to achieve planned outcomes
Problem solving	• Troubleshoot testing equipment and testing issues related to production processes, and communication between laboratory processes and computer systems to identify problems and to recommend corrective action • Identify and resolve complex problems by using agreed problem solving strategies and act to prevent their recurrence • Modify products and applications to meet evaluation recommendations
Initiative and enterprise	• Identify areas for systems improvement • Develop and introduce practices to improve the work environment • Recommend improvements for future projects • Initiate trial and evaluate corrective action and make appropriate adjustments
Planning and organising	• Organise and optimise the use of resources within agreed parameters to achieve planned outcomes • Develop and coordinate rosters to balance job requirements, laboratory efficiency and skill development opportunities • Determine resource requirements, including personnel, time, equipment and materials • Collect relevant information from manuals, specification sheets, diagnostic equipment and software

EMPLOYABILITY SKILLS QUALIFICATION SUMMARY	
Self-management	• Recognise limits of own professional expertise and make decisions within limits of responsibility and authority • Ensure work practices are conducted in and ethical and professional manner • Apply safety precautions appropriate to the task • Follows enterprise procedures to document development process
Learning	• Consult specialists as necessary • Provide information to employees and develop and implement training programs • Maintain knowledge of current and new requirements impacting on work/functional area • Provide coaching and mentoring support to personnel to change work practices such as difficulties with meeting targets for performance
Technology	• Select, use and evaluate information directories and databases, online data search facilities and computer networks • Use standard laboratory equipped with appropriate pilot batch manufacturing and testing equipment

Packaging Rules

Packaging Rules

To be awarded an Advanced Diploma of Laboratory Operations competency must be achieved in a total of **thirteen** (**13**) units of competency, consisting of:

- **seven** (**7**) core units of competency
- **six** (**6**) elective units of competency.

Units listed under **core** are considered essential for all laboratory supervisors. The units listed as **electives** may only apply to some personnel according to the size and scope of the particular enterprise and laboratory.

Core units of competency

Select all **seven** (**7**) units of competency listed below.

Unit code	Unit title	Prerequisites
MSAENV472B	Implement and monitor environmentally sustainable work practices	
MSL916001A	Develop and maintain laboratory documentation	
MSL916002A	Manage and develop teams	
MSL916003A	Supervise laboratory operations in work/functional area	
MSL916004A	Maintain registration and statutory or legal compliance in work/functional area	
MSL936001A	Maintain quality system and continuous improvement processes within work/functional area	
MSL946001A	Implement and monitor OHS and environmental management systems	

Elective units of competency

Select **six** (**6**) elective units of competency from Groups A and B, as specified below:

- a minimum of **three** (**3**) units must be chosen from Group A
- the remainder may be chosen from Groups A and B, to bring the total number of electives to **six** (**6**).

Note that **three** (**3**) of the elective may be chosen from this Training Package, other endorsed Training Packages and accredited courses where those units are available for inclusion at Advanced Diploma level.

Group A

Unit code	Unit title	Prerequisites
MSL916005A	Manage complex projects	
MSL936002A	Conduct an internal audit of the quality system	
MSL976001A	Classify building sites	MSL975023A **OR** MSL975007A **AND** MSL954001A, MSL973009A
MSL976002A	Prepare plans and quality assurance procedures for environmental field activities	MSL975011A, MSL974007A
MSL976003A	Evaluate and select appropriate test methods and/or procedures	
MSL977001A	Contribute to the development of products and applications	MSL976003A
MSL977002A	Troubleshoot equipment and/or production processes	MSL976003A
MSL977003A	Contribute to the validation of test methods	MSL976003A
MSL977004A	Develop or adapt analyses and procedures	MSL976003A
MSL977005A	Integrate data acquisition and interfacing systems	MSL924002A

Unit code	Unit title	Prerequisites
MSAENV672B	Develop workplace policy and procedures for environmental sustainability	

Group B

Unit code	Unit title	Prerequisites
MSL905001A	Perform non-standard calibrations	MSL904001A
MSL905002A	Create or modify calibration procedures	MSL905001A, MSL904001A
MSL905003A	Create or modify automated calibration procedures	MSL905002A, MSL905001A, MSL904001A
MSL915001A	Provide information to customers	
MSL915002A	Schedule laboratory work for a small team	
MSL925001A	Analyse data and report results	MSL924001A
MSL925002A	Analyse measurements and estimate uncertainties	MSL924001A
MSL935001A	Monitor the quality of test results and data	MSL924001A
MSL935002A	Assist in the maintenance of reference materials	
MSL935003A	Authorise the issue of test results	MSL925001A, MSL924001A

Unit code	Unit title	Prerequisites
MSL935004A	Maintain instruments and equipment	
MSL955001A	Supervise a robotic sample preparation system	MSL953002A
MSL965001A	Design and manufacture glass apparatus and glass systems	MSL963001A, MSL963002A
MSL965002A	Perform glass coating, grinding and finishing operations	MSL963001A, MSL963002A
MSL965003A	Construct, modify and maintain high vacuum systems	MSL963001A, MSL963002A
MSL975001A	Perform microbiological tests	MSL974006A, MSL973004A, MSL973007A
MSL975002A	Perform haematological tests	MSL974006A, MSL973004A, MSL973007A
MSL975003A	Perform histological tests	MSL974006A, MSL973004A, MSL973007A
MSL975004A	Perform chemical pathology tests	MSL974006A, MSL973004A, MSL973007A
MSL975005A	Conduct sensory analysis	
MSL975006A	Perform immunohaematological tests	MSL974006A, MSL973004A, MSL973007A
MSL975007A	Supervise sampling, inspections and testing at construction sites	MSL974002A, MSL973012A
MSL975008A	Apply electrophoretic techniques	MSL973002A **OR**

Unit code	Unit title	Prerequisites
		MSL974001A, MSL974003A
MSL975009A	Apply routine chromatographic techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975010A	Perform fire assay techniques	MSL973011A **OR** MSL954002A
MSL975011A	Design and supervise complex environmental field surveys	MSL974007A
MSL975012A	Provide input to production trials	MSL974003A **OR** MSL974004A **OR** MSL974005A **OR** MSL974010A
MSL975013A	Perform tissue and cell culture techniques	MSL974006A, MSL973004A, MSL973007A
MSL975014A	Perform molecular biology tests and procedures	MSL974006A, MSL973004A, MSL973007A
MSL975015A	Prepare animal and plant material for	MSL974006A, MSL973004A, MSL973007A

Unit code	Unit title	Prerequisites
	display	
MSL975016A	Perform complex tests to measure engineering properties of materials	MSL974012A **AND** MSL973001A **OR** MSL973010A
MSL975017A	Perform laboratory-based ecological techniques	MSL974006A, MSL973004A, MSL973007A
MSL975018A	Perform complex tests to measure chemical properties of materials	MSL975009A **OR** MSL975020A **AND** MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975019A	Apply complex instrumental techniques	MSL975009A **OR** MSL975020A **AND** MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A,

Unit code	Unit title	Prerequisites
		MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975020A	Apply routine spectrometric techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975021A	Apply routine electrometric techniques	MSL974003A **OR** MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A **AND** MSL973002A **OR** MSL974001A
MSL975022A	Perform food analyses	MSL974004A **OR** MSL974006A, MSL973004A, MSL973007A
MSL975023A	Supervise geotechnical site investigations	MSL974002A, MSL973012A

MSL904001A Perform standard calibrations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to calibrate test and measurement equipment in accordance with standard calibration procedures and documented test methods. These procedures/methods specify all associated reference standards, materials, equipment and methods to be used and the required parameters or quantities and ranges to be tested, including the criteria for rejection or approval.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory and calibration technicians who carry out tests and/or calibrations using standard calibration methods in first, second and third party laboratories, and laboratories where testing and/or calibration forms part of inspection or product certification. Personnel are not permitted to deviate from explicit instructions in any manner, modify the procedure, nor substitute alternative equipment. They work under limited supervision and results of their work are interpreted and checked by the laboratory supervisor, quality inspector or designated signatory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare items for calibration	1.1. Select the authorised calibration procedure in accordance with enterprise procedures 1.2. Identify hazards and use appropriate personal protective equipment, safety equipment and procedures 1.3. Confirm all measuring equipment meets the laboratory's specification requirements and complies fully with the calibration procedure 1.4. Assemble and set up specified reference standards and associated equipment prior to testing

ELEMENT	PERFORMANCE CRITERIA
	1.5. Verify performance of reference standards and measuring equipment prior to use and adjust or calibrate as necessary 1.6. Identify and minimise potential sources of measurement error
2. Perform calibration	2.1. Perform individual tests without variance according to the documented procedure to ensure repeatability of measurement 2.2. Confirm readings are the result of a valid measurement and record data as required (as-found or before adjustment) 2.3. Adjust device under test to bring readings within specification and record data (as-left or after adjustment) if required 2.4. Analyse resulting test data to detect trends or inconsistencies that would significantly affect the accuracy or validity of test results 2.5. Seek appropriate advice when interpretation of results is outside authorised scope of approval
3. Document results	3.1. Document compliance/non-compliance with requirements of test and/or specifications 3.2. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 3.3. Record the results of each test/calibration accurately, unambiguously and objectively 3.4. Ensure confidentiality of enterprise information
4. Finalise calibration	4.1. Prepare and issue a final report on the job/item detailing testing carried out, traceability, statement of compliance and relevant information as required 4.2. Report any non-compliance and verify next course of action with supervisor 4.3. Attach calibration labels, equipment stickers, quality control tags and tamper resistant seals as required in enterprise procedures 4.4. Store test equipment/measurement standards and results in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- selecting and applying appropriate test methods and calibration procedures
- maintaining close attention to procedures, accuracy and precision of measurement to ensure the integrity of test/calibration results
- using calibration and correction charts
- calculating to give results in appropriate accuracy, precision and units
- preparing test/calibration documentation that is accurate and complies with requirements
- operating equipment correctly and safely
- recognising problems or departures in systems and documentation and initiating actions to prevent or minimise them
- recognising and report opportunities for improvements to procedures

Required knowledge

Required knowledge includes:

- purpose of metrology and calibration, including common terminology, concepts, principles, procedures, and applications
- National Association of Testing Authority's (NATA) and National Measurements Institute's (NMI) role in the measurement and testing system in Australia
- traceability, including legal requirements for traceability
- requirements for the competence of testing and calibration laboratories (e.g. AS ISO/IEC 17025) as they affect job role and responsibilities
- hierarchy and appropriate selection of reference materials and instruments
- non-conformance/non-compliance procedures and protocols associated with equipment, reference material and calibration procedures
- troubleshooting procedures for equipment and test methods
- methods for statistical analysis (means, ranges and standard deviations) and estimation of uncertainty of measurement (may include the use of software)
- reporting procedures and legislative requirements
- handling, transport, storage and operation of reference and working standards
- laboratory environmental control requirements
- relevant health, safety and environmental requirements
- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- lines of communication
- role of laboratory services for the enterprise and customers

REQUIRED SKILLS AND KNOWLEDGE
Specific calibration fields Additional knowledge requirements may apply for different calibration fields. For example, testing and calibrations conducted in the following: • acoustic and vibration measurement • chemical testing • construction materials testing • electrical testing • heat and temperature measurement • mechanical testing • metrology • non-destructive testing • optics and radiometry • pressure measurements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • maintain very close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results (especially during lengthy tests) • critically examine each calibration step to ensure repeatability and validity of data • apply all relevant procedures and regulatory requirements to ensure the quality and integrity of the services or data provided • prepare test/calibration documentation that is accurate and complies with requirements • operate equipment correctly and safely • recognise problems or departures in systems and documentation and initiate actions to prevent or minimise them

EVIDENCE GUIDE	
	• recognise and report opportunities for improvements to procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001 Process and interpret data* • *relevant MSL974000 series unit of competency* • *relevant MSL975000 series unit of competency*. Resources may include: • specialised calibration/test equipment, reference standards and laboratory facilities • access to a library of calibration methods, procedures and equipment specifications • enterprise quality manual and procedures.
Method of assessment	The following assessment methods are suggested: • review of calibration results, uncertainty calculations and workplace documentation completed by the candidate • feedback from supervisors and/or customers regarding quality of calibration services provided by the candidate • observation of the candidate performing standard calibrations • oral or written questioning to check underpinning knowledge of standard calibration procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.

EVIDENCE GUIDE	
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Background** Calibration work may be simple or highly complex depending upon the type of equipment being calibrated and the accuracy or uncertainties required. Manual calibrations may involve interconnecting equipment and setting the stimulus devices to the settings listed in the procedure. At each setting, the technician must verify that the response or output of the unit under test (UUT) is within the tolerances specified in the procedure. In addition, many procedures require that 'as-found' (before adjustment) and 'as-left' (after adjustment) results are recorded for maintaining the UUT documentation history. Often calibration technicians must assess and document the total uncertainties for a given measurement by analysing equipment specifications and methodology during calibration. They have to interpret specifications and technical information and demonstrate initiative when adjusting and repairing instruments. The calibration technician's workload can be routine and repetitive. A perpetual backlog of work and the constant need to reduce turn-around-time to meet client demands, coupled with enterprise productivity goals, can induce stress and mental fatigue if not carefully managed. However, it is essential that all personnel are able to perform tests and associated work tasks without undue pressure that might influence technical judgement if 'integrity of measurement' is to be retained. Errors arising from items incorrectly calibrated will, at best, have to be recalled which wastes time, resources and destabilises enterprise credibility. At worst, if undetected, they may have severe safety implications to personnel or equipment, depending on the nature of the item. **Calibration (1)** A customer delivers a test pressure gauge and requires certification that the gauge conforms to manufacturer's specifications. Personnel in the item reception area log the job and the laboratory supervisor assigns it to a calibration technician. He/she reads the work order and

EVIDENCE GUIDE	
	retrieves the approved calibration procedure. The procedure requires the customer's gauge to be tested to 1000 kPa using a hydraulic test station. The technician assembles the required apparatus and personal protective equipment. The gauge is visually inspected for defects and contamination. The temperature of the environment is checked and the hydraulic test station confirmed as fully operational. The required pressures are applied to the gauge and the indicated readings are transcribed onto the test report. The technician notes that some readings are outside the allowable tolerance and adjustments will have to be made. He/she takes another set of readings after making the necessary adjustments and records them on the report. The technician applies the required labels to the gauge, updates the database, produces a test report and places the item on the quality assurance bench for inspection by the supervisor. The supervisor visually inspects the item and checks the readings on the report. The job has taken two hours to complete. **Calibration** (**2**) A client has asked the laboratory to calibrate a spectrum analyser to manufacturer's specification. The supervisor assigns the job to a calibration technician who reads the job sheet and locates the appropriate calibration procedure. Although this spectrum analyser will be calibrated partly with the aid of automated technology, the technician estimates that the calibration will still take about nine hours to complete. The technician reads the procedure and assembles the equipment and allows for the required warm-up time for instrument stabilisation. Possible sources of error are minimised by cleaning connectors and tensioning them with the torque spanner. The technician performs the manual phase of the test and manually records 12 pages of results. The equipment is reconnected for the automated part of the procedure the test recommenced. The technician produces a further six pages of results. These are assessed for errors and non-conformances and all calculations are carefully checked. A final report is produced which accompanies the spectrum analyser to the quality assurance bench for checking by the supervisor. All cables and equipment used for the calibration are returned to the store.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise procedures may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9001:2008 Quality management systems - Requirements
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Quality assurance requirements for measurement equipment
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• material safety data sheets (MSDS)
	• enterprise recording and reporting procedures and standard operating procedures (SOPs)
	• quality manuals, equipment and operating/technical manuals
	• test methods and calibration procedures (validated and authorised)
	• test methods and calibration procedures

RANGE STATEMENT	
	published by international, national or regional standards, reputable technical organisations, scientific texts or journals and equipment manufacturers • incident and accident/injury reports • schematics, work flows, laboratory layouts and production and laboratory schedules
Standard calibrations	Standard calibrations may include testing and/or calibrating the following equipment and reference materials using standard methods and procedures: • test equipment, such as anemometers, balances, barometers, calipers, environmental chambers, hygrometers, manometers, masses, micrometers, pressure equipment, spectrophotometers, tape measures, rules, temperature (digital) indicating systems, thermometers, thermocouples, timing devices, vibration analysis equipment and weighing instruments • electrical reference standards, such as air-lines, analogue meters, attenuators, bridges-manual balance, capacitors, DC voltage references, digital instruments (calibrators, DMMs, electronic transfer standards), inductors, instrument and ratio transformers, instrument transformer test sets, potentiometers, resistors, radio frequency (RF) power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes and watt-hour references • working standards, instruments and testing equipment, such as electromagnetic compatibility (EMC) test equipment, field strength meters, flammability test equipment, gauges/test fingers/test pins, hipot testers, impact hammers, impulse testers, instrument calibrators, network analysers, signal generators and spectrum and harmonic analysers
Hazards	Hazards may include: • electric shock • disturbance or interruption of services

RANGE STATEMENT	
	• manual handling of heavy equipment boxes • sources of electromagnetic radiation (lasers and RF generators/transmitters) • fluids under pressure • heat sources, such as ovens
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses and coveralls • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning of equipment and work areas
Reference materials	Reference materials may include: • colour standards • graded granular materials • hardness blocks
Communication	Communication may be with: • supervisors and managers (laboratory, quality and customer service) • peers and other laboratory or relevant technical personnel • clients and end users of equipment • external auditors, or accreditation agency for example, NATA • manufacturers of equipment and suppliers of spare parts and materials
Working environment	The working environment will have a controlled environment but may include: • purpose-built designed facility • mobile facility in the field
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these

RANGE STATEMENT	
	requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Calibration

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL905001A Perform non-standard calibrations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to recognise non-conforming calibration work, to research and select the most appropriate test method or calibration procedure for a given measurement request and then conduct the calibration. It also covers the ability to modify and revise existing procedures or substitute alternative instruments and measurement standards, when necessary.

Application of the Unit

Application of the unit	This unit of competency is applicable to calibration technicians/specialists who carry out calibrations in first, second and third party laboratories, and laboratories where testing and/or calibration forms part of inspection or product certification. They work with limited guidance and results of their work are checked by the laboratory manager, quality inspector or designated signatory. The unit requires personnel to use a wide variety of precision measuring equipment and standards and cope with deviations from the explicit procedural instructions detailed in standard procedures and work instructions. When deviations do occur, each case must be documented, technically justified, authorised and accepted by the client. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL904001A	*Perform standard calibrations*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Select the appropriate calibration procedure	1.1. Identify non-conforming calibration tasks and requests and analyse their significance 1.2. Review the authorised procedure and establish whether it is appropriate for the test, if required 1.3. Research an alternative or adapt an existing procedure to satisfy the test specification requirements, if required 1.4. Confirm that available resources meet all the requirements of the calibration procedure 1.5. Obtain authorisation prior to substituting equipment,

ELEMENT	PERFORMANCE CRITERIA
	changing or deviating from the specified procedure 1.6. Document and validate any authorised changes or deviations in accordance with enterprise procedures
2. Prepare items for calibration	2.1. Identify hazards and use the appropriate personal protective equipment, safety equipment and procedures 2.2. Assemble and set up reference standards and associated equipment prior to testing 2.3. Verify performance of reference standards and measuring equipment prior to use and adjust or calibrate as necessary 2.4. Identify and minimise potential sources of measurement error
3. Perform calibration	3.1. Perform individual tests and document each step in the calibration procedure to ensure repeatability of measurement 3.2. Critically analyse readings to confirm they are the result of a valid measurement and record data as required (as-found or before adjustment) 3.3. Adjust device under test to bring readings within tolerance and record results (as-left or after adjustment) if required 3.4. Analyse resulting test data to detect trends or inconsistencies that would significantly affect the accuracy or validity of test results 3.5. Seek appropriate advice when result interpretation is outside authorised scope of approval
4. Document results	4.1. Document compliance/non-compliance with requirements of test and/or specifications 4.2. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 4.3. Record the results of each test/calibration accurately, unambiguously and objectively 4.4. Ensure confidentiality of enterprise information
5. Finalise calibration	5.1. Prepare and issue a final report for the job/item detailing testing carried out, statement of compliance and all other required information 5.2. Report any non-compliance and verify next course of action with supervisor 5.3. Attach calibration labels, equipment stickers, quality control tags and tamper resistant seals as required in

ELEMENT	PERFORMANCE CRITERIA
	enterprise procedures 5.4. Report all changes and deviations that may have a significant influence on the test 5.5. Store test equipment/measurement standards and results in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • operating a wide range of equipment correctly and safely in accordance with enterprise procedures • identifying non-conforming calibration tasks and requests and assessing their significance • researching current, alternative calibration methods and equipment • quantifying the potential or actual impact of a wide range of test/environmental/equipment influences on data quality • explaining complex calibration procedures to clients • maintaining close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results • critically examining each calibration step to ensure repeatability and validity of data • preparing test/calibration documentation that is accurate and complies with requirements • recognising opportunities for improvements to procedures
Required knowledge
Required knowledge includes: • requirements for the competence of testing and calibration laboratories (e.g. AS ISO/IEC 17025) as they affect job role and responsibilities • limits of authority and procedures for changing or deviating from standard calibration methods and procedures • structure and terminology used in standard calibration methods, procedures, requests and instructions • current calibration methods, procedures and technology applications used in the

REQUIRED SKILLS AND KNOWLEDGE
laboratory • implications of changing or deviating from standard calibration procedures • equipment specifications and limitations and the implications of equipment substitution • hierarchy and appropriate selection of reference materials • handling, transport, storage and operation of reference and working standards • laboratory environmental control requirements • calculation procedures to give results in appropriate accuracy, precision and units • equipment and testing method troubleshooting procedures • methods for statistical analysis (means, ranges and standard deviations) and estimation of uncertainty of measurement (may include the use of software) • reporting procedures and legislative requirements • enterprise and/or legal traceability requirements • relevant health, safety and environmental requirements • layout of the enterprise, divisions and laboratory • organisational structure of the enterprise • lines of communication • role of laboratory services to the enterprise and customers **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example, testing conducted in the following fields: • acoustic and vibration measurement • chemical testing • construction materials testing • electrical testing • heat and temperature measurement • mechanical testing • metrology • non-destructive testing • optics and radiometry • pressure testing

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • identify non-conforming calibration tasks and requests and assess their significance • research current, alternative calibration methods and equipment for a given request • quantify the potential or actual impact of a wide range of test/environmental/equipment influences on data quality • explain complex calibration procedures to clients and clarify requirements and deviations • maintain very close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results • critically examine each calibration step to ensure repeatability and validity of data • prepare test/calibration documentation that is accurate and complies with requirements • operate a wide range of equipment correctly and safely • apply all relevant enterprise procedures to ensure the quality and integrity of the services or data they provide • recognise opportunities for improvements to procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *MSL925002A Analyse measurements and estimate uncertainties*. Resources may include: • specialised calibration/test equipment, reference standards and materials and laboratory facilities • access to a library of calibration methods, procedures and equipment specifications • enterprise quality manual and procedures.
Method of assessment	The following assessment methods are suggested:

EVIDENCE GUIDE	
	• review of calibration results, uncertainty calculations and documentation completed by the candidate • feedback from supervisors and/or customers regarding quality of calibration services provided by the candidate • observation of the candidate conducting non-standard calibrations • oral or written questioning to check underpinning knowledge of non-standard calibration procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Background** Calibration technicians/specialists have the skills and knowledge to operate, maintain and calibrate a wide variety of complex test equipment and measuring instruments with limited guidance. They must remain abreast of technical and equipment advances, interpret complex technical information accurately and liaise with clients to clarify their needs. They must demonstrate high levels of initiative and concentration when performing technically demanding measurements, providing solutions for non-conforming work and when adjusting or repairing complex instruments. The calibration specialist's workload can be routine and repetitive. A perpetual back-log of work and the constant need to reduce turn-around-time to meet client demands coupled

EVIDENCE GUIDE	
	with enterprise productivity goals can induce stress and mental fatigue if not carefully managed. However, it is essential that personnel are able to perform tests and associated work tasks without undue pressure that might influence technical judgement if 'integrity of measurement' is to be retained. **Calibration (1)** A client has delivered a new model vibration transducer to the laboratory and would like a full test report on the item. A calibration technician assesses the job. They conclude that because the item is new to the industry, the laboratory will probably not have a documented calibration procedure. A quick ring around the company's other laboratories confirms that a procedure has not been written yet. They analyse the item's technical specifications and realise that although a generic procedure will suffice for most of the tests, it will have to be modified. The technician reports these concerns to the supervisor who confirms that the client wants to know if the item meets the manufacturer's specifications. Approval is given to the technician to modify a previous procedure. The revised procedure is shown to the supervisor who checks each step and confirms the test is technically justified and all uncertainties have been calculated and documented. The technician sets up the reference standards, confirms they are fully operational and within specification and begin the test. Each stage of the test is carefully monitored to ensure the data is correct and valid. On completion, another technician conducts the test and the data is compared. The supervisor is confident the test and data are valid and a report is generated, including a method validation summary for the laboratory's records. **Calibration (2)** A calibration technician is scheduled to calibrate a client's signal generator in accordance with the manufacturer's procedure. The technician reads the procedure and assembles all the required reference standards but notices the laboratory's reference frequency counter is not available because it has been sent away for calibration. The technician needs to substitute another instrument and so scans the other workbenches. They decide on a particular model and refer to the instrument's

EVIDENCE GUIDE	
	technical specifications to confirm that it has all the required ranges and is accurate enough. Convinced this item will do the job, the technician seeks and gains approval from the supervisor. There is no need to consult with the customer because the substitution will have no negative influence on the results. The technician completes the calibration in accordance with the procedure. In the final report, they document the details of the replacement equipment used in the test to ensure the repeatability of measurements and to comply with statutory regulations.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9001:2008 Quality management systems - Requirements
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Quality assurance requirements for measurement equipment
	  • ISO 5725 Accuracy (trueness and

RANGE STATEMENT	
	precision) of measurement methods and results • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • material safety data sheets (MSDS) • enterprise recording and reporting procedures and standard operating procedures (SOPs) • quality manuals, equipment and operating/technical manuals • test methods and calibration procedures (validated and authorised) • test methods and calibration procedures published by international, national or regional standards, reputable technical organisations, scientific texts or journals and equipment manufacturers • incident and accident/injury reports • schematics, workflows, laboratory layouts and production and laboratory schedules
Non-standard calibrations	Non-standard calibrations involve detecting and dealing with non-conforming work associated with the testing and/or calibrating of equipment, such as: • common test equipment, such as anemometers, balances, barometers, calipers, environmental chambers, hygrometers, manometers, masses, micrometers, pressure equipment, spectrophotometers, tape measures, rules, temperature (digital) indicating systems, thermometers, thermocouples, timing devices, vibration analysis equipment and weighing instruments • electrical reference standards, such as air-lines, analogue meters, attenuators, bridges-manual balance, capacitors, DC voltage references, digital instruments (calibrators, DMMs, electronic transfer standards), inductors, instrument and ratio transformers, instrument transformer test sets, potentiometers, resistors,

RANGE STATEMENT	
	radio frequency (RF) power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes and watt-hour references • working standards, instruments and testing equipment, such as electromagnetic compatibility (EMC) test equipment, field strength meters, flammability test equipment, gauges/test fingers/test pins, hipot testers, impact hammers, impulse testers, instrument calibrators, network analysers, signal generators and spectrum and harmonic analysers
Hazards	Hazards may include: • electric shock • disturbance or interruption of services • manual handling of heavy equipment boxes • sources of electromagnetic radiation (lasers, RF generators/transmitters) • fluids under pressure • heat sources, such as ovens
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses and coveralls • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions and enterprise procedures and regulations • regular cleaning of equipment and work areas
Communication	Communication may be with: • supervisors and managers (laboratory, quality and customer service) • peers and other laboratory or relevant technical personnel • clients and end users of equipment • external auditors, or accreditation agency for example, National Association of Testing Authorities (NATA)

RANGE STATEMENT	
	• equipment manufacturers and suppliers of spare parts
Working environment	The working environment will have a controlled environment but could be a: • purpose-built designed facility • mobile facility in the field
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Calibration

Competency field

Competency field	

Co-requisite units

Co-requisite units	

Co-requisite units		

MSL905002A Create or modify calibration procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to create or modify calibration procedures in response to the introduction of alternative/new equipment, changing test circumstances, activities involved in research and development trials or to meet client needs. The unit covers research of current calibration procedures and technology, development or modification of a procedure, its subsequent trialling and confirmation that it is fit for purpose. This unit of competency does not cover the ability to create or edit software controlled calibration procedures as this is covered in another unit of competency.

Application of the Unit

Application of the unit	This unit of competency is applicable to calibration technicians/specialists who carry out test and/or calibrations in first, second and third party laboratories, and laboratories where testing and/or calibration forms part of inspection or product certification. It covers the work of only those personnel who are authorised by their laboratory to create or modify calibration procedures. They work with limited guidance and results of their work are checked by the laboratory manager, quality inspector or designated signatory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL905001A	*Perform non-standard calibrations*
	MSL904001A	*Perform standard calibrations*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Assess the suitability of available calibration procedures	1.1. Confirm that the authorised calibration procedure is not appropriate for intended use or requires modification 1.2. Research suitable alternative established calibration procedures, if available 1.3. Establish whether an available procedure can be customised or if a new procedure is needed 1.4. Obtain internal approval to develop or modify a calibration procedure, as necessary

ELEMENT	PERFORMANCE CRITERIA
	1.5. Confirm that available resources meet all the requirements of the alternative or new procedure 1.6. Gain authorisation for any deviation from requirements previously agreed with client
2. Develop procedure	2.1. Identify and document all relevant calibration data to be collected, including parameters and ranges to be tested 2.2. Describe all new instructions or modifications to methods to ensure repeatability of test 2.3. Document all hazards and safety measures to be observed 2.4. Specify data to be recorded and produce a results template, if required 2.5. List the requirements for calibration approval and rejection 2.6. Confirm that all calibration requirements can be fulfilled by using the procedure
3. Prepare equipment for testing	3.1. Use the appropriate personal protective equipment, safety equipment and procedures 3.2. Assemble and set up reference standards and associated equipment prior to testing 3.3. Verify performance of reference standards and measuring equipment prior to use and adjust or calibrate as necessary 3.4. Identify and minimise potential sources of measurement error
4. Trial modified/new calibration procedure	4.1. Perform individual steps and confirm they are adequately documented to ensure repeatability of measurement 4.2. Critically analyse readings to confirm they are the result of a valid measurement and record data as required 4.3. Adjust device under test to bring readings within tolerance and record results 4.4. Analyse the resulting test data to detect trends or inconsistencies that may significantly affect the accuracy or validity of test results
5. Confirm the modification or new procedure is fit for purpose	5.1. Compare results achieved with those from other calibration procedures 5.2. Systematically analyse all measurement and environmental factors that may influence the result

ELEMENT	PERFORMANCE CRITERIA
	and take corrective action, if necessary 5.3. Arrange for internal peer checking of calibration procedure, data and results and incorporate feedback 5.4. Quantify the uncertainties of results obtained by analysing equipment specifications and test methodology 5.5. Compare results with those obtained by other laboratories, if applicable 5.6. Confirm that the modified/new procedure is fit for purpose and relevant to the client's needs and document as necessary
6. Document and review modified/new calibration procedure	6.1. Ensure that the procedure is written in accordance with enterprise procedures or statutory and regulatory requirements 6.2. Ensure that the procedure has been reviewed in accordance with enterprise procedures 6.3. Report and present the procedure to appropriate personnel for validation before use

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • researching current, alternative calibration methods and equipment • applying specialised technical knowledge to critically analyse and resolve complex problems associated with measurement non-conformances where solutions are not obvious or readily available • developing or adapting methods to suit technical and/or client requirements • conducting reliable calibration/testing trials to ensure a high degree of reproducibility • explaining complex calibration procedures to clients and clarifying requirements and deviations • liaising with peers and technical staff from other laboratories to clarify and validate test methods • estimating measurement uncertainty and applying statistical techniques for analysing test and/or calibration data

REQUIRED SKILLS AND KNOWLEDGE

- writing calibration procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements
- preparing all test documentation accurately, concisely and in accordance with requirements
- recognising opportunities for improvements to procedures

Required knowledge

Required knowledge includes:

- requirements for the competence of testing and calibration laboratories (e.g. AS ISO/IEC 17025) as they affect job role and responsibilities
- limits of authority and procedures for creating or modifying calibration procedures
- structure and terminology used in standard calibration methods, procedures, requests and instructions
- current calibration methods, procedures and technology applications used in laboratory
- implications of modifying standard calibration procedures
- equipment specifications and limitations and the implications of equipment substitution
- hierarchy and appropriate selection of reference materials
- handling, transport, storage and operation of reference and working standards
- laboratory environmental control requirements
- calculation procedures to give results in appropriate accuracy, precision and units
- methods for statistical analysis (means, ranges and standard deviations) and estimation of uncertainty of measurement (may include the use of software)
- equipment and testing method troubleshooting procedures
- enterprise procedures and legislative requirements for documenting calibration procedures
- enterprise and/or legal traceability requirements
- relevant health, safety and environmental requirements
- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- lines of communication
- role of laboratory services for the enterprise and customers

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example, testing conducted in the following fields:

- acoustic and vibration measurement
- chemical testing
- construction materials testing
- electrical testing

REQUIRED SKILLS AND KNOWLEDGE
• heat and temperature measurement • mechanical testing • metrology • non-destructive testing • optics and radiometry • pressure testing

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • research current, alternative calibration methods and equipment for a given request • apply specialised technical knowledge to critically analyse and resolve complex problems associated with measurement non-conformances where solutions are not obvious or readily available • develop or adapt methods to suit technical and/or client requirements • conduct reliable calibration/testing trials to ensure a high degree of reproducibility • explain complex calibration procedures to clients and clarify requirements and deviations • liaise with peers and technical staff from other laboratories to clarify and validate test methods • estimate measurement uncertainty and apply statistical techniques for analysing test and/or calibration data • write calibration procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements • prepare all test documentation accurately, concisely and in accordance with requirements • recognise opportunities for improvements to

EVIDENCE GUIDE	
	procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *MSL925002A Analyse measurements and estimate uncertainties*. Resources may include: • specialised calibration/test equipment, reference standards and materials and laboratory facilities • access to a library of calibration methods, procedures and equipment specifications • enterprise quality manual and procedures.
Method of assessment	The following assessment methods are suggested: • review of documented calibration procedures modified or developed by the candidate and associated validation data • feedback from supervisors and/or customers regarding quality of calibration procedures developed or modified by the candidate • observation of the candidate creating/modifying calibration procedures • oral or written questioning to check underpinning knowledge of complex calibration procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies

EVIDENCE GUIDE	
	below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Background** Calibration specialists have the skills and knowledge to operate, maintain and calibrate a very wide variety of test equipment and measuring instruments with limited guidance. They must remain abreast of technical and equipment advances, interpret complex technical information accurately and liaise with clients to clarify their needs. They must demonstrate high levels of initiative and concentration when performing technically demanding measurements, providing solutions for non-conforming work and when adjusting and repairing complex instruments. Calibration specialists are often asked to modify existing calibration procedures and develop new ones. International and Australian standards specify strict criteria for how this is to be done. Above all, clients must agree that the procedures meet their requirements and the procedures must be validated before use. A considerable understanding of test methods is required and personnel must be able to analyse complex technical specifications and estimate uncertainties. **Calibration** The calibration laboratories within the Australian Defence Force have recently been advised that all metric dimensional metrology (for example, micrometers, verniers and dial test indicators) must be calibrated to current Australian Standards. The supervisor of the physical laboratory conveys the new instruction to his staff. One of the technicians is about to begin calibrating a batch of micrometers but because the client's (Defence) calibration requirements have changed, they halt proceedings until a new procedure is drafted. The technician rings the other Defence laboratories and establishes that no procedure for that particular model of micrometer exists and therefore seeks permission from the supervisor to develop one. The laboratory supervisor has no reservations because the technician is a calibration specialist who has worked in the industry for a long time. The technician first obtains a copy of AS 2102 *Micrometer calipers for external measurement*, copies of the technical specifications relating to the reference

EVIDENCE GUIDE	
	standards (gauge blocks and optical flats/parallels) and those for the micrometers themselves. The technician lists all the parameters to be tested and drafts a new results template. They calculate tolerances and uncertainties, amend the template accordingly and neatly lay out raw data, calculations and formulae used for peer review. As the technician goes through each measurement they record the various steps in accordance with enterprise procedures so that the test can be reproduced. The required safety procedures, the environmental conditions and the need for equipment stabilisation are also carefully documented. On completion of the test, the technician compares the data with the micrometer's previous calibration history and double checks the new methodology against a similar American NAVAIR calibration procedure. They are satisfied that the procedure is fit for purpose, that it meets the client's needs and is technically justified and that the data is valid. The technician then presents the draft procedure for another technician to complete. The test is reproduced successfully and the documentation is given to the administration staff for word processing. Upon completion, the draft test procedure is emailed to the other six Defence laboratories for comment. Following the correction of minor clerical errors, the procedure is submitted to the military's primary standard laboratory (MSL) for final approval and authorisation.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards,

RANGE STATEMENT	
	it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise procedures may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9001:2008 Quality management systems - Requirements
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Quality assurance requirements for measurement equipment
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• material safety data sheets (MSDS)
	• enterprise recording and reporting procedures and standard operating procedures (SOPs)
	• quality manuals, equipment and operating/technical manuals
	• test methods and calibration procedures (validated and authorised)
	• test methods and calibration procedures published by international, national or regional standards, reputable technical organisations, scientific texts or journals and equipment manufacturers
	• incident and accident/injury reports
	• schematics, workflows, laboratory layouts and production and laboratory schedules

Modifying or developing new test methods	Modifying or developing new test methods may involve using, testing and/or calibrating the

RANGE STATEMENT	
	following: • common test equipment, such as anemometers, balances, barometers, calipers, environmental chambers, hygrometers, manometers, masses, micrometers, pressure equipment, spectrophotometers, tape measures, rules, temperature (digital) indicating systems, thermometers, thermocouples, timing devices, vibration analysis equipment and weighing instruments • electrical reference standards, such as air-lines, analogue meters, attenuators, bridges-manual balance, capacitors, DC voltage references, digital instruments (calibrators, DMMs, electronic transfer standards), inductors, instrument and ratio transformers, instrument transformer test sets, potentiometers, resistors, radio frequency (RF) power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes and watt-hour references • working standards, instruments and testing equipment, such as electromagnetic compatibility (EMC) test equipment, field strength meters, flammability test equipment, gauges/test fingers/test pins, hipot testers, impact hammers, impulse testers, instrument calibrators, network analysers, signal generators and spectrum and harmonic analysers
Hazards may include:	Hazards may include: • electric shock • disturbance or interruption of services • manual handling of heavy equipment boxes • sources of electromagnetic radiation (lasers, RF generators/transmitters) • fluids under pressure • heat sources, such as ovens
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses and

RANGE STATEMENT	
	coveralls • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions and enterprise procedures and regulations • regular cleaning of equipment and work areas
Communication	Communication may be with: • supervisors and managers (laboratory, quality and customer service) • peers and other laboratory or relevant technical personnel • clients and end users of equipment • external auditors, or accreditation agency, such as National Association of Testing Authorities (NATA) • equipment manufacturers and suppliers of spare parts
Working environment	The working environment will have a controlled environment but could be a: • purpose-built designed facility • mobile facility in the field
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Calibration

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL905003A Create or modify automated calibration procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to create, edit, test and document computer controlled calibration procedures for test and measurement instruments. This may be in response to the introduction of alternative or new equipment, changing test circumstances, activities involved in research and development trials or to meet client needs. The unit covers performance of automated, including computer-aided, calibrations as well as the programming and control of automated calibration systems.

Application of the Unit

Application of the unit	This unit of competency is applicable to calibration technicians/specialists who carry out tests and/or calibrations in first, second and third party laboratories, and laboratories where testing and/or calibration forms part of inspection or product certification. They require a substantial, in-depth technical knowledge across a broad spectrum of advanced calibration practices and technologies, including a thorough understanding of equipment specifications and proprietary software writing skills. They are authorised by their laboratory to create or modify calibration procedures. They work with limited guidance and results of their work are checked by the laboratory manager, quality inspector or designated signatory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL905002A	*Create or modify calibration procedures*
	MSL905001A	*Perform non-standard calibrations*
	MSL904001A	*Perform standard calibrations*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Assess the suitability of available automated procedures	1.1. Determine the technical and quality deficiencies of the current automated calibration procedure 1.2. Research alternative established procedures, if

ELEMENT	PERFORMANCE CRITERIA
	available 1.3. Establish whether an available procedure can be customised or if a new procedure is needed 1.4. Obtain internal approval to develop an automation plan and strategy 1.5. Identify the resources required for automation and verify they meet necessary quality, laboratory and technical requirements 1.6. Confirm that the automated procedure will meet the needs of the client, if applicable
2. Create or edit automated procedure	2.1. Identify and document all relevant calibration data to be collected, including parameters and ranges to be tested 2.2. Check that instructions are adequately documented to ensure repeatability of test 2.3. Document hazards and safety measures to be observed 2.4. List the requirements for calibration approval and rejection 2.5. Specify data to be recorded and produce a results template, if required 2.6. Edit or compile the procedure using appropriate software 2.7. Confirm that all calibration requirements can be fulfilled by using the procedure 2.8. Test run the program, check errors and debug as necessary
3. Configure instruments/ equipment	3.1. Use the appropriate personal protective equipment, safety equipment and procedures 3.2. Configure workstation, reference standards, instruments and equipment 3.3. Verify performance of reference standards, instruments and equipment prior to use and adjust or calibrate as necessary 3.4. Identify and minimise potential sources of measurement error
4. Refine the automated procedure	4.1. Run automated procedure to confirm functionality of all steps 4.2. Recognise non-conforming results or data and amend the program or troubleshoot procedure/equipment as necessary

ELEMENT	PERFORMANCE CRITERIA
	4.3. Verify all data are the result of valid measurements and all calculations are correct 4.4. Confirm the integrity of procedure at each step to ensure repeatability of measurement
5. Verify automated procedure is fit for purpose	5.1. Generate a calibration report and compare results achieved with other methods 5.2. Systematically analyse all measurement and environmental factors that may influence results and take corrective action 5.3. Quantify the uncertainties of results by analysing equipment specifications and test methodology 5.4. Arrange for internal peer checking of procedure, data and results and incorporate feedback 5.5. Review feedback from other laboratories to assess acceptance of procedure, if applicable 5.6. Confirm the procedure is fit for purpose and relevant to the client's needs and document as required
6. Document and review automated procedure	6.1. Ensure that the procedure is written in accordance with enterprise procedures or statutory and regulatory requirements 6.2. Ensure that the procedure has been reviewed in accordance with enterprise procedures 6.3. Report and present the procedure to appropriate personnel for validation before use

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • assessing the suitability of software controlled calibration procedures • researching current, alternative calibration methods and equipment • developing or modifying calibration procedures to automate as many processes as possible • writing efficient calibration procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements

REQUIRED SKILLS AND KNOWLEDGE

- writing/editing efficient software programs for a range of calibration applications and assessing their integrity under test
- applying specialised technical knowledge to critically analyse and resolve complex problems associated with measurement non-conformances where solutions are not obvious or readily available
- explaining automated calibration procedures to clients and clarifying their requirements
- conducting reliable calibration/testing trials to ensure a high degree of reproducibility
- liaising with peers and technical staff from other laboratories to clarify and validate automated procedures
- estimating measurement uncertainty and applying statistical techniques for analysing test and/or calibration data
- critically examining each calibration step to ensure repeatability and validity of data
- preparing all test documentation accurately, concisely and in accordance with requirements
- recognising opportunities for improvements to procedures

Required knowledge

Required knowledge includes:

- requirements for the competence of testing and calibration laboratories (e.g. AS ISO/IEC 17025) as they affect job role and responsibilities
- limits of authority and procedures for creating or modifying automated calibration procedures
- structure and terminology used in standard calibration methods, procedures, requests and instructions
- current automated calibration methods, procedures and technology applications used in laboratory
- computer operation/automation using graphical user interfaces
- equipment specifications and limitations and the implications of equipment substitution
- equipment and testing method troubleshooting procedures
- the hierarchy and appropriate selection of reference materials
- handling, transport, storage and operation of reference and working standards
- laboratory environmental control requirements
- calculation procedures to give results in appropriate accuracy, precision and units
- methods for statistical analysis (means, ranges and standard deviations) and estimation of uncertainty of measurement (may include the use of software)
- enterprise procedures and legislative requirements for documenting calibration procedures
- enterprise and/or legal traceability requirements

REQUIRED SKILLS AND KNOWLEDGE
• relevant health, safety and environmental requirements • layout of the enterprise, divisions and laboratory • organisational structure of the enterprise • lines of communication • role of laboratory services for the enterprise and customers **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example, testing conducted in the following fields: • acoustic and vibration measurement • chemical testing • construction materials testing • electrical testing • heat and temperature measurement • mechanical testing • metrology • non-destructive testing • optics and radiometry • pressure testing

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • assess the suitability of software controlled calibration procedures • research current, alternative calibration methods and equipment for a given request • develop or modify calibration procedures to automate as many processes as possible • write efficient calibration procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements • write/edit efficient software programs for a range of

EVIDENCE GUIDE	
	calibration applications and assess their integrity under test • apply specialised technical knowledge to critically analyse and resolve complex problems associated with measurement non-conformances where solutions are not obvious or readily available • explain automated calibration procedures to clients and clarify their requirements • conduct reliable calibration/testing trials to ensure a high degree of reproducibility • liaise with peers and technical staff from other laboratories to clarify and validate automated procedures • estimate measurement uncertainty and apply statistical techniques for analysing test and/or calibration data • critically examine each calibration step to ensure repeatability and validity of data • prepare all test documentation accurately, concisely and in accordance with requirements • recognise opportunities for improvements to procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *MSL925002A Analyse measurements and estimate uncertainties*. Resources may include: • specialised calibration/test equipment, reference standards and materials and laboratory facilities • access to a library of calibration methods, procedures and equipment specifications • laboratory calibration software and programs and manufacturer's proprietary software • enterprise quality manual and procedures.
Method of assessment	The following assessment methods are suggested: • review of documented automated procedures modified or developed by the candidate and associated validation data • feedback from supervisors and/or customers

EVIDENCE GUIDE	
	regarding quality of automated procedures developed or modified by the candidate • observation of the candidate trialing automated procedures as part of their development • oral or written questioning to check underpinning knowledge of automated procedures, calibration software and programming techniques used in the laboratory. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Background** Automated calibration relies heavily on computers to assist technicians do their jobs. While calibration software is used to conduct the actual calibrations, it is usually not necessary to know how to program in a computer programming language to conduct the actual tests. Most systems do not require high-order programming expertise for generating calibration procedures. Often, procedures are self-documenting and resemble familiar manual procedures. Most off-the-shelf applications incorporate error checking, online help screens, tolerance calculation, and test uncertainty ratio checking. Many systems display illustrations that show connection points or operator locations of adjustments in devices being tested. Sample procedures are often provided to guide new users through the steps of writing

EVIDENCE GUIDE	
	an automated procedure for an instrument. **Calibration** The laboratory supervisor presents a signal generator to a senior calibration technician/specialist and explains that a client will send another 20 units for calibration if the laboratory can calibrate each item within a day. The laboratory currently has an automation station configured to test similar instruments in five hours and therefore the client's request should present no problem. On closer inspection, the specialist realises that the instrument is fitted with a higher-specification option rendering the laboratory's automated procedure deficient in a number of respects. The specialist searches the internal database for something more applicable but concludes that either a new procedure needs to be sourced externally or the current one needs to be modified. Checks on the internet confirm that no suitable procedure has been developed yet so they obtain approval from the supervisor to edit the current one. The specialist determines which tests have to be modified and where new instructions have to be compiled. They analyse all the equipment specifications, including calculating the measurement uncertainties and what data is to be collated. Particular attention is paid to highlighting the safety measures that must be observed. On completion of the software program, the specialist conducts a dummy run to confirm that the program is bug free. A colleague vets the procedure and verifies that each step is technically justified. The supervisor emails a copy of the procedure interstate for external validation by means of inter-laboratory comparison. Following successful feedback, the laboratory obtains agreement from the client to use the procedure, calibrates the instrument in 5.5 hours and returns it with a certificate of conformance. The automated procedure is entered into the laboratory's database as an authorised procedure and distributed to affiliated laboratories.

Range Statement

RANGE STATEMENT

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9001:2008 Quality management systems - Requirements
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Quality assurance requirements for measurement equipment
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• laboratory calibration software and programs, manufacturer's proprietary software
	• material safety data sheets (MSDS)
	• enterprise recording and reporting procedures and standard operating procedures (SOPs)
	• quality manuals, equipment and operating/technical manuals
	• test methods and calibration procedures (validated and authorised)

RANGE STATEMENT	
	• test methods and calibration procedures published by international, national or regional standards, reputable technical organisations, scientific texts or journals and equipment manufacturers • incident and accident/injury reports • schematics, workflows, laboratory layouts and production and laboratory schedules
Editing or creating automated procedures	Editing or creating automated procedures may involve using, testing and or calibrating the following: • common test equipment, such as anemometers, balances, barometers, callipers, environmental chambers, hygrometers, manometers, masses, micrometers, pressure equipment, spectrophotometers, tape measures, rules, temperature (digital) indicating systems, thermometers, thermocouples, timing devices, vibration analysis equipment and weighing instruments • electrical reference standards, such as air-lines, analogue meters, attenuators, bridges-manual balance, capacitors, DC voltage references, digital instruments (calibrators, DMMs, electronic transfer standards), inductors, instrument and ratio transformers, instrument transformer test sets, potentiometers, resistors, radio frequency (RF) power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes and watt-hour references • working standards, instruments and testing equipment, such as electromagnetic compatibility (EMC) test equipment, field strength meters, flammability test equipment, gauges/test fingers/test pins, hipot testers, impact hammers, impulse testers, instrument calibrators, network analysers, signal generators and spectrum and harmonic analysers
Hazards	Hazards may include: • electric shock

RANGE STATEMENT	
	• disturbance or interruption of services • manual handling of heavy equipment boxes • sources of electromagnetic radiation (lasers, RF generators/transmitters) • fluids under pressure • heat sources, such as ovens
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses and coveralls • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations • regular cleaning of equipment and work areas
Communication	Communication may be with: • supervisors and managers (laboratory, quality and customer service) • peers and other laboratory or relevant technical personnel • clients and end users of equipment • external auditors, or accreditation agency such as National Association of Testing Authorities (NATA) • equipment manufacturers and suppliers of spare parts
Working environment	The working environment will have a controlled environment but could be a: • purpose-built designed facility • mobile facility in the field
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous

RANGE STATEMENT	
	nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Calibration

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL912001A Work within a laboratory/field workplace (induction)

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the induction of an employee into scientific/technical work within an enterprise.

Application of the Unit

Application of the unit	This unit of competency is applicable to samplers/testers, production operators and field assistants working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Work within enterprise structure and culture	1.1. Demonstrate broad knowledge of enterprise business ethics, goals, products and/or scientific/technical services 1.2. Identify key enterprise sites and functions and their contribution to product range and quality
2. Work in accordance with workplace agreements and/or legislative requirements	2.1. Locate key workplace information and apply it correctly 2.2. Follow enterprise policy and procedures relating to employment, security, confidentiality and reporting lines 2.3. Perform all work activities in accordance with relevant environmental management procedures, including sustainable energy principles and work practices
3. Provide scientific/technical support	3.1. Identify workplace roles and responsibilities of scientific/technical personnel 3.2. Identify typical tasks and calendar of events in work area 3.3. Recognise and locate the equipment and resources required for everyday work 3.4. Interpret work instructions correctly and seek clarification if necessary 3.5. Follow work instructions to perform

ELEMENT	PERFORMANCE CRITERIA
	scientific/technical tasks safely and efficiently 3.6. Maintain own work area, equipment and materials in a safe and organised manner according to enterprise policy and procedures
4. Organise daily work efficiently	4.1. Assess and prioritise work load according to level of responsibility 4.2. Advise supervisor if additional resources or support are required to improve performance 4.3. Undertake duties in a positive manner to enhance workplace cooperation and efficiency
5. Accept responsibility for quality of own work	5.1. Monitor and adjust work practices to ensure that the quality of outputs is maintained 5.2. Identify and report opportunities for improvements in procedures, processes and equipment in work area
6. Identify own learning needs	6.1. Identify career options and training opportunities in the enterprise 6.2. Consult appropriate personnel to identify own learning needs for future work requirements and career aspirations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • using personal protective clothing, equipment and containment facilities as required • following work instructions to complete tasks within the required timeframe • working ethically • working efficiently when alone and with others • maintaining required quality of work outputs • complying with legislative and enterprise requirements in everyday work
Required knowledge
Required knowledge includes:

REQUIRED SKILLS AND KNOWLEDGE
• enterprise objectives, product and service range • enterprise structure and reporting lines • role of quality assurance and/or scientific/technical services in the enterprise • own role, rights, responsibilities and key tasks • workplace procedures that govern personal work, health, safety and environment • basic ethical values and principles, such as respect for the law, responsibility, courtesy, diligence and confidentiality • use and names of equipment, materials and other resources relevant to work function • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • follow workplace procedures to complete tasks within the required timeframe • efficiently organise own daily work • accept responsibility for quality of own work.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL922001A Record and present data* • *MSL952001A Collect routine site samples* • *MSL972001A Conduct routine site measurements*. Resources may include: • relevant documentation, such as enterprise SOPs, legal/regulatory requirements andcodes of practice • organisational charts and flow diagrams showing links between enterprise functions and/or production processes • employment, training and career information.

EVIDENCE GUIDE	
Method of assessment	The following assessment methods are suggested: • observation of candidate performing a range of scientific/technical tasks • feedback from peers and supervisors • oral or written questioning to check underpinning knowledge • review of workplace documentation completed by the candidate. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Environmental** At the start of an induction program, the supervisor asks two new laboratory assistants to introduce themselves to all the staff individually and find out about three major tasks that each person regularly performs. In addition, they watch the company's induction video, complete the necessary paperwork and are assigned a locker and safety equipment. At the end of the day, they report back to the supervisor. On Day Two, the supervisor assigns them to an experienced technician and asks them to shadow him/her. At the end of the day the new assistants are asked to describe two tests they have observed and outline some of the major safety issues involved with each one. On Day Three, they begin bench work by helping to conduct routine tests, such as titrations of

EVIDENCE GUIDE	
	industrial waste water samples under guidance of a technician. **Manufacturing** A laboratory assistant was required to complete the company's induction program during their first week of employment. The assistant completed the following activities: • met with all laboratory staff and discussed their roles and duties • prepared their own organisational flow chart for the laboratory and recorded the contact details and key function of each staff member • talked to the laboratory manager about the company's products and services and the laboratory's role in quality assurance • read through the induction booklet's summary of key company policies, procedures, emergency and risk management plans • talked to the safety officer about OHS risks in the laboratory and the location of key safety equipment and information • prepared a plan of the layout of the company site with location of key buildings and services • shadowed several technicians to observe their daily routines • prepared a weekly work plan in conjunction with the supervisor.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards,

RANGE STATEMENT	
	it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• Human Rights and Equal Opportunity Commission Act 1986
	• occupational health and safety (OHS) national standards and codes of practice
	• principles of good laboratory practice (GLP)

Business ethics	Business ethics may include: • following enterprise policy and procedures • behaving honestly and openly • respecting others and treating them with courtesy and impartiality • working diligently and responsibly • ensuring confidentiality of information, including client identification and test results
Enterprise sites	Enterprise sites may include: • laboratories • head office functions • production or processing plants • supplier services and consultancy services
Key functions	Key functions may include: • production • packaging, warehouse and distribution • quality assurance • purchasing, sales and marketing • human resources (personnel, training and employee relations)

RANGE STATEMENT	
Sources of workplace information	Sources of workplace information may include: • notice boards, public address or paging systems • standard operating procedures (SOPs), manuals, work instructions, signs and notices • material safety data sheets (MSDS) • telephone or contract details, email systems and websites • emergency exits, routes and collection points • enterprise recording and reporting procedures, quality manuals, equipment and operating/technical manuals • test methods (validated and authorised) • schematics, workflows, laboratory layouts and production and laboratory schedules
Workplace agreements, policies and procedures	Workplace agreements, policies and procedures may include: • industrial awards, enterprise bargaining agreements and individual contracts • emergencies, accidents and incidents • incident and accident/injury reports • health, safety and environment • quality assurance • customer services
Legislative requirements	Legislative requirements may involve: • OHS • workers compensation • equal employment, anti-discrimination and anti-harassment • ethics, copyright, intellectual property and privacy • environmental protection
Sustainable energy principles and work practices	Sustainable energy principles and work practices may include: • examining work practices that involve excessive use of electricity, gas and/or water • switching off equipment when not in use • regularly cleaning filters • recycling and reusing materials wherever

RANGE STATEMENT	
	feasible • minimising waste
Scientific and technical support	Scientific and technical support may include: • routine site sampling of raw materials and products • packaging, labelling, storing and transporting samples • visual inspection of products and packaging • routine site measurements that take a short time and involve a narrow range of variables or easily recognised control limits • cleaning of equipment • housekeeping of work areas
Equipment and resources	Equipment and resources will vary according to: • the scope and nature of the enterprise's products, and scientific/technical functions and services
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL913001A Communicate with other people

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to receive and pass on written and oral messages, provide relevant information in response to requests within timelines and demonstrate effective interpersonal skills.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants and instrument operators working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Receive and act upon instructions	1.1. Listen attentively to instructions and respond appropriately 1.2. Clarify instructions to ensure a complete understanding of the task
2. Receive and convey messages	2.1. Receive verbal and written messages and respond appropriately 2.2. Record and convey information so that messages are understood
3. Demonstrate appropriate interpersonal skills	3.1. Follow enterprise procedures which reflect equal opportunity, anti-discrimination and non-harassment legislative requirements 3.2. Demonstrate effective interpersonal skills during everyday interactions
4. Provide appropriate information	4.1. Deal with inquiries in accordance with enterprise customer service requirements 4.2. Establish details of inquiry by questioning and summarising 4.3. Access and provide relevant information that meets own authorisation and confidentiality requirements 4.4. Redirect inquiries to relevant personnel for

ELEMENT	PERFORMANCE CRITERIA
	resolution if beyond own area of responsibility 4.5. Complete all workplace documents legibly and accurately in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • communicating effectively with people from different organisational levels and diverse cultural backgrounds • using available communication equipment (e.g. telephone, online and hard copy directories, email, fax, intranet and internet) • listening attentively and clarifying messages and instructions to confirm their meaning • responding to calls and messages within accepted enterprise timelines • locating relevant sources of information • providing accurate information in an effective and timely manner • understanding colloquial, scientific and technical terminology appropriate to theexpected level of knowledge in the workplace • legibly and accuratelycompleting relevant workplace documents • promoting cooperation through personal interactions
Required knowledge
Required knowledge includes: • enterprise customer service standards and procedures • standard operating procedures (SOPs) for routine technical tasks undertaken by candidate • principles of effective interpersonal interactions • equal opportunity, anti-discrimination and anti-harassment requirements • communication protocols • relevant health, safety and environment requirements • products and services provided by the enterprise • layout of the enterprise and laboratory • role of laboratory services to the enterprise and customers • organisational structure

REQUIRED SKILLS AND KNOWLEDGE
Specific industry Additional knowledge requirements may apply for different industry sectors. For example: Manufacturing, food processing and construction materials testing industry sectors: • instructions to production staff when altering production mixes as a result of laboratory analysis Biomedical industry sector: • verification and signature requirements for the receipt and release of human specimens (such as blood transfusion products, blood alcohol samples and urine for drug testing)

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • communicate with people effectively by listening attentively and clarifying messages and instructions to confirm their meaning • provide accurate and timely information using appropriate terminology • complete workplace documents legibly and accurately • use personal interactions to promote cooperation.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL933002AContribute to the achievement of quality objectives*. Resources may include: • enterprise procedures and documents • communication equipment (for example, telephone,

EVIDENCE GUIDE	
	online and hard copy directories, email, fax, intranet and internet).
Method of assessment	The following assessment methods are suggested: • review of messages and workplace documentation prepared by the candidate • feedback from peers, customers and supervisors • observation of the candidate's performance of a wide range of technical and administrative tasks • questions to assess understanding of relevant workplace procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Manufacturing** A technician in a petroleum refinery asked a laboratory assistant to 'go down to the cat and take a sample of the bottoms,' not realising that the assistant had only just started work with the company. The assistant looked at the technician in amazement, not knowing whether to pretend to understand, maintain self esteem, or clarify the instructions for the task. The assistant decided on the latter - to ask for clarification - and the technician repeated the instructions without using jargon. The laboratory assistant then proceeded to the catalytic cracker to take the sample as per the appropriate standard operating procedures.

EVIDENCE GUIDE	
	Biomedical The regular collection staff were not present when a flustered client came into the outpatient clinic with a domestic container full of straw coloured fluid. The receptionist knew what urine collection containers usually looked like and this was clearly not one. The receptionist called for help from the laboratory in the absence of collection staff. A technical officer was sent. The officer quickly realised that a recollection would be requested and because this would be inconvenient to the patient, tried to seek an explanation from them as to why the correct container was not used. The technical officer then explained as clearly and gently as possible the reasons for the recollection and why the substitute container could not be used. The officer confirmed that the patient was clear on the collection procedure and checked that the labels on the new container were correct. **Food** The front office staff of a small food processing company were responsible for many tasks and could not always ensure that they were in the office to receive customers and answer phone calls. This meant that urgent inquiries were not always immediately attended to and some customers became irate if they were unfortunate enough to have made several inquiries while the office staff were absent. The company laboratory was adjacent to the reception area and laboratory technicians would attend to customers if they happened to see them waiting. The laboratory technicians realised that they could improve company-customer relations. They organised for a buzzer to be installed that connected the reception desk to the laboratory and the reception phone to redirect to the laboratory if it was not answered within a reasonable period of time. Since they could not always attend to the specific needs of the callers, they developed a standard format for recording messages that were passed back to the reception staff. The laboratory assistants were also trained to receive personal and phone inquires in an appropriate manner. The company found that, even though the laboratory technicians could not always satisfy the immediate demands of customers, the customer satisfaction level was greater when customers

EVIDENCE GUIDE	
	were attended to personally than when they were connected to an answering machine or not received at all.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Anti-discrimination Acts
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Human Rights and Equal Opportunity Commission Act 1986
	• Therapeutic Goods Regulations 1009
	• customer service and telephone protocols
	• information directories for staff access (personnel and telephone), online databases and CD-ROMs
	• workplace documents, such as:
	  • SOPs and laboratory methods
	  • job (batch) cards and job descriptions
	  • equipment manuals and service logs
	  • induction manuals
	  • supplier catalogues
	  • (daily) production schedules
	  • laboratory schedules

RANGE STATEMENT	
	• calibration and maintenance schedules • guide to relevant acts and regulations (e.g. Food Standards Code) • material safety data sheets (MSDS) • non-compliance reports • quality manuals • time sheets and logbooks • product specifications • text procedures • shift handover reports • pick lists • hazard analysis and critical control points (HACCP) procedures • libraries • information which uses: • common scientific and technical terminology • symbols, charts, signs, written text, tables, graphs and calculations
Communication	Communication may include interactions with: • supervisors and managers • other laboratory and production personnel • members of the public, customers and clients
Items of equipment	Items of equipment may include: • telephone, two-way radio, PA system, fax and computer (email) • direct display readouts • online information systems
Interpersonal communication	Interpersonal communication includes: • active listening • including others • effective questioning • tolerating the view of others, attempting to reduce conflict and to negotiate suitable outcomes
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise

RANGE STATEMENT	
	OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL913002A Plan and conduct laboratory/field work

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to plan and complete tasks individually or in a team context. The tasks involve established routines and procedures using allocated resources with access to readily available guidelines and advice. Work plans may need to be modified with supervisor agreement to suit changing conditions and priorities.

Application of the Unit

Application of the unit	This unit of competency is applicable to instrument operators, laboratory assistants and technical assistants working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan and organise daily work activities	1.1. Clarify allocated work activities and required resources if necessary 1.2. Prioritise work activities as directed 1.3. Break down work activities into small achievable components and efficient sequences 1.4. Review work plan in response to new information, urgent requests, changed situations or instructions from appropriate personnel 1.5. Update work plan and communicate changes to appropriate personnel
2. Complete allocated work	2.1. Locate relevant workplace procedures for required tasks 2.2. Undertake tasks following prescribed and routine work related sequences 2.3. Seek assistance from relevant personnel when difficulties cannot be handled 2.4. Record completion of activities to confirm outputs in accordance with plan
3. Identify and resolve work problems	3.1. Recognise problems or opportunities for improved work performance

ELEMENT	PERFORMANCE CRITERIA
	3.2. Apply agreed problem solving strategies to consider possible causes and solutions 3.3. Identify and access appropriate sources of help 3.4. Consider available alternatives and keep them open before agreeing on the most appropriate action
4. Work in a team environment	4.1. Cooperate with team members to negotiate and achieve agreed outcomes, timelines and priorities 4.2. Recognise personal abilities and limitations when undertaking team tasks 4.3. Confirm personal role and responsibility within the team for particular outputs 4.4. Demonstrate sensitivity to the diversity of other team members' backgrounds and beliefs
5. Update knowledge and skills as required	5.1. Recognise own strengths and weaknesses and take advantage of skill development opportunities

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- conducting work based on ethical values and principles
- clarifying tasks and recognising resource needs
- following relevant procedures consistently
- recognising potential disruptions or changed circumstances and modifying work plan in conjunction with relevant personnel
- ability to adjust to a variety of working environments (indoor, outdoor and night)
- seeking assistance from relevant personnel when difficulties arise
- achieving quality outcomes within timelines
- working effectively with team members who may have diverse work styles, cultures and perspectives
- promoting cooperation and good relations in the team
- assisting team members to organise and manage its workload

Required knowledge

REQUIRED SKILLS AND KNOWLEDGE

Required knowledge includes:
• enterprise procedures:
  • customer service
  • quality
  • occupational health and safety (OHS) and environmental legislative requirements
  • technical work that the candidate routinely performs
• workplace agreements and employment conditions:
  • workers compensation
  • industrial awards enterprise agreements
  • equal employment opportunity
  • anti-discrimination and anti-harassment
• ethical background relevant to the nature of the work:
  • use of animals for research
  • genetic modification, gene therapy, cloning and stem cells
  • invitro fertilisation
  • forensic testing of populations
  • importance of commercial confidentiality
• problem solving strategies
• interpersonal communication and conflict resolution techniques
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • follow workplace procedures to achieve quality outcomes within timelines • identify and resolve work problems • work effectively with team members and promote cooperation and good relations

EVIDENCE GUIDE	
	• prioritise activities and recognise potential disruptions or changed circumstances and modify the work plan in conjunction with relevant personnel.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL913001A Communicate with other people* • *MSL943002A Participate in laboratory/field workplace safety* • technical units related to the tasks undertaken. Resources may include: • enterprise procedures, equipment and materials for relevant technical tasks.
Method of assessment	The following assessment methods are suggested: • review of a flowchart prepared by the candidate to show efficient sequencing of tasks • observation of the candidate performing a range of technical tasks over sufficient time to demonstrate their handling of a variety of contingencies • review of documents detailing completed tasks, such as completed job cards, a report or suggestions for quality improvement • feedback from peers and team members • feedback from supervisors • written or oral questions to partly assess the candidate's ability to handle a range of contingencies and work in a team environment. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like

EVIDENCE GUIDE	
	environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Manufacturing** A plastic processing plant had to halt production because of a suspect raw material. The plant manager immediately requested the polymer testing laboratory to test and identify all batches of polypropylene additives and colouring agents. The laboratory team of three assistants and one technical officer allocated the workload amongst themselves to conduct the twelve different tests within a period of four hours to identify the 'out of specification' materials and report them to the production supervisor. All laboratory assistants had to reschedule their workplan, perform the required tests and assist each other to solve the production problem. **Biomedical** As part of a routine sequence, a technical officer is required to perform a series of tasks, including the calibration of instruments required for testing of blood samples. These tasks are to be completed within a specified timeframe to meet the output requirements of the enterprise. During the calibration of one of the instruments, the technician experiences difficulties that require expert technical assistance. The problem is referred to the appropriate person and is quickly resolved. Consequently, the officer is able to complete all necessary tasks within the prescribed timeframe and the required output is maintained. **Food processing** Each of the technical assistants working in the laboratory of a food processing company was dedicated to performing specific analyses. As a result, they often alternated between periods of inactivity and excessive workload (the latter case had the potential to compromise their health and safety and the accuracy of their food analyses). One of the contributing factors to the periods of intense activity was the need to quickly prepare standard solutions and reagents. The team discussed this problem and agreed that while it was not appropriate for each assistant to become competent to perform every

EVIDENCE GUIDE	
	analytical procedure, it was feasible for each person to be able to prepare solutions and reagents used by others. The team developed a central register in which impending shortages of these materials was noted. Each assistant referred to this register when no other work was due and prepared the materials on a 'first in, first out' basis unless a task was given a priority rating. The team found that this strategy more evenly distributed the workload over their shift, improved safety in the laboratory and reduced the risk of error.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• OHS national standards and codes of practice

Ethical and professional work performance	Ethical and professional work performance includes: • following enterprise policy and procedures, regulations and legislation • behaving honestly and openly

RANGE STATEMENT	
	• respecting others and treating them with courtesy and impartiality • working diligently and responsibly • ensuring confidentiality of information, including client identification and test results • ensuring proprietary rights, intellectual property and copyright are protected • clarifying personal values and ethics and analysing how they impinge on actions in the workplace
Workplace activities	Workplace activities may include: • setup and pre-use checks of laboratory equipment • calibration status checks • sampling and testing following standard procedures • maintenance and cleaning tasks
Workplace procedures	Workplace procedures may include: • standard operating procedures (SOPs) • job cards, batch cards and production schedules • job descriptions • methods, recipes, procedures and protocols
Problem solving	Problem solving may include: • accessing relevant documentation • identifying inputs and outputs • sequencing a process • identifying and rectifying a problem step • obtaining timely help • implementing preventative strategies wherever possible
Teams	Teams may: • be ongoing with responsibility for particular services or functions • be project based • have a mixture of full and part-time employees and contractors, laboratory, construction and production personnel • be separated by distance and work at sites

RANGE STATEMENT	
	outside laboratory facilities
Team operation	Team operation may occur within: • small, medium and large contexts • internal and external environments • enterprise guidelines covering access and equity principles and practices, licensing requirements, industrial awards, enterprise bargaining agreements and codes of practice • agreed responsibility and accountability requirements • appropriate goals, objectives • given resource parameters
Team tasks	Team tasks may vary according to: • the size of enterprise • the scope of the laboratory • their level of responsibility
Strategies to maintain work flow	Strategies to maintain work flow may include: • communicating critical events on shift • recognising shortages in reagents and problems with equipment • communicating quality breakdowns • recognising urgent and abnormal results to be processed • communicating and behaving in a courteous manner • being punctual
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and

RANGE STATEMENT	
	Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL914001A Prepare practical science classes and demonstrations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to manage the day-to-day running of science teaching laboratories and the preparation of practical experiments, demonstrations and field trips.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants and technical officers working in the secondary and tertiary education sectors. It also applies to zoos, aquariums and museums that run education programs. Personnel are required to assess and treat risks associated with practical activities. Some personnel may have the additional role of fire warden, first aid officer or occupational health and safety (OHS) representative. They may also have other skills, such as boating, SCUBA diving or trade qualifications. They may work autonomously but are required to liaise closely with teaching staff about the design and scheduling of practical activities. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Ensure safe work practices	1.1. Organise and perform risk assessments to identify hazards and analyse risks associated with planned practical activities 1.2. Select and implement appropriate controls for identified risks and monitor their effectiveness 1.3. Ensure preparation and conduct of practical activities are performed in accordance with relevant regulations, codes, guidelines and enterprise procedures 1.4. Select, fit and use personal protective clothing and

ELEMENT	PERFORMANCE CRITERIA
	equipment and ensure that it is used by students and teachers 1.5. Ensure materials and equipment are handled, prepared, stored and disposed of safely 1.6. Address incidents and emergencies as they arise
2. Plan work schedule	2.1. Plan schedule of classes and demonstrations in consultation with teaching staff to ensure timely delivery 2.2. Communicate effectively with staff and students using appropriate negotiation and conflict resolution skills 2.3. Prioritise work activities and manage time to meet deadlines 2.4. Modify work plan to deal with contingencies as they arise
3. Organise experiments and demonstrations	3.1. Collect materials and equipment from appropriate sources 3.2. Perform pre-use checks, prepare material and equipment and organise ready for use 3.3. Demonstrate practical skills, techniques and use of materials and equipment, as required 3.4. Organise clean-up operations and recycling or disposal of wastes 3.5. Trial experiments and demonstrations and recommend variations or alternatives
4. Manage resources	4.1. Operate practical activities within approved budgets 4.2. Maintain and control stocks of materials and equipment 4.3. Maintain storerooms, preparation areas and laboratories fit for purpose 4.4. Evaluate and select materials and equipment and make recommendations for purchase 4.5. Order, receive and store materials and equipment using enterprise procedures 4.6. Organise quotes and bookings for transport and accommodation for field trips, as necessary 4.7. Service and/or repair laboratory equipment where feasible 4.8. Arrange for the servicing or repair of equipment by appropriate personnel or accredited service agents, as necessary

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • using problem solving techniques and contingency planning • clarifying/designing practical activities and assessing resource needs • working with teaching staff and students to assess risks, develop and implement controls and monitor their effectiveness • preparing laboratory experiments and demonstrations on time with the correct materials and equipment • maintaining the laboratory fit for purpose • obtaining stocks of materials and equipment
Required knowledge
Required knowledge includes: • scientific terminology used in common practical activities • relevant legislation, regulations and codes governing practical activities • technical details of sampling, testing, equipment and instrumentation used in common practical activities • enterprise procedures for the purchase, handling and storage of materials and equipment • principles of budgeting, operational planning and efficient resource use • principles of risk assessment, risk management and hierarchy of control • relevant enterprise health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • clarify/design practical activities and assess resource needs • work with teaching staff and students to assess risks, develop and implement controls and monitor their effectiveness • prepare laboratory experiments and demonstrations on time with the correct materials and equipment • work with teaching staff and students to ensure all practical activities are performed safely (through demonstrations and monitoring of practical activities) • manage contingencies and resources within level of responsibility • maintain the laboratory fit for purpose • liaise with suppliers to obtain stocks of materials and equipment using enterprise procedures • work effectively with students and staff who may have diverse work styles, cultures and perspectives.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL944001A Maintain laboratory/field workplace safety* • *relevant MSL974000 series of units of competency* • *relevant MSL975000 series of units of competency*. Resources may include: • laboratory/field work environment, equipment and materials • personal protective equipment and safety equipment • enterprise OHS management system, policies and procedures.
Method of assessment	The following assessment methods are suggested: • review of operational plans, schedules and budgets prepared by the candidate • review of risk assessments and treatment strategies prepared by the candidate • review of job cards detailing completed tasks • feedback from students, teaching staff, suppliers and supervisor • observation of the candidate assisting teaching staff

EVIDENCE GUIDE	
	and students during practical activities • written or oral questions to partly assess the candidate's knowledge of relevant enterprise procedures, technical details of common practical activities and his/her ability to handle a range of contingencies. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Education** (**1**) A biology class returns from a short excursion where pond water samples have been collected. The teacher plans for the students to identify some of the common microscopic organisms present in the samples and conduct a range of tests for pH, electrical conductivity, turbidity and the presence of nitrates. The teaching assistant prepares, checks and calibrates the monitoring equipment and sets out ten microscopes with clean slides, cover slips and transfer pipettes together with waste buckets and bags for collection of biological material. A sharps container is set out for broken slides and cover slips. At the end of the class, the assistant cleans, checks and stows the microscopes and collects the waste material for disposal. The assistant disposes of the waste according to enterprise procedures. **Education** (**2**) A technical officer has responsibility for the technical

EVIDENCE GUIDE	
	support of practical classes in two laboratories. Every semester, he/she prepares a detailed schedule for all classes and field trips in collaboration with the teaching staff. This involves a careful assessment of risks and implementation of controls for each kind of activity to ensure that the institution meets its OHS and environmental management responsibilities. The schedule must also satisfy the science department budget constraints, seasonal variations and the availability of key staff and items of equipment. The officer's daily routine involves the preparation of all equipment, experiments and demonstrations for classes, the checking of equipment before and after its use, general cleaning and maintenance of equipment and work areas and the maintenance of stock levels.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 2252 Biological safety cabinets
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS/NZS 1269 Set:2005 Occupational noise

RANGE STATEMENT	
	management set • AS/NZS 1337 Eye protection • AS/NZS 2161 Set:2008 Occupational protective gloves set • AS/NZS 2210:1994 Occupational protective footwear • AS/NZS 2243 Set:2006 Safety in laboratories set • AS/NZS 2243.1:2005 Safety in laboratories - Planning and operational aspects • AS/NZS 2243.3:2002 Safety in laboratories - Microbiological aspects and containment facilities • AS/NZS 2243.8:2006 Safety in laboratories - Fume cupboards • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements • AS/NZS 4452:1997 The storage and handling of toxic substances • AS/NZS 4501 Set:2008 Occupational clothing set • AS/NZS ISO 14000 Set:2005 Environmental management standards set • animal welfare legislation and codes of practice • Australian Dangerous Goods Code • Australian Quarantine and Inspection Service (AQIS) Import Guidelines • gene technology regulations • Guide to physical containment levels and facility types • HB 9-1994 Occupational personal protection • National Code of Practice for the labelling of workplace substances (NOHSC:2012 (1994)) • permits for wildlife capture and handling • principles of good laboratory practice (GLP)
Hazards	Hazards may include: • electric shock • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue

RANGE STATEMENT	
	and fluids • solar radiation, dust and noise • exposure to extreme weather conditions • snake, insect and animal bites • chemicals, such as acids, heavy metals, pesticides and hydrocarbons • aerosols from broken centrifuge tubes and pipetting • radiation, such as alpha, beta, gamma and X-ray • sharps, broken glassware and hand tools • flammable liquids • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam, hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry • sources of ignition • high temperature ashing processes • disturbance or interruption of services • occupational overuse syndrome, slips, trips and falls • manual handling, working at heights and working in confined spaces • crushing, entanglement and cuts associated with moving machinery or falling objects • vehicle and boat handling
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • use of material safety data sheets (MSDS) • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storing hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and

RANGE STATEMENT	
	equipment, such as hats, hearing protection, gloves, safety glasses, coveralls, gowns, body suits, respirators and safety boots • applying containment procedures through the use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets and Class PCII and PCIII physical containment facilities • following established manual handling procedures for tasks involving manual handling • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Risk assessment	Risk assessment includes: • analysing the risk • identifying factors influencing the risk and the range of potential consequences • effectiveness of existing controls • likelihood of each consequence considering exposure and hazard level • combining these in some way to obtain a level of risk • comparison of the determined risk with pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring control

Hierarchy of control	Hierarchy of control includes:
	• the preferred order of risk-control measures from most to least preferred, that is:
	  • eliminating risk
	  • substituting with a lesser hazard
	  • isolating personnel from hazard
	  • engineering controls
	  • applying administrative controls, for example, procedures and training
	  • using personal protective equipment

Typical materials	Typical materials may include:

RANGE STATEMENT	
	• live flora and fauna, such as plant specimens • animals, such as rats, bacteria, algae, insects and fungi • blood and blood products, human or animal tissue and fluids • teaching aids, such as textbooks and videos • distilled water, reagents, chemicals, disinfectants, detergents, agar media and plates • consumable items, such as syringes, pipette tips and weigh boats • oils/lubricants, fuels, industrial gases, cryogenics, such as dry ice and liquid nitrogen • equipment spares, such as fuses, bulbs and batteries • paper and stationery • reference samples and standards
Typical equipment	Typical equipment may include: • analytical instruments, such as ultraviolet-visible (UV-VIS) and atomic absorption spectrometers(AAS) , gas chromatography (GC) and high pressure liquid chromatography (HPLC) • animal cages • autoclaves • balances • blenders, centrifuges and separating equipment • cell counters and staining machines • dishwashers, refrigerators, freezers, ovens, microwave ovens, incubators and water baths • fume hoods, biohazard containers and biological safety cabinets • gas cylinders • glassware (burettes, pipettes), plastic ware, glass, plastic and quartz cuvettes • hotplates, mantles, burners and muffle furnaces • light and fluorescence microscopes • microtomes and tissue processors • teaching aids, such as DVD players and computers • thermometers, pH meters and ion selective electrodes

RANGE STATEMENT	
	• ultrasonic cleaners
Incidents and emergencies	Incidents and emergencies may include: • workplace injury and accidents • biological and chemical spills • leakage of radioactivity • fire • bomb • security threats
Contingencies	Contingencies may include: • new information • urgent requests • modified activities • changed situations • late instructions from appropriate personnel • substitution of reagents
Sources of materials and equipment	Sources of materials and equipment may include: • field trips, including land and sea-based • botanic gardens and parks • abattoirs • commercial suppliers • other institutions • blood bank • shops
Demonstration of techniques and use of equipment	Demonstration of techniques and use of equipment may involve: • teaching staff • other technical staff • students during practical classes • students doing projects or postgraduate studies
Resource management	Resource management may include: • preparation of operational plans • schedules and budgets • handling of petty cash and reconciliation of bank statements • contacting suppliers and completing order requisition forms • use of an enterprise credit card

RANGE STATEMENT	
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL915001A Provide information to customers

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to respond to both internal and external inquiries of a specialised technical nature. The advice and information requested will require the gathering of information, such as trend analysis, collection of data and samples, confirmation of validity of results, revision of plans or product advice additional to that on data sheets.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants and officers in all industry sectors. All personnel that conduct sampling and testing are required to communicate appropriately with internal and external customers in order to respond effectively to requests of a specialised technical nature. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Assess the request for information and/or advice	1.1. Clarify and confirm the source, nature and priority of the request 1.2. Redirect the request to the relevant section, department or person, if appropriate 1.3. Record the receipt of the request in accordance with enterprise procedures
2. Prepare response	2.1. Locate and obtain required information if available 2.2. If not available, decide whether to obtain or generate the required information given the priority and costs involved 2.3. Seek required approval/authority to release information before proceeding
3. Provide information	3.1. Ensure that information is accurate, relevant and

ELEMENT	PERFORMANCE CRITERIA
and/or advice	complies with enterprise/statutory requirements 3.2. Keep the customer informed of progress when it is not possible to answer immediately 3.3. Notify other relevant personnel of request and response in accordance with enterprise procedures 3.4. Use most appropriate communication method given priority, cost and customer facilities 3.5. Provide information in a format suitable to customer 3.6. Check that the response met the customer's needs and take appropriate actions if required 3.7. Deal with customers politely, efficiently and appropriately, and in accordance with enterprise procedures
4. Record details of the request and response	4.1. Record all information details accurately in accordance with enterprise procedures 4.2. Ensure that all written information is accurate and/or legible 4.3. File all records in the designated place and in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- following enterprise procedures for communicating and providing information to customers
- prioritising requests for information
- locating and synthesising the required information using appropriate sources
- providing authorised information that is accurate, relevant, and in the required format
- using technical terminology appropriate to the customer and avoiding jargon
- communicating in an efficient and polite manner, taking into account the needs of the customer
- maintaining security and confidentiality of information
- recording and filing records of the request and information provided

REQUIRED SKILLS AND KNOWLEDGE
Required knowledge

Required knowledge includes:
• enterprise procedures relating to:
  • customer service for internal and internal customers with cognisance of cultural and social contexts
  • communication protocols
  • occupational health and safety (OHS) and environmental regulations
• enterprise business goals and key performance indicators as a basis for dealing with customers
• customer information about enterprise products and services
• technical details of methods, data and sample collection and the key features of laboratory results
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • correctly assess and prioritise requests for information • locate and synthesise the required information using appropriate sources • provide authorised information that is accurate, relevant, and in the required format • uses technical terminology appropriate to the customer and avoid jargon • communicate in an efficient and polite manner, taking into account the needs of the customer • maintain security and confidentiality of information as required by enterprise procedures • record and file records of the request and information provided as required by enterprise procedures.

EVIDENCE GUIDE	
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with any relevant technical unit of competency. Resources may include: • information directories and databases • workplace documents • equipment, such as telephone, fax and computer equipment (email or online information systems).
Method of assessment	The following assessment methods are suggested: • examination of written records of advice and information given to a range of customers • feedback from customers that the information/advice provided was accurate, timely and in a useful format • feedback from supervisors that enterprise procedures were followed. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A sales office representative submitted a sample from a customer who had complained that the product was contaminated. A technical officer discussed the problem with the representative and traced the history of the

EVIDENCE GUIDE	
	product sample from production batch to the customer's tank. It was found that the product had been delivered to a distributor, who had then sold it to the customer. The technical officer was able to show that the sample should be taken from the distributor's tank rather than the customer's. With a clear understanding of sampling protocols and procedures, the technical officer was able to ensure effort was not wasted on analysing a sample that would not identify the cause of the problem. Direct communication with the representative made sure there were guidelines to prevent the problem happening again. **Biotechnology** A technical officer in a government analytical laboratory often provides information to others about how a sample should be collected, received, labelled and its receipt recorded. This may occur when samples are collected: • for forensic analysis from a crime scene • at sporting events for the purpose of testing urine for performance enhancing drugs • for blood-alcohol determination. The technical officer conveys instructions using a minimum of jargon about the method and times of collection, the holding temperature, chain of custody requirements and documentation of the sample source. In some cases, the officer may also specify additional requirements governing the safe storage and transport of infectious or hazardous materials. **Food processing** A food processing company has a team of laboratory personnel that perform analysis of food products both for the company and on a fee-for-service basis for other enterprises. The laboratory often receives phone requests for the early release of results when they are needed urgently. Sometimes when this occurs, the individual who performed the analyses is unavailable and no one else is sufficiently informed to provide a verbal report on the data. The laboratory personnel realise that they should organise the way they record their results so that everyone can access, understand and report them quickly. The team develops a centralised system of recording and filing the results. They also organise a series of brief training sessions to share information about the analyses that they perform.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• information directories (organisational structure and telephone)
	• online database
	• CD-ROMs
	• workplace documents, such as:
	  • equipment manuals
	  • laboratory records
	  • National Association of Testing Authorities (NATA) requirements
	  • Australian standards
	  • certified laboratory reports
	  • analysis report sheets (past and present)
	  • organisational charts
	  • standard operating procedures (SOPs)
	• enterprise procedures governing, for example:
	  • receipt of requests
	  • release of information and results and confidentiality needs of clients and customers
	  • sample collection protocols and techniques for preserving sample integrity
	  • handling and collection of native fauna and flora (based on animal welfare legislation and codes of practice)
	  • filing systems, databases and laboratory

RANGE STATEMENT	
	records
Items of equipment or systems	Items of equipment or systems may include: • telephone • fax • email • computer software • databases • spreadsheets • Auslan
Information sources	Information sources may include personnel, such as: • scientists • technical experts • quality managers • laboratory and production personnel • customer service
Customers	Customers may include: • internal and external customers • members of the public • authorities, including regulatory authorities • other enterprises, municipalities • engineers • scientists • other specialist staff
Information provided	Information provided may refer to: • a local situation • a person with a disability • a person from a particular cultural group • material classification and characteristics • technical and/or manufacturing knowledge of procedures • analysis and/or test results and their interpretation where authority permits • risk assessment, monitoring and minimisation • cost, quantity and time estimation • contractual variations and claims • site assessment and problems • data analysis and statistical interpretation

RANGE STATEMENT	
Manufacturing and food processing sector variables	Manufacturing and food processing sector variables may include: • assessing requests for changes to formulations and alterations to production processes • determining variations and their significance for compliance with relevant standards

Biomedical and environmental sector variables	Biomedical and environmental sector variables may include:
	• providing responses to inquiries regarding sample collection and recollection protocols from:
	  • patients, doctors, nurses and environmental health officers
	  • collection staff and couriers

Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL915002A Schedule laboratory work for a small team

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to schedule laboratory work for a small team to meet operational requirements. It covers the ability to identify resource requirements and then document, monitor and adjust schedules in response to operational variations and in consultation with relevant personnel.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and laboratory technicians who have responsibility for the work outputs of a small work team in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine work requirements and laboratory resources	1.1. Determine and prioritise demand for laboratory services in work area for the planning period 1.2. Access and verify information on orders/service requests, stocks and delivery 1.3. Determine the personnel, material and equipment required to deliver services
2. Develop schedules in consultation with relevant personnel	2.1. Prepare schedules which meet the demand for services and balance the best use of available resources with skill development opportunities 2.2. Distribute work schedules to team or appropriate personnel and confirm contents with them
3. Monitor schedules	3.1. Monitor workflow and outputs against schedules and recognise any variations or potential disruptions 3.2. Identify possible causes for the variations and discuss possible adjustments with senior personnel
4. Adjust schedules in	4.1. Adjust schedules in response to operational variation

ELEMENT	PERFORMANCE CRITERIA
consultation with senior personnel	4.2. Maintain or renegotiate outputs in accordance with work requirements 4.3. Update documented schedules and distribute to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- scheduling the work activities of a small team to meet operational requirements
- determining required resources
- recognising non-standard behaviour in samples and equipment
- compensating for a variety of work environments (e.g. outdoors or night work)
- adjusting schedules and resource requirements efficiently in response to variations and disruptions
- communicating and documenting schedule variations in accordance with procedures
- recognising and using capabilities of team members
- communicating effectively with team members

Required knowledge

Required knowledge includes:

- sufficient knowledge of the enterprise's information systems, procedures and equipment to schedule the laboratory work for a small team to meet operational requirements
- enterprise business goals as a basis for decision making and actions
- basic planning strategies
- accurate scientific and technical terminology
- scientific and technical details underpinning the processes or techniques involved
- enterprise standard operating procedures (SOPs) for the processes or techniques involved
- production schedules and analysis times for product range
- operational factors that may affect the type of tasks scheduled
- resource requirements of the work to be scheduled
- hazards of operations, equipment and materials involved

REQUIRED SKILLS AND KNOWLEDGE
• enterprise procedures relating to occupational health and safety (OHS), access and equity, relevant sections of industrial awards and enterprise agreements • quality requirements for the tasks scheduled • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • schedule the work activities of a small team to meet operational requirements • determine required resources accurately • plan schedules that are efficient and satisfy operational requirements without compromising safety, quality, accuracy and ethics • adhere to timelines whenever possible • recognise non-standard behaviour in samples and equipment • recognise potential disruptions to planned timetable • compensate for a variety of work environments (e.g. outdoors or night work) • handle a variety of schedules and contingencies • adjust schedules and resource requirements efficiently in response to variations • communicate and document schedule variations in accordance with procedures • recognise and use capabilities of team members • communicate effectively with team members.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with technical units of competency relevant to the work of the team. Resources may include:

EVIDENCE GUIDE	
	• workplace procedures • workplace documentation (e.g. production data).
Method of assessment	The following assessment methods are suggested: • review of documented work schedules prepared by the candidate which successfully meet a variety of operational requirements • feedback from managers, supervisors and customers serviced by the team involved • feedback from team members regarding the effectiveness of team interactions • questions to check underpinning knowledge of relevant policies, procedures and scheduling principles and handling of possible contingencies • scenarios simulating disruption to workflow • questions to check scientific and technical details underpinning the processes or techniques involved. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustratethe practical application of this unit of competency and to show their relevance in a workplace setting. **Construction materials** A consulting laboratory working with construction industries receives 10-15 samples to test daily. The technical officer schedules the work for three other laboratory team members depending on the type of tests and equipment required. One of the technical officer's main tasks is to determine daily and weekly work

EVIDENCE GUIDE	
	priorities and distribute the work among team members to maximise their output and use of laboratory equipment. The technical officer monitors work outputs against the schedule and takes corrective action, if required, to ensure that customers receive results within the agreed timeframe. **Biomedical** At a regular team meeting a technical officer announced changes to the team's work schedules for the following week. The technical officer explained that the changes were part of a strategy to enable the team to become multi-skilled. However, the technical officer neither documented nor distributed written confirmation of the changes, as required. On the set date, confusion and conflict arose as a number of team members insisted on using the old schedules. Valuable time was taken up resolving the problem and confirming the changes with personnel individually. Afterwards, the laboratory supervisor reviewed the relevant communication protocols with the technical officer to emphasise their importance. **Environmental** The annual wastewater audit for a company required analysis of water samples collected at one-hourly intervals over a 24-hour period. The technical officer called his team together to find out what work priorities individual team members had and whether they had any personal commitments for the following two days. Afterwards, the officer drew up a roster for the annual audit, taking into account the commitments of team members. Following the audit, the officer analysed the results and compared them with the previous year's data.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

RANGE STATEMENT	
regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Laboratory work	Laboratory work may include: • setup, pre-use and calibration checks of equipment • preparation and standardisation of solutions • maintenance of laboratory facilities, equipment and stocks • collection, preparation and storage/dispatch of samples • testing and analysis of raw materials, products and specimens • preparation of products (e.g. sterile media) and product batches • trial and modification of methods

Scheduling for a small team	Scheduling for a small team may include:
	• identification of resources to maintain work flow including:
	  • interpreting production data
	  • analysing job tasks
	  • prioritising tasks within a work schedule
	  • determining appropriate human resources in terms of skills and numbers
	  • determining material and equipment requirements
	  • monitoring information regarding orders, stocks and deliveries
	• monitoring of work outputs
	• adjustment of work schedules as agreed with senior personnel to accommodate unexpected events, such as:
	  • processing abnormal and urgent results
	  • delays in arrival of samples
	  • seasonal variations and bad weather
	  • analysing and solving operational problems resulting in unacceptable test results
	  • unexpected events, such as equipment

RANGE STATEMENT	

	failure and sudden personnel absences
	• communication with senior personnel including:
	  • determining and organising work priorities and schedules
	  • analysing and solving problems affecting work schedules
	  • adjusting work schedules as necessary
	  • identifying possible problems for following shift
	• appropriate communication with team members in relation to:
	  • explaining work schedules, priorities and sequences
	  • distributing work schedules
	  • maintaining required output
	• documentation of outputs and resource usage
	  • quality and quantity of outputs
	  • supplies of stock materials
	  • maintenance and servicing of equipment

Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL916001A Develop and maintain laboratory documentation

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to develop and maintain relevant documentation and systems in response to identified information requirements or changes in laboratory policy or external accreditation requirements. It includes the analysis of specialised technical requirements and the development and/or amendment of workplace documents, procedures and record keeping systems using established workplace procedures. Final responsibility for documentation and systems generally rests with professional scientific/medical/engineering staff who have the appropriate signatory status or legal delegation.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and laboratory supervisors working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Recognise documentation needs/deficiencies	1.1. Evaluate current documentation to identify instances where documentation is needed or deficient 1.2. Analyse development opportunities and discuss with appropriate personnel to assess and confirm requirements
2. Develop/revise documentation	2.1. Specify documentation need and set/prioritise objectives 2.2. Analyse existing documentation/records in accordance with specified requirements 2.3. Develop/amend documentation as a draft in accordance with review requirements 2.4. Issue documentation to appropriate personnel for review

ELEMENT	PERFORMANCE CRITERIA
	2.5. Edit documentation to ensure that the initial identified need/deficiency and review requirements are satisfied 2.6. Recall superseded documentation and issue new documentation in accordance with document control procedures
3. Implement and evaluate new laboratory documentation	3.1. Brief personnel on new/revised documentation to ensure successful implementation of new procedures 3.2. Monitor and evaluate implementation of new/revised documentation and amend documents or provide training, if required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- analysing, drafting and amending enterprise documentation in accordance with specifications
- completing documentation in a clear and concise manner that is easily understood by others and in accordance with enterprise requirements/ specifications
- recognising problems in systems and documentation
- using internal and external information sources efficiently
- critically analysing information
- preparing documentation that is accurate, free from editorial errors and omissions and easily understood by the intended audience
- obtaining and including relevant feedback on draft documentation
- communicating information and developments in the appropriate manner
- completing the preparation and distribution of documents in the given time

Required knowledge

Required knowledge includes:

- documentation development and tracking
- records management and maintenance
- quality systems and continuous improvement
- organisational structure, delegations and responsibilities

REQUIRED SKILLS AND KNOWLEDGE
• communication protocols and reporting • scientific, technical and workplace terminology • occupational health and safety (OHS), environmental and other relevant legislative requirements, regulations and codes • enterprise standard operating procedures (SOPs) • technical developments in the sector (current methodologies, ranges and interpretations) • relevant health, safety and environment requirements • the laboratory's business goals and key performance indicators

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • analyse, draft and amend enterprise documentation in accordance with specifications • complete documentation in a clear and concise manner that is easily understood by others and in accordance with enterprise requirements/ specifications • recognise problems in systems and documentation • use internal and external information sources efficiently • critically analyse information • prepare documentation that is accurate, free from editorial errors and omissions, and in accordance with requirements • prepare documentation that is easily understood by the intended audience • obtain and include relevant feedback on draft documentation • communicate information and developments in the appropriate manner • complete the preparation and distribution of

EVIDENCE GUIDE	
	documents in the given time.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL916004A Maintain registration and statutory or legal compliance in work/functional area* • *MSL936001A Maintain quality system and continuous improvement processes within work/functional area* • *MSL946001A Implement and monitor OHS and environmental management systems*. Resources may include: • information directories and databases • enterprise documents and procedures.
Method of assessment	The following assessment methods are suggested: • examination of a range of relevant enterprise documentation developed by the candidate • feedback from peers and supervisors that enterprise procedures were followed and that the documentation is accurate and user friendly. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental**

EVIDENCE GUIDE	
	A water sample thought to contain cadmium had been logged for analysis. Later that day, the technician designated to perform the analysis advised the laboratory supervisor that the procedures had not yet been revised to suit the newly installed analytical equipment. The supervisor created a draft procedure document for the revised procedure and passed it, with an explanation of the reasons for the change, to the appropriate personnel for authorisation. The draft document was approved and the supervisor issued the revised procedures as a control document. The supervisor notified all relevant personnel of the change, removed the old procedures, replaced it with the new document and entered the change in the document control register. **Food processing** Two senior technicians in the laboratory of a food processing company hazard analysis and critical control points (HACCP) team suggested extensive changes to the way the laboratory functioned so that it better supported the HACCP system. The technicians reviewed the existing HACCP documentation and legislation and revised the laboratory documentation that was relevant to the HACCP system. They also organised in-house training to provide each member of the laboratory team with the knowledge and skills essential for successful implementation of this system. Overall, the adoption of a HACCP plan by the company proceeded with relatively few problems, in part because of the involvement of the laboratory staff and the training provided by the company.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 10013-2003 Guidelines for quality management system documentation
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• gene technology regulations
	• OHS national standards and codes of practice
	• principles of good laboratory practice (GLP)
	• testing procedures and specific method collections for industry sectors:
	  • Association of Analytical Communities International (AOAC International) Official Methods of Analysis

Workplace documentation	Workplace documentation may include: • workplace procedures, SOPs and operating manuals • test procedures • sampling procedures (sampling, preparation, labelling, storage, transport and disposal) • evaluation of materials or products

RANGE STATEMENT	
	• instructions for equipment installation, commissioning, calibration and maintenance • safety requirements for equipment, materials or products • cleaning, hygiene and personal hygiene requirements • methods for extraction or manufacture of a product • risk evaluation, monitoring or control procedures • compliance/non-compliance reports • quality system and continued improvement processes • incident and accident/injury reports • permits • schematics/work flows/laboratory layouts • instructions to comply with new legislation, standards, guidelines and codes • stock records/inventory • training program contents • waste minimisation and disposal
Items of equipment and systems	Items of equipment and systems may include: • online information systems, databases, record and filing systems • computer equipment
Communication	Communication may be with: • supervisors and managers (laboratory, quality and customer service) • other laboratory or production personnel • members of the public, customers and suppliers • external auditors, regulation and licensing/accreditation authorities, such as National Association of Testing Authorities (NATA)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through

RANGE STATEMENT	
	state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL916002A Manage and develop teams

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to develop and empower team members through motivating, mentoring, coaching and promoting team cohesion to achieve planned outcomes. It includes managing the team to improve its performance.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers and laboratory supervisors working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Promote team effectiveness	1.1. Clearly define and communicate team goals and roles 1.2. Promote respect for team members through coaching and example 1.3. Achieve balanced participation in discussions and activities 1.4. Negotiate work roles to balance team goals, job requirements and team members' strengths, experience, work style and career goals 1.5. Apply effective conflict resolution processes and implement them fairly 1.6. Provide effective links between senior management, other teams and the work team 1.7. Encourage networking to share experiences, expertise and resources
2. Identify and develop individual potential	2.1. Assess each team member's strengths and weaknesses against agreed performance requirements, and identify training and development options in consultation with them 2.2. Provide opportunities to develop skills through allocation/rotation of work tasks and roles

ELEMENT	PERFORMANCE CRITERIA
	2.3. Encourage the sharing of knowledge and skills through coaching, mentoring and shadowing
3. Monitor individual and team performances	3.1. Review each team member's performance on a regular basis with the individual 3.2. Recognise achievements and address problems with performance 3.3. Provide constructive feedback on the performance of the team and team members 3.4. Record information relating to individual and team performance following enterprise/statutory procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- using interpersonal and communication strategies
- applying conflict resolution processes
- working effectively with team members who may have diverse work styles, cultures and perspectives
- promoting team cohesion and effectiveness
- improving team and individual performance
- monitoring team and individual performance

Required knowledge

Required knowledge includes:

- the organisational structure and layout of the laboratory and enterprise
- enterprise/statutory policies and procedures relating to access and equity
- staff/workgroup practices, relevant sections of industrial awards and enterprise bargaining agreements
- key principles of team dynamics, team leadership and management
- interpersonal/communication strategies for a diverse workforce
- conflict resolution strategies and processes
- key principles of performance management systems

REQUIRED SKILLS AND KNOWLEDGE
• performance outcomes expected and key indicators • business goals • operating budgets and plans for work area • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • work effectively with team members who may have diverse work styles, cultures and perspectives • promote team cohesion and effectiveness • measure and improve team and individual performance • monitor team and individual performance.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. Competency in this unit should be assessed over a sufficient period of time to enable the candidate to initiate and implement improvements. This unit of competency may be assessed with: • *MSL916003ASupervise laboratory operations in work/functional area*. Resources may include: • relevant OHS, equal opportunity, licensing, registration policies and procedures • workplace procedures and standard operating procedures (SOPs) • industrial awards and enterprise agreements.
Method of assessment	The following assessment methods are suggested: • review of record systems and documentation of team

EVIDENCE GUIDE	
	outputs and performance • feedback from team members about team processes • feedback from managers about team performance • feedback from customers serviced by the team • observation of the candidate during team meetings and contact with individual team members • interview questions with the candidate to assess underpinning knowledge of team dynamics, leadership and management. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing** A materials testing laboratory introduced a mentoring system as part of its laboratory work team's program. Laboratory assistants and technicians were placed in work teams that included technical specialists. This strategy was designed to enable less experienced team members to develop advanced technical skills on the job. The team leader acted as the mentor, monitored the competency of the less experienced team members and organised work tasks to further develop their skills. For example, as part of a quality improvement project, the team was asked to propose a way of minimising waste disposal. After discussing a number of alternatives, the team narrowed down the choice to one feasible suggestion, and then investigated the cost and

EVIDENCE GUIDE	
	environmental implications with the guidance of the team leader. **Biomedical** Two technical officers working in the haematology section of a large hospital laboratory explained to their supervisor that they would like to gain experience of making blood films, having learned the basic skills during their initial training. The supervisor agreed, but first assessed their competency against enterprise standards and recognised that they could benefit from some on-the-job training. The supervisor arranged for them to be coached by a more experienced team member. Some time later, they were assessed as competent and able to regularly perform the task. **Food processing** The new laboratory supervisor of a food processing company was keen to develop the professionalism of the laboratory team. The supervisor wanted to enhance the team's level of cooperation, participation in the ongoing development of the quality management system and willingness to suggest refinements to the food analyses that they performed. Neither the supervisor nor the team of technicians believed they had the time to devote to in-house professional development exercises. In any event, the technicians were dubious about the effectiveness of these activities. Instead, the supervisor offered to meet the costs of the technicians joining a professional society of their choice, provided that it was closely related to the work performed in the laboratory. Most of the staff accepted this offer. Over the next few months, a significant improvement in the enthusiasm of the staff and the quality of their work occurred. The supervisor attributed this to an increased sense of esteem for their profession, the forging of links with the laboratory staff of other companies and the opportunity to discuss their work within a wider circle of peers. Some technicians made the time to visit other laboratories, where they were able to assess new work practices and the merits of instrumentation not used in their own workplace. Overall, the supervisor found that the benefits to the operation of the laboratory team greatly outweighed the modest financial cost involved.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Teams	Teams may: • be ongoing with responsibility for particular services or functions • be project based • have a mixture of full and part-time employees and contractors • be separated by distance and work at sites outside the laboratory
Team operation	Team operation may occur in: • small, medium and large contexts • internal and external environments • enterprise guidelines covering access and equity principles and practices, licensing requirements, industrial awards and enterprise bargaining agreements • agreed responsibility and accountability requirements • appropriate goals and objectives • given resource parameters
Methods for promoting team cohesion	Methods for promoting team cohesion may include: • providing clear information and directions when devolving responsibility and accountability • organising regular team meetings • involving the team in planning and allocation of tasks • encouraging the team to openly propose, discuss and resolve issues

RANGE STATEMENT	
	• dealing with conflict before it adversely affects team performance • treating people openly and fairly • recognising individual and cultural differences • recognising and rewarding achievement
Methods for improving team and individual performance	Methods for improving team and individual performance may include: • using appropriate continuous improvement processes to improve team planning and results • analysing barriers to team effectiveness and developing appropriate strategies to overcome them • recording individual and team performance • monitoring individuals' outputs and providing constructive feedback • identifying and utilising individuals' strengths • identifying individuals' training needs and providing development opportunities • supporting the team to share knowledge and skills
Monitoring team performance	Monitoring team performance may include: • applying enterprise performance management systems • communicating with senior management, team members and the team as a whole • recording and updating confidential personal data • applying total quality management principles
Identifying individual potential	Identifying individual potential may require: • comparisons of work requirements against outputs • competency-based assessment against standards or enterprise requirements
Communication issues within and between teams	Communication issues within and between teams may include: • critical events on shift • urgent or abnormal results that require attention • problems with instruments, reagents, tests and sampling

RANGE STATEMENT	
	• equipment and material shortages • changes to work priorities, schedules and rosters
Documentation	Documentation may include: • job descriptions and person specifications • workplace procedures, occupational health and safety (OHS) and equal opportunity policies • licensing/registration requirements • industrial awards and enterprise agreements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL916003A Supervise laboratory operations in work/functional area

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers planning, allocation of tasks, coordination, quality assurance, monitoring resource usage and recording and reporting of laboratory operations. This requires using significant judgement about work sequences and choosing appropriate technology and procedures to ensure that products and services meet customer expectations, and are provided safely and efficiently in keeping with the enterprise business plan.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers and laboratory supervisors working in all industry sectors. Responsibility is undertaken for the day-to-day operation of the functional area under broad direction from more senior staff such as scientists, medical staff and engineers, Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Monitor and direct work practices within functional area	1.1. Ensure that personnel follow all relevant procedures, regulations and standards 1.2. Confirm that all technical work is performed in accordance with relevant standards, standard operating procedures (SOPs) and schedules 1.3. Ensure that analytical results/data are checked, collated and distributed in accordance with enterprise requirements 1.4. Monitor testing and sampling procedures for quality control in accordance with enterprise requirements 1.5. Identify and resolve complex problems by using agreed problem solving strategies and act to prevent their recurrence
2. Manage personnel	2.1. Develop and coordinate rosters to balance job

ELEMENT	PERFORMANCE CRITERIA
within work area	requirements, laboratory efficiency and skill development opportunities 2.2. Empower work groups/teams in dealing with technical and work flow problems and suggesting improvements 2.3. Provide coaching and mentoring to support personnel who have difficulties with meeting targets for performance and/or resource usage 2.4. Establish and maintain effective communication with all personnel and clients to ensure smooth and efficient operations
3. Establish resource requirements and operating budgets	3.1. Collect and analyse available resource information in consultation with appropriate personnel 3.2. Prepare operational plans which make the best use of available resources, taking into account client needs and enterprise plans 3.3. Identify and analyse possible variances due to external/internal factors and prepare contingency plans 3.4. Compile operating budgets as required
4. Procure resources to achieve operational plans	4.1. Analyse resource requirements and sources of supply in terms of suitability, cost, quality and availability 4.2. Select and purchase new materials and equipment in accordance with enterprise procedures 4.3. Coordinate stocktaking of materials and equipment to ensure maintenance of stock at prescribed levels 4.4. Ensure that personnel are competent to perform required tasks and organise training if required 4.5. Arrange for the recruitment and induction of personnel as appropriate
5. Monitor and optimise operational performance and resource usage	5.1. Monitor the relationship between budget and actual performance to foresee problems 5.2. Analyse variations in budget performance and either report or rectify abnormal/sub-optimal performance 5.3. Negotiate with designated personnel and seek approval for variations to operational plans as required 5.4. Assess utilisation of plant, equipment and consumables and compare with planned usage 5.5. Rectify sub-optimal utilisation of plant, equipment

ELEMENT	PERFORMANCE CRITERIA
	and consumables 5.6. Program and arrange for maintenance of plant and equipment in accordance with enterprise maintenance schedules 5.7. Maintain systems, procedures and records associated with resource usage in accordance with enterprise requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • collecting, analysing and reportingon information for enterprise operational plans, budgets and performance management • organising and optimising the use of resources within agreed parameters to achieve planned outcomes • revising plans to take account of the unexpected • solving non-routine problems • making decisions within limits of responsibility and authority • ensuring that legislation, statutory and enterprise requirements are met in work operations • monitoring outputs, analyses, processes and introducing ways to improve operations • using effective consultative processes • promoting a learning environment for personnel in the immediate work area • motivating and counselling personnel to improve performance
Required knowledge

Required knowledge includes:
• enterprise:
  • business, strategic and operational plans
  • key performance indicators
  • laboratory services
  • products

REQUIRED SKILLS AND KNOWLEDGE
• customers • legislation, codes, standards and registration criteria relevant to the work area or function • principles of budgeting, operational planning and efficient resource use • workplace industrial agreements and regulations dealing with hygiene, dress and behaviour of employees • SOPs and the technical details of sampling, testing, equipment and instrumentation within the work area • problem solving techniques and contingency planning • broad trends in production data (e.g. seasonal and annual) • auditing procedures • team leadership and development techniques • mentoring and coaching techniques • relevant health, safety and environment requirements **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example: Biomedical and environmental: • access information from sources, such as relevant Federal and State/Territory Acts, Environmental Protection Agency (EPA), National Pathology Accreditation Advisory Council (NPAAC) and National Health and Medical Research Council (NHMRC) Food processing: • Codex Alimentarius standards, Association of Analytical Communities International (AOAC International) Official Methods of Analysis

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • collect, analyse and reporton information for enterprise operational plans, budgets and

EVIDENCE GUIDE	
	performance management • organise and optimise the use of resources within agreed parameters to achieve planned outcomes • revise plans to take account of the unexpected • make decisions within limits of responsibility and authority • supervise laboratory operations and personnel so that planned outcomes are achieved within agreed resource and budget parameters without compromising safety, quality and ethics • ensure that legislation, statutory and enterprise requirements are met in work operations • monitor outputs, analyses processes and introduce ways to improve operations • solve a range of non-routine problems • use effective consultative processes • promote a learning environment for personnel in immediate work area • motivate and counsel personnel to improve performance.
Context of and specific resources for assessment	This unit of competency should be assessed in a laboratory environment that meets Australian standards for working laboratories or is accredited by NATA or the Royal College of Pathology. The assessment timeframe must allow for adequate assessment over a planning cycle. This unit of competency may be assessed with: • *MSL916002A Manage and develop teams* • *MSL916004A Maintain registration and statutory or legal compliance in work/functional area* • *MSL946001A Implement and monitor OHS and environmental management systems*. Resources may include: • laboratory equipped with appropriate services, equipment, instruments and consumables • relevant enterprise policies, procedures, operational reports, financial reports and stock records • technical manuals, SOPs and quality manuals.
Method of assessment	The following assessment methods are suggested: • direct observation of the candidate's interactions with personnel

EVIDENCE GUIDE	
	• review of reports from subordinates, peers, managers and customers • review of reports, operational budgets and plans generated by the candidate • review of performance reports for the candidate's work area • review of documented examples of quality performance improvements achieved and examples of significant problems solved • simulations/role plays to assess situations which are critical but did not arise during the negotiated assessment period. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A laboratory supervisor analysed the costs of regular heavy metal testing of the wastewater stream leaving the company's plant. He/she compared these costs with a quotation from an external environmental consulting company and noted that it would be more cost effective to outsource the current level of testing. However, the supervisor argued that the company should retain this capability in-house given the impact of impending legislation which will require it to develop an environmental management plan and introduce more complex monitoring. He/she demonstrated that it would

EVIDENCE GUIDE	
	benefit the company more in the long run if they recruited one new technician, retrained existing laboratory staff and continued to perform all wastewater testing on site. **Food processing** A technical officer had to complete a wide range of chemical analyses that required samples to be ignited for many hours in a muffler furnace, digested with acid, prepared for analysis by atomic absorption spectroscopy and gas chromatography (GC), and titrated against standard solutions. The laboratory supervisor noticed that the number of analyses performed each day by the technician tended to fluctuate widely without an obvious cause. Closer observation showed that the technician's efficiency was dependent on the order in which the analyses were begun and the use of the auto sampler for overnight operation of the GC. The supervisor suggested several ways to improve the technician's time management. The supervisor installed a timer on the muffler furnace so that it could be operated overnight and organised the technician to perform labour intensive tasks after automated analyses had been initiated. The supervisor then showed the technician the optimum order to perform individual tasks and verified that his instructions were followed over succeeding weeks. The supervisor's actions significantly improved the productivity of the laboratory. Later it became obvious that the technician's time management system was not working as effectively as it had. Again, the supervisor monitored the technician's work and realised that since the daily analytical load was seasonal, a second management system had to be developed that was dedicated to the new season. Both systems were sufficiently flexible to take account of short term fluctuations in workload. In summary, the organisational skills of the supervisor and technician's ability to follow detailed instructions resulted in a more efficient use of company time, labour and resources.

Range Statement

RANGE STATEMENT

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• occupational health and safety (OHS) national standards and codes of practice
	• principles of good laboratory practice (GLP)
	• standard Australian test methods
	• registration/licensing requirements
	• ethical and legal responsibilities of enterprise personnel such as:
	  • animal welfare
	  • poisons
	  • environmental protection
	• National Association of Testing Authorities (NATA) accreditation
	• staff performance measures, such as:
	  • SOPs

RANGE STATEMENT	
	• three stage proficiency testing (external, interpersonal and replicate) • customer needs, specific testing requirements and standards • waste auditing and minimisation processes • strategic plans, productivity/profit targets and business plans • quality and continuous improvement processes and standards • cost-benefit analysis principles • workplace industrial agreements • hygiene/dress/behaviour regulations • grievance and dispute resolution procedures • access/equity/ethics principles, processes and procedures • batch cards, work schedules and rosters • maintenance and housekeeping schedules
Equipment and systems	Equipment and systems may include: • computer equipment • information management systems • financial accounting systems
Problem solving	Problem solving may include: • troubleshooting and fault finding • risk analysis, root cause analysis and aspect/impact analysis • non-routine operational/technical problems • non-routine administrative and personnel related problems
Communication	Communication may be with: • supervisors and managers • laboratory and production personnel • work teams • members of the public • customers • suppliers
Supervisory responsibilities	Supervisory responsibilities may include: • work practices within functional area: • determining quality assurance sequences to

RANGE STATEMENT	
	minimise errors and inconsistencies • participating in external quality control programs • ensuring documentation of results and that data is processed and records maintained • personnel within functional area: • developing rosters to fulfil both work requirements and skill development opportunities • identifying roles and responsibilities for individuals and team members • providing effective communication pathways to ensure smooth and efficient operations • encouraging teams to solve problems relating to work flow and to suggest possible improvements to work organisation to maximise efficiency • operational plans: • determining work schedules that use resources efficiently and meet customer and enterprise needs • identifying possible variances of operational plans in order to prepare contingency plans • operational performance: • recognising problems and initiating corrective actions • continuously improving the skills of personnel in the workplace
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply

RANGE STATEMENT	
	current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL916004A Maintain registration and statutory or legal compliance in work_functional area

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers responsibility for the day-to-day operation of the work/functional area and its compliance with legislation and licensing, registration, ethical or accreditation requirements (e.g. National Association of Testing Authorities (NATA)) and enterprise policies and procedures.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers and laboratory supervisors in all industry sectors. While statutory or legal compliance is the responsibility of all personnel, supervisors have an important leadership role in promoting and monitoring workplace practices which enhance compliance. They work under broad supervision of scientists/medical staff/engineers. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and communicate current legislation, codes and standards	1.1. Maintain knowledge of current and new requirements impacting on work/functional area 1.2. Distribute clear information regarding the roles and responsibilities of teams and individuals to maintain the laboratory's statutory or legal compliance 1.3. Explain the implications of non-conformance to all personnel within the work area
2. Ensure that work practices meet compliance requirements	2.1. Plan work practices to ensure compliance with relevant legislation and licensing, registration, ethical or accreditation requirements 2.2. Ensure that the calibration system is implemented to meet traceability requirements 2.3. Ensure that testing procedures are implemented so that methods and equipment are fit for purpose 2.4. Implement systems to ensure the accuracy of

ELEMENT	PERFORMANCE CRITERIA
	measuring equipment 2.5. Empower team members through coaching and mentoring to manage their responsibilities
3. Monitor, analyse, adjust and report performance	3.1. Ensure that actual and potential problems are identified, rectified and reported promptly to ensure workplace compliance 3.2. Analyse and supervise activities so that potential non-compliance is minimised 3.3. Recommend to designated personnel strategies to improve compliance 3.4. Ensure that individuals/teams are informed of new and improved procedures 3.5. Maintain systems, records and reporting procedures according to legislative and licensing, registration, ethical or accreditation requirements and workplace procedures
4. Investigate, rectify and report non-conformance	4.1. Investigate and deal with non-conformance according to legislative and licensing, registration or accreditation requirements and workplace procedures 4.2. Provide on/off job training for personnel to acquire and apply competencies to meet legislative and licensing, registration or ethical accreditation requirements 4.3. Re-design or adjust workplace practices to ensure that non-conformance is not repeated

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • ensuring work practices are conducted in an ethical and professional manner • monitoring and analysing work practices to ensure compliance and taking appropriate action to rectify potential problems or instances of non-conformance • detailed analysis of results and long term data trends • providing information and training on roles and responsibilities and enterprise

REQUIRED SKILLS AND KNOWLEDGE
procedures dealing with legal/statutory requirements • communicating appropriately with all customers (internal and external) • negotiating changes to work processes and procedures to meet statutory or legal requirements • developing and introducing practices to improve the work environment • providing coaching and mentoring support to personnel to change work practices • keeping required records complete, current and secure
Required knowledge
Required knowledge includes: • enterprise procedures governing document control, record management, communication and reporting, and internal and external audits • scientific technical terminology used to describe legislative, licensing, or registration requirements (e.g. traceability) • legal, ethical and welfare issues associated with laboratory and technical work • role, structure and responsibilities of ethics committees • statutory and legal compliance requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidate can: • ensure work practices are conducted in an ethical and professional manner • supervise laboratory operations to ensure that the work or functional area complies with legislation and laboratory licensing, registration or accreditation requirements (e.g. NATA) and the enterprise's policies and procedures • monitor and analyse work practices to ensure compliance and take appropriate actions to rectify potential problems or instances of non-conformance • provide information and training on roles and

EVIDENCE GUIDE	
	responsibilities and enterprise procedures dealing with legal/statutory requirements • communicate appropriately with all customers (internal and external) and be aware of cultural and social contexts • negotiate changes to work processes and procedures to meet statutory or legal requirements • develop and introduce practices to improve the work environment • provide coaching and mentoring support to personnel to change work practices • keep required records complete, current and secure.
Context of and specific resources for assessment	This unit of competency should be assessed in a laboratory environment that either meets Australian standards for working laboratories or is accredited by NATA or the Royal College of Pathology, as appropriate. This unit of competency may be assessed with: • *MSL915001A Provide information to customers* • *MSL916001A Develop and maintain laboratory documentation* • *MSL916003A Supervise laboratory operations in work/functional area* • *TAADEL301C Provide training through instruction and demonstration of work skills*. Resources may include: • laboratory equipped with appropriate equipment, instruments, services and consumables • relevant enterprise policies, procedures, operational reports, financial reports and stock records • technical manuals, standard operating procedures (SOPs), quality manuals and quality system documentation.
Method of assessment	The following assessment methods are suggested: • observation of the candidate's interactions with personnel • review of verified records and reports generated by the candidate • feedback from managers regarding the candidate's ability to implement relevant enterprise procedures • review of information developed by the candidate

EVIDENCE GUIDE	
	and provided to the workgroup. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** A pathology laboratory is preparing for NATA assessment. The role of one laboratory supervisor is to organise information sessions to inform personnel about the standards and codes to be followed for accreditation. These cover issues, such as working with biological, chemical and radiation hazards, the use of safety equipment, the disposal of waste, ethics committee requirements and patient confidentiality. Training is provided to ensure all personnel are equipped with sufficient knowledge and skills to fulfil their responsibilities in line with the relevant codes and standards. The thorough preparation of the laboratory personnel by the laboratory supervisor assists the laboratory to gain NATA accreditation. **Environmental** A laboratory supervisor is asked to do an internal audit of a work area as part of an analytical laboratory's preparation for a NATA assessment. The supervisor checks items, such as the currency of the quality manual and laboratory documentation, the storage of reference standards and compares the documentation of test results with NATA requirements. As a result of this internal

EVIDENCE GUIDE	
	audit, the supervisor is confident that the forthcoming NATA assessment will show that the work area complies with all requirements. **Food processing** A team of technical assistants performs a common set of food analyses that are essential to the operations of a food processing company. After a period of rapid staff turnover, their supervisor noticed that the degree of variance in the analytical results has increased. An internal proficiency study confirmed that this rise was not due to compositional differences between samples. The supervisor sought to overcome this problem by first discussing it with the team. The supervisor realised that some of the recently employed technical assistants did not fully understand some analytical procedures. Furthermore, each member of the team, for various reasons, has a distinct preference for performing some procedures over others and this appeared to influence their competency to conduct all other analyses. In consultation with the team, the supervisor made several changes to the way they work. A more structured induction of new staff was introduced and where possible each technician was allocated the analyses that they preferred and were most competent to perform. The supervisor also instigated a review of the analytical methods involved and identified the critical steps in each assay as defined by the laboratory's accreditation authority. Particular attention was paid to steps regularly misunderstood by one or more technicians in the past and a series of 'critical operating procedures' were developed. These procedures, together with the SOPs, were clearly displayed in the area where the relevant assay was conducted. Overall, these actions by the laboratory supervisor improved the work performance and satisfaction of the staff, maintained the laboratory's standards of compliance and enhanced the level of communication and cooperation with the team.

Range Statement

RANGE STATEMENT

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	• AS ISO 1000-1998 The international system of units (SI) and its application
	• AS ISO 10013-2003 Guidelines for quality management system documentation
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	• AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	• AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)

RANGE STATEMENT	
	• animal welfare legislation and codes of practice • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • Australia New Zealand Food Standards (ANZFS) Code • Australian code of good manufacturing practice for medicinal products (GMP) • Australian Dangerous Goods Code • Anti-discrimination Acts • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 and Import Guidelines • dispute resolution • ethics committee requirements • freedom of information • gene technology regulations • general duty of care • Human Rights and Equal Opportunity Commission Act 1986 • intellectual property and copyright • maintenance and confidentiality of records • maintenance of certified reference materials and regulation 80 certificates • maintenance of records of breaches • National Association of Testing Authorities (NATA) Accreditation programs requirements • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • natural justice • privacy legislation • representative work groups/committees • Therapeutic Goods Regulations 1009 • workers' compensation, WorkCover and industrial relations

RANGE STATEMENT	
Ethical considerations	Ethical considerations may include: • identification and impartial resolution of ethical issues, such as conflict of interest • ethical decision making • provision of products and services which match the operational and financial needs of stakeholders, including realistic quotes for work • accurate representation of skills, services, knowledge and qualifications of individuals and the organisation • acknowledgment of services and products developed by others, intellectual property and copyright • provision of unbiased, accurate and appropriately qualified information results
Communication	Communication may involve: • managers and supervisors • laboratory and production staff • regulating authorities • provision of information and training • explanation of legislation, codes, standards and work practices
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL916005A Manage complex projects

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to interpret complex technical briefs, determine project methodologies and resource requirements, establish project plans, manage projects to successful conclusions and evaluate project outcomes.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers and laboratory supervisors working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Interpret brief and design feasible project plan	1.1. Interpret and confirm project objectives, deliverables, constraints and principal work activities 1.2. Determine resource requirements, including personnel, equipment and materials 1.3. Develop a detailed implementation plan for the project outlining methodology, milestones and budget 1.4. Identify roles and responsibilities of project team members 1.5. Analyse quality requirements to ensure compliance with quality standards 1.6. Develop risk management strategies and risk management plans to ensure successful and timely outcomes
2. Establish and implement project plan	2.1. Brief team members about the project and allocate roles and responsibilities, balancing job roles and skills development opportunities 2.2. Establish communication and reporting mechanisms 2.3. Implement agreed time management strategies to ensure milestones are met 2.4. Apply agreed quality requirements to measure

ELEMENT	PERFORMANCE CRITERIA
	performance and outcomes
3. Manage project	3.1. Monitor and report progress of activities in relation to the project plan 3.2. Ensure income and expenditure is in line with the agreed project plan and budget 3.3. Work with the team to analyse and diagnose problems and to determine corrective actions 3.4. Implement agreed variations to the plan to accommodate changing situations 3.5. Maintain accurate records and communication with stakeholders and project team members
4. Finalise project	4.1. Ensure project objectives are met and deliverables are provided on time and within budget 4.2. Complete all reporting requirements
5. Evaluate project methodology	5.1. Assess the effectiveness of resource management in delivering project outcomes 5.2. Evaluate the effectiveness of communication processes used throughout the project 5.3. Recommend improvements for future projects

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- analysing a complex technical brief and preparing a feasible project implementation plan
- establishing a project team and implementing a project in response
- reaching milestones within budget
- consulting and communicating effectively to ensure the project outcomes are achieved
- maintaining accurate records and documentation in accordance with the enterprise procedures
- selecting and establishing operational systems for the project
- planning work activities, resources and finances to ensure the project outcomes are

REQUIRED SKILLS AND KNOWLEDGE
achieved within the timeframe and budget constraints • monitoring and evaluating the progress of the project
Required knowledge
Required knowledge includes: • purpose and methods of planning • techniques for monitoring timelines, expenditure and team performance • techniques for achieving effective communication and cooperation • techniques for troubleshooting, problem solving and conflict resolution • reporting requirements • techniques for evaluation and continuous improvements • relevant health, safety and environment requirements • laboratory's business goals and key performance indicators

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • analyse a complex technical brief and prepare a feasible project implementation plan • establish a project team and implement a project in response • reach milestones within budget • consult and communicate effectively to ensure project outcomes are achieved • maintain accurate records and documentation in accordance with enterprise procedures • select and establish operational systems for the project • plan work activities, resources and finances to ensure project outcomes are achieved within the timeframe and budget constraints • monitor and evaluate the progress of the project.

EVIDENCE GUIDE	
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL916002A Manage and develop teams* • *MSL936001AMaintain quality system and continuous improvement processes within work/functional area*. Resources may include: • procedures and documentation typically used by the enterprise • scheduling charts/strategic plans • GANTT charts • operational reports • financial plans • sample budgets.
Method of assessment	The following assessment methods are suggested: • review of reports, operational budgets and project plans generated by the candidate • review of project outcomes and customer satisfaction • questioning/interview to assess underpinning knowledge • feedback from project team and management • review of documented examples of quality performance improvements achieved and examples of significant problems solved • observation of the candidate's interaction with project team. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like

EVIDENCE GUIDE	
	environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A cosmetics manufacturing company decided to upgrade the image of a product range which included lipsticks, nail lacquers, hair shampoos and conditioners. A technical specialist coordinated the project and organised input from marketing, development, quality assurance and production personnel. The production boundaries were defined through consultation with marketing and it was decided to update shades of shaded products and introduce natural ingredients wherever possible. The project had to be completed within a reasonably short timeframe and within a tight budget which placed overall constraints on the way the project could be handled. After developing and gaining approval for an implementation plan, team members were briefed and development samples produced for approval. Product characteristics were checked and recommendations made for adjustments until each product met requirements. When pilot batch manufacture had been successfully completed, project development processes were fully documented and then passed to production to allow for efficient development of production batches. **Environmental** The quality team in a laboratory has set a goal of getting reports out more quickly and assigned the coordination of the project to one of the senior technical officers. The officer prepared an outline of the project, a timeframe, a resource list and budget. Specific tasks were allocated to members of the quality team according to their abilities and existing work commitments. The officer monitored the project's progress by tracking and adjusting elements as necessary. After the development of a final draft for the revised procedures, a draft project report was prepared for consideration by the quality team. **Food processing** A dairy company currently uses an imported cocoa-based product for the chocolate flavouring of their milk. Following a feasibility study of a range of ingredients, it

EVIDENCE GUIDE	
	was decided to investigate further an alternative source on the basis of cost. A technical specialist prepared a project plan that included required personnel, materials, equipment and a detailed GANTT chart. Key personnel from quality assurance, production, engineering, product development and marketing were chosen for the project team. The project was monitored to confirm progress, control expenditure and review the suitability of the alternative product source. At the end of the project, the technical specialist assessed the outcomes and prepared a detailed report that recommended the use of a local ingredient.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Complex projects	Complex projects may include: • development or modification of products and services • acquisition and commissioning of new equipment • commissioning of laboratory facilities • appraisal of supplies • development of applications for customers • validation of analytical methods and/or equipment • quality improvement or corrective action teams • restructuring of laboratory services • reclassification of staff and staffing levels

RANGE STATEMENT	
Records	Records may include: • lists of potential costs, invoices and payment records • project and/or enterprise files and records • reports to clients, personnel and higher management • risk management plans and log books • diaries, scheduling charts and other charts
Communication	Communication may include: • computer generated communication • customers, stakeholders, external authorities and project team • reports, briefs, minutes, letters, oral briefings, advice and conversations and telephone calls
Resources	Resources may include: • personnel • budget • equipment, materials and facilities • computer project planning programs
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Communication/organisation

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL922001A Record and present data

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to record and store data, perform simple calculations of scientific quantities and present information in tables and graphs. The unit of competency requires personnel to solve predictable problems using clear information or known solutions. Where alternatives exist, they are limited or apparent.

Application of the Unit

Application of the unit	This unit of competency is applicable to production operators, field assistants and laboratory assistants working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Record and check data	1.1. Enter data into laboratory information system or record sheets as directed 1.2. Check data to identify transcription errors or atypical entries 1.3. Rectify errors in data using enterprise procedures
2. Calculate simple scientific quantities	2.1. Calculate simple scientific quantities using given formulae and data 2.2. Ensure calculated quantities are consistent with estimations and expectations 2.3. Report all calculated quantities with appropriate precision and units
3. Present data in tables, charts and graphs	3.1. Present data accurately in tables and charts using given formats and scales 3.2. Recognise and report obvious features and trends in data
4. Store and retrieve	4.1. File and store data in accordance with enterprise

ELEMENT	PERFORMANCE CRITERIA
data	procedures 4.2. Maintain enterprise confidentiality standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • performingsimple calculations • preparing and interpreting straightforward tables, graphs and charts • applying calculations in the workplace • coding, recording and checking data accurately • presenting accurate results in the required format • recognising obvious trends in data • maintaining the confidentiality of data in accordance with workplace and regulatory requirements
Required knowledge
Required knowledge includes: • concepts of metrology • the international system of units (SI) • relevant scientific and technical terminology • procedures for coding, entering, storing, retrieving and communicating data • procedures for verifying data and rectifying mistakes • conversion of units involving multiples and submultiples • significant figures, estimation, approximation, rounding off • substitution of data in formulae • calculations involving fractions, decimals, proportions and percentages • procedures for maintaining and filing records, security of data

Evidence Guide

EVIDENCE GUIDE

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • accurately code, check and record data in the required format • calculate simple scientific quantities • recognise obvious trends in data • maintain the confidentiality of data.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit may be assessed with technical units, such as: • *MSL973001A Perform basic tests* • *MSL973002A Prepare working solutions* • *MSL973007A Perform microscopic examination*. Resources may include: • data sets and records • computer and relevant software or laboratory information system • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • review of data worksheets, calculations, graphs and tables prepared by the candidate • review of records transcribed, maintained or stored by the candidate • feedback from supervisors and peers • observation of the candidate as they record data and perform calculations • questions to assess understanding of relevant procedures and trends in data. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and

EVIDENCE GUIDE	
	disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Construction materials** A laboratory assistant is given 20 soil samples and asked to test their moisture content by weighing each sample, placing them in an oven for 24 hours and then reweighing them. The assistant performs the tests in accordance with the standard method and then calculates the % water content by dividing the weight loss by the wet weight and multiplying by 100. He/she checks the results. After entering them into the laboratory information management system (LIMS), they notice that they are consistently less than the previous results recorded for soils at the same site. The assistant reports the discrepancy to the supervisor who checks whether the oven was operated at the required temperature. The supervisor then discovers that the assistant has calculated the moisture content by dividing the weight loss by the wet weight instead of the dry weight. The assistant recalculates the moisture content for the 20 samples and notes that the results are now consistent with previous results. **Manufacturing** On Friday, a laboratory assistant performs the routine set of temperature, pressure and humidity measurements at 10 sites in a refinery. They enter the data on a pre-prepared data sheet that also contains the data recorded for the previous days of that week. The assistant checks the data for any significant variations to that recorded previously. They notice that for site #5, the temperature reading is 250(C which is 100(C below the expected value. The assistant repeats the measurement and gets the same result. After returning to the laboratory, the assistant enters the data into the LIMS

EVIDENCE GUIDE	
	and reports the odd result to their supervisor. The supervisor contacts the site manager and finds out that the pipeline at site #5 has been isolated as part of unscheduled maintenance in that part of the site.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards such as: • AS ISO 1000-1998 The international system of units (SI) and its application • national measurement regulations and guidelines
Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Data	Data may be recorded on:

RANGE STATEMENT	
	• worksheets • spreadsheets or databases linked to information management systems Data may include results of: • observations • tests and measurements • surveys Data may be presented in the form of: • graphs • tables • control charts • semi-quantitative observations expressed on a scale (for example, 1 to 4 or + to ++++)
Simple calculations	Simple calculations may be performed with or without a calculator or computer software and may include scientific quantities such as: • decimals, fractions, ratios, proportions and percentages • perimeters, areas, volumes and angles • concentration • unit conversion, multiples and submultiples • use of significant figures, rounding off, estimation and approximation • substitution of data in formulae • conversions between SI units • areas (m^2) and volumes (mL, L, m^3) of regular shapes (e.g. packaging and moulds) • average mass, mass %, density, specific gravity, moisture, relative and absolute humidity • ratios, such as mass to mass, mass to volume and volume to volume percentages • industry specific ratios, such as g/cm^2 , kg/m^2 • concentration (for example, g/100mL, mg/L, mg/(L, dilution mL/L) • statistical values such as mean, median, mode and standard deviation • average count, colonies per swab surface and cell counts (live and dead/total) • process variables, such as pressure, velocity

RANGE STATEMENT	
	and flow rates • % content of moisture, ash, fat, protein, alcohol, sulphur dioxide and trace metals, such as calcium or zinc • food properties, such as % concentration (dry), friability, bitterness, brix, free amino nitrogen, diastatic power, calorific content and yeast viability
Obvious features and trends in data	Obvious features and trends in data could include: • maximum and minimum values • spread of data • increasing/decreasing data, rate of change • outliers, data beyond control limits or normal range
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Data

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL924001A Process and interpret data

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to retrieve data, evaluate formulae and perform scientific calculations, present and interpret information in tables and graphs and keep accurate records. The unit requires personnel to solve problems of limited complexity where the information may be less obvious, but not contradictory, and can be determined by direct reasoning.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants, field/laboratory technicians and instrument operators in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Retrieve and check data	1.1. Store and retrieve data using appropriate files and/or application software 1.2. Verify the quality of data using enterprise procedures 1.3. Rectify errors in data using enterprise procedures
2. Calculate scientific quantities	2.1. Calculate statistical values for given data 2.2. Calculate scientific quantities using given formulae and data and estimate uncertainties 2.3. Ensure calculated quantities are consistent with estimations and expectations 2.4. Report all calculated quantities using the appropriate units and correct number of significant figures
3. Present data in tables, charts and graphs	3.1. Present data in clearly labelled tables and charts 3.2. Graph data using appropriate scales to span the range of data or display trends 3.3. Report all data using the appropriate units and

ELEMENT	PERFORMANCE CRITERIA
	number of significant figures
4. Interpret data in tables, charts and graphs	4.1. Interpret significant features of graphs, such as gradients, intercepts, maximum and minimum values, and limit lines 4.2. Recognise and report trends in data
5. Keep accurate records and maintain confidentiality	5.1. Transcribe information accurately 5.2. Verify the accuracy of records following enterprise procedures 5.3. File and store workplace records in accordance with enterprise procedures 5.4. File all reference documents logically and keep them up-to-date and secured 5.5. Observe enterprise confidentiality standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- performing calculations of scientific quantities
- using scientific notation
- applying the concepts of metrology
- applying calculations to the workplace
- coding, recording and checking of data accurately
- presenting accurate results in the required format
- preparing graphs, tables and charts (pie, bar, histogram) and interpreting trends
- preparing and interpreting process control charts
- maintaining the confidentiality of data in accordance with workplace and regulatory requirements

Required knowledge

Required knowledge includes:

- concepts of metrology
- the international system of units (SI)
- relevant scientific and technical terminology

REQUIRED SKILLS AND KNOWLEDGE
• uncertainty associated with measurement steps • procedures for coding, entering, storing, retrieving and communicating data • procedures for verifying data and rectifying mistakes • converting units involving multiples and submultiples • significant figures, rounding off, estimating, approximating • transposing and evaluating formulae • calculations involving fractions, decimals, proportions and percent • determining statistical values of data such as mean, median, mode and standard deviation • procedures for maintaining and filing records, and maintaining security of data

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • code, record and check the documentation of data • calculatescientific and statistical quantities relevant to the workplace and present accurate results in the required format • recognise anomalies and trends in data • maintain the confidentiality of data in accordance with workplace and regulatory requirements • keep records up-to-date and secure.

Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment.
	This unit of competency may be assessed with:
	• *MSL924002A Use laboratory application software*
	• technical units, such as:
	  • *relevant MSL973000 series units of competency*
	  • *relevant MSL974000 series units of competency*.
	Resources may include:
	• data sets and records

EVIDENCE GUIDE	
	• computer and relevant software or laboratory information system • relevant workplace procedures.
Method of assessment	The following assessment methods are suggested: • review of data worksheets, calculations, computer files (such as spreadsheets, databases, statistical analysis), graphs, tables and/or charts prepared by the candidate • review of records transcribed, maintained or stored by the candidate • feedback from supervisors and peers • questions to assess understanding of relevant procedures and trends in data • observation of the candidate as they process data, file and store records. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A laboratory assistant in a materials testing laboratory was performing routine tensile tests on samples of vinyl sheet. The assistant converted the readings from the machine to appropriate units using a simple calculation and recorded them in the logbook for that test method. After comparing these test results with previous results for the same type of vinyl material, the assistant found

EVIDENCE GUIDE	
	that the tensile strength was within the required range. However, it was at the lower rather than the upper end of the range as in previous testing. The assistant discussed the results with the laboratory supervisor. The calibration file for that machine showed that it had been calibrated four months previously and had not needed adjustment. Test results for the same period showed that the machine was giving lower than normal tensile strength readings for the few higher strength materials tested over the last two months. The assistant did some more checks and confirmed this trend. The machine was re-calibrated by the instrument company and the frequency of internal calibration checks by the laboratory assistant was increased. This problem would not have been detected or corrected as quickly without the assistant's initiative and competent recording and retrieval of test results and calibration information. **Biomedical** A technical assistant works in a team with laboratory scientists and technical officers. Analyses of electrolytes are routine and occur in large volume throughput even in this small diagnostic laboratory. The assistant is assigned tasks that contribute to the overall production of results, their reporting and the quality control evaluation of the results. One task is the daily collection of the electrolyte analyses from the internal quality control area. In this case, the technical assistant plots the results on a Levy-Jennings graph and computes the mean value. The assistant reports immediately to the supervisor if the plots show deviations which indicate out-of-control results. **Food processing** Cooking and holding temperatures greatly affect the nutrient composition of processed foods. The CSIRO provides documentation of nutrient losses with temperature variations. For cooked foods, there is the added problem of microbial growth in the so called 'danger zone'. In one laboratory, the technical assistant conducts simple testing of foods using a temperature probe and also measures the temperature of the storage areas, holding trays or bainmaries and individual tray units. Careful documentation of the temperatures of the foods and times of measurement must be kept. The technical assistant supplies the data as tables and a plot

EVIDENCE GUIDE	
	of temperature versus time. For quality control purposes, the assistant is directed to use a cross reference of mercury thermometer readings versus probe measurements for ambient temperature. The assistant plots the thermometer readings against the probe readings and reports to the supervisor if the plot shows a slope other than the defined value.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• national measurement regulations and guidelines
	• National Association of Testing Authorities (NATA) Technical notes
	• material safety data sheets (MSDS)

RANGE STATEMENT	
	• equipment manuals and warranty, supplier catalogues and handbooks • sampling and test procedures and standard operating procedures (SOPs) • enterprise quality manual and customer quality plan • validation of the equipment and associated software where applicable • validation of spreadsheets developed in-house for assay and process calculations
Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Data	Data may be recorded on: • worksheets • spreadsheets • databases linked to information management systems Data may include results of: • observations • tests and measurements • analyses • surveys • quality assurance and control assessments Data may be presented in the form of: • graphs • tables • histograms • pie charts • bar charts • control charts

RANGE STATEMENT	
	• semi-quantitative observations and be expressed on a scale (for example, 1 to 4 or + to ++++)
Calculations	Calculations may be performed: • with or without a calculator • using computer software, spreadsheets, databases and statistical packages
Calculations of scientific quantities	Calculated of scientific quantities may include: • converting units involving multiples and submultiples • significant figures, round off, estimate and approximate • transposing and evaluating formulae • fractions, decimals, proportions and percentages • perimeters and angles • percentage and absolute uncertainties in measurements and test results • statistical values of data, such as mean, median, mode and standard deviation • areas (m^2) and volumes (mL, L, m^3) of regular shapes, such as packaging • dose (mg), average mass, mass percentage, density, specific gravity, moisture, relative and absolute humidity, viscosity and permeability • ratios, such as mass to mass, mass to volume and volume to volume percentages • concentration, such as molarity, g/100mL, mg/L, mg/(L, ppm, ppb, dilution mL/L • average count, colonies per swab surface and cell counts, such as live and dead/total • process variables, such as pressure, gauge pressure, velocity and flow rates • biological oxygen demand (BOD), chemical oxygen demand (COD) and total organic carbons (TOC) • % content of moisture, ash, fat, protein, alcohol, sulphur dioxide and trace metals, such as calcium or zinc • food properties, such as % concentration (dry), friability, bitterness, brix, free amino nitrogen, diastatic power, calorific content and yeast

RANGE STATEMENT	
	viability • stress, strain, moduli and force
Records	Records could include information associated with: • purchase of equipment and materials, service records • safety procedures • history of calibration and test results
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Data

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL924002A Use laboratory application software

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to use and apply computer application software in the laboratory, field and production plants for analysis and reporting.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and laboratory technicians in all industry sectors. It describes the application and use of software packages in the context of laboratory or field work. Typically this software would be for the storage, retrieval, analysis and display of information. There is no expectation that candidates would be able to customise the software to meet specific needs. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Access application software	1.1. Identify software required for the task 1.2. Open software from a personal computer or network terminal
2. Use software for specified purposes	2.1. Input a range of scientific data into a computing system 2.2. Conduct searches for the retrieval of required data 2.3. Use application features for efficient computation 2.4. Construct data sets and databases for numerical and graphical analyses
3. Produce reports of retrieved data and/or processed data	3.1. Analyse data using features of the software package 3.2. Select options for constructing data reports 3.3. Print the results of data analyses using features of the software package 3.4. Integrate data from diverse application software

ELEMENT	PERFORMANCE CRITERIA
	units in a report 3.5. Report the outcomes and rationale for computerised database searches where appropriate 3.6. Reference computerised data sources according to the style requirements of the enterprise
4. Perform simple record housekeeping	4.1. Backup worked data according to enterprise standard procedures 4.2. Maintain archive data according to enterprise standard procedures 4.3. Maintain hard copy data according to standard enterprise operating procedures 4.4. Apply approved antivirus software and general standard quarantine procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • using software application features and instructions to input, save, analyse, sort, retrieve and display the records or data • using software for the analysis, reporting and management of laboratory and field data and information • using in-house software manuals to augment skills and solve operational problems • selecting the most appropriate software package for the task • backing up electronic storage • using scanning software to protect in-house software and data
Required knowledge
Required knowledge includes: • applications of the software package • terminology associated with the software packages • basic knowledge of the types of spreadsheet, database, data analysispackages that are available • application ofspecific software package features torelevantlaboratory tasks

REQUIRED SKILLS AND KNOWLEDGE
• relationship between the protocol for data input and file storage of the data • general file and record maintenance • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • select the most appropriate software package for the task from the suite of software applications available • use routine instruction sets of the software package to complete the task • use software to analyse data such as quality control and instrument performance characteristics • back up electronic storage • use scanning software to protect in-house software and data.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *relevant MSL974000 series units of competency* • *relevant MSL975000 series units of competency*. Resources may include: • access to a computer network or a personal computer • software packages that include a database package, spreadsheet, statistical analysis and simple graphics output • input and output data.
Method of assessment	The following assessment methods are suggested: • review of analysis tasks linking test results to the

EVIDENCE GUIDE	
	generation of meaningful reports by the candidate • review of simple statistical and/or graphical analysis of quality control data completed by the candidate • oral and written exercises in preparation for keyboard activities. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A laboratory technician performs tests on starting materials, such as appearance, identity, melting point, moisture content, trace elements, sulfated ash and assay. The results are entered in a computer database that allows trend analysis to be carried out on the test results for materials from each supplier. As a result, the technician may recognise when a supplier is experiencing potential problems with their production process. The technician would then notify the supervisor and/or supplier that there is a high probability that future supplies may be out of specification and that constant monitoring of starting materials will be required. **Biomedical** An important task of the technical officer in a pathology laboratory is to perform statistical analysis for quality control purposes. The software package provides for the input of data, analysis of mean value and variance as well

EVIDENCE GUIDE	
	as graphical reporting. The technical officer uses a dedicated software package or a package within the customised pathology data management system in order to assess the validity of the results produced from the analytical instrument. **Food processing** A technical officer is required to perform a nutrient analysis of a food product, the results of which will be displayed on the food container. The output from the nutrient analysis is fed into a software program that calculates the levels of these components 'per portion' and 'per 100g' and displays the information in the correct tabular format. The software package is designed so that the technical officer can input new data or access existing data and manipulate that data to provide a full and accurate nutrient display or report.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Information sources	Information sources may include: • manuals of enterprise standard instructions • hardware manuals • software manuals • training materials to orient software to enterprise needs • on-screen instructions embedded in the software
Software packages	Software packages may include:

RANGE STATEMENT	
	• word processing • spreadsheets • databases • graphical and statistical analysis • laboratory information systems
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Data

Competency field

Competency field	

Co-requisite units

Co-requisite units		

Co-requisite units		

MSL925001A Analyse data and report results

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform scientific calculations, analyse trends and uncertainty in data and report results within the required timeframe.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and laboratory technicians working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL924001A	*Process and interpret data*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Perform scientific calculations	1.1. Ensure raw data are consistent with expectations and reasonable ranges 1.2. Calculate scientific quantities involving algebraic, power, exponential and/or logarithmic functions 1.3. Ensure calculated quantities are consistent with estimations 1.4. Present results using the appropriate units, uncertainties and number of significant figures
2. Analyse trends and relationships in data	2.1. Determine linear and non-linear relationships between sets of data 2.2. Prepare and analyse control charts to determine if a process is in control 2.3. Identify possible causes for out-of-control condition 2.4. Follow enterprise procedures to return process to in-control operation
3. Determine variation and/or uncertainty in data distributions	3.1. Organise raw data into appropriate frequency distributions 3.2. Calculate means, medians, modes, ranges and standard deviations for ungrouped and grouped data 3.3. Interpret frequency distributions to determine the characteristics of the sample or population 3.4. Calculate standard deviations and confidence limits for means and replicates

ELEMENT	PERFORMANCE CRITERIA
	3.5. Estimate the uncertainty in measurements using statistical analysis 3.6. Determine data acceptability using statistical tests and enterprise procedures
4. Check for aberrant results	4.1. Identify results that cannot be reconciled with sample, sample documentation, testing procedures and/or expected outcomes 4.2. Determine appropriate actions in consultation with supervisor as required
5. Report results	5.1. Use charts, tables and graphs to present results in the required format 5.2. Verify that entry of data and results are correct 5.3. Prepare reports in a format and style consistent with their intended use and enterprise guidelines 5.4. Communicate results within the specified time and in accordance with enterprise confidentiality and security guidelines

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- performing laboratory computations
- calculating scientific quantities
- statistical analysis
- graphical analysis
- reporting results in the required formats and expected timeframe
- storing, retrieving and manipulating data following document traceability procedures
- maintaining the security and confidentiality of data in accordance with workplace and regulatory requirements

Required knowledge

Required knowledge includes:

REQUIRED SKILLS AND KNOWLEDGE
• relevant scientific and technical terminology such as: variables, dispersion, central tendency, process control, process stability, normal distribution, confidence level and replication • calculations involving evaluation of formulae containing algebraic, power, exponential and/or logarithmic functions • preparation and interpretation on linear and non-linear graphs, complex control charts and frequency distribution plots • determination of regression line equations, correlation coefficients • statistical analysis and significance tests, such as t-test, f-test, analysis of variance (ANOVA) • data acceptability tests, such as Q, T and Youden • the characteristics of a valid measurement • relevance/importance of the national measurement legislation and guidelines to laboratory measurement • sources and estimates of uncertainty in measurements • procedures for data traceability • procedures for verifying data and rectifying mistakes • procedures for maintaining and filing records, and maintaining security of data

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • store, retrieve and manipulate data following document traceability procedures • calculate scientific quantities relevant to their work and present accurate results in the required format • analyse data to determine relationships between variables • prepare frequency distributions for given data, calculate and interpret measures of central tendency and dispersion • prepare and interpret control charts and take appropriate actions

EVIDENCE GUIDE	
	• maintain the security and confidentiality of data in accordance with workplace and regulatory requirements • report results in the required formats and expected timeframe.

Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment.
	This unit of competency may be assessed with:
	• *MSL924002A Use laboratory application software*
	• technical units, such as:
	  • *relevant MSL974000 series units of competency*
	  • *relevant MSL975000 series units of competency*.
	Resources may include:
	• data sets and records
	• computer and relevant software or laboratory information system
	• relevant workplace procedures.

Method of assessment	The following assessment methods are suggested: • review of data worksheets, calculations, computer files (such as spreadsheets, databases), statistical analysis, graphs and/or tables prepared by the candidate • questions to assess understanding of relevant procedures, trends in data and sources of uncertainty • review of reports prepared by the candidate • feedback from supervisors and peers regarding the candidate's ability to analyse and report data in accordance with enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of

EVIDENCE GUIDE	
	assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Before pharmaceutical products can be approved for use in Australia, they must be tested for shelflife in their Australian sales packs. The shelf life of a preparation is the time of storage which results in a preparation becoming unfit for use, either through chemical decomposition of the active substances or physical deterioration of the preparation. Stability profiles are determined by storing the preparation under a range of temperature conditions and evaluating it at predetermined time intervals. For example, a technical assistant may be required to evaluate the physical parameters of the new tablet to detect any changes in its appearance, hardness, friability, disintegration and dissolution profile. The assistant regularly assays the tablets using a stability indicating assay. The results are plotted and the information gained is used to predict the period of time for which the tablets will meet the appropriate standards for physical characteristics, purity and potency when stored under defined conditions. **Biomedical** Supplementation of vitamins and minerals in the diet as a means to avert a clinical problem is a popular area of research, linking epidemiological and clinical investigation with food analyses. In the example of folate, such combined studies have led to the fortification of a number of foods and the requirement for folate supplementation for women of child bearing age. A typical project team would involve medical staff, a dietician and a scientific or technical officer to perform the assays. One possible line of study is to control the level of supplementation for the person and introduce the micronutrient in a dose form over and above that given in a controlled baseline diet. Blood samples would be collected and the serum micronutrient levels assayed. The technical officer would be responsible for keeping

EVIDENCE GUIDE	
	the statistical quality control data and analysing the assays. The technical officer would work with the research team to correlate the serum levels with the dose input. To contribute effectively, the technical officer must understand the significance of the relationships between collected test data and the controlled experimental variables. **Food processing** A state government analytical laboratory recently performed comparative assays of (-carotene using ultraviolet-visible (UV-VIS) spectrometric and high performance liquid chromatography (HPLC) techniques. In any procedure where the assay is to be replaced, side by side analyses must be performed on multiple samples and the correlations between the data compared statistically. The two procedures are then developed or modified for local laboratories and a routine procedure developed. At this point, technical officers would assay the samples by the two methods. They would ensure that all procedures were followed with close attention to quality control. Precision would be assessed through frequent assays of the same samples. Sensitivity of the assay would be assessed by performing the assay over a range of sample concentrations. The technical officers would carefully document the procedures and record all data for later validation. They may also provide preliminary graphical representations of data for their supervisor.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it

RANGE STATEMENT	
	is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• national measurement regulations and guidelines
	• National Association of Testing Authorities (NATA) Technical notes
	• material safety data sheets (MSDS)
	• equipment manuals and warranty, supplier catalogues and handbooks
	• sampling and test procedures and standard operating procedures (SOPs)
	• enterprise quality manual and customer quality plan
	• validation of the equipment and associated software, where applicable
	• validation of spreadsheets developed in-house for assay and process calculations

Data records	Data records may include: • worksheets • spreadsheets or databases linked to information management systems • the results of tests, measurements, analyses and surveys
Scientific and technical terminology	Scientific and technical terminology may include: • variables • dispersion • central tendency • process control • process stability

RANGE STATEMENT	
	• normal distribution • confidence level • replication
Laboratory computations	Laboratory computations may include: • algebraic, logarithmic, exponential and power functions • calculations involving fractions, decimals, ratios, proportions and percentages • evaluation of formulae containing powers, exponents and logarithms functions • use of scientific notation, correct units and correct number of significant figures • calculation of uncertainties • preparation and interpretation of linear, semi-log and log-log graphs • calculation and interpretation of statistical quantities, such as mean, median, mode, range, variance and standard deviation • determination of regression line equations and correlation coefficients • preparation and interpretation of more complex control charts and frequency distribution plots

Calculations of scientific quantities	Calculations of scientific quantities may include:
	• percentage and absolute uncertainties in measurements and test results
	• dose (mg), dilution(1:10), concentration (molarity, g/mL, mg/L, ppm, ppb)
	• pH, [H+], [OH-], buffer calculations, Ka, pKa, Kb, pKb, Kw
	• solubility constants Ks, pKs
	• radioactivity:
	  • half life, dose, activity and exposure
	• optical properties:
	  • absorbance/transmittance, path length, extinction coefficient, concentration (Beers law) and detection limits
	• electrical properties:
	  • conductivity, resistivity and dielectric constants
	• mechanical properties:

RANGE STATEMENT	
	• stress, strain, elastic moduli, yield strength and hardness • thermal properties: • heat capacity, thermal expansion, thermal conductivity and thermal resistance • food content (%) of water, ash, dietary and crude fibre, carbohydrate, protein, fat and specific vitamin • quantities associated with quality control monitoring, assessment and reporting
Graphical analysis	Graphical analysis may include: • determination of linear, logarithmic, exponential and power relationships • regression lines and interpretation of correlation coefficients • preparing frequency distributions for given data • calculating and interpreting measures of central tendency and dispersion

Calculations	Calculations may be performed:
	• with a calculator
	• without a calculator
	• with computer software such as:
	  • spreadsheets
	  • databases
	  • statistical packages

Statistical analysis	Statistical analysis may include the use of: • histograms, frequency plots, stem and leaf plots, boxplots and scatter plots • probability and normal probability plots • Pareto diagrams, Stewhart control charts and CuSum control charts • regression methods for calibration, linearity checks and comparing analytical methods • analysis of variance (ANOVA) • data acceptability tests, such as Q, T and Youden
Records	Records may include information associated with: • purchase of equipment and materials • service records

RANGE STATEMENT	
	• safety procedures • history of calibration and test results
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Data

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL925002A Analyse measurements and estimate uncertainties

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to estimate and report measurement uncertainty in accordance with the ISO *Guide to the Expression of Uncertainty in Measurement*. Personnel are required to review their estimates of measurement uncertainty to assist with making decisions on the fitness for purpose of the measurements.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel who work in calibration and testing facilities and process and interpret data and are required to determine uncertainties using standard methods. The rigour required in estimating uncertainty will depend on the required accuracy of the particular calibration, test or measurement. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL924001A	*Process and interpret data*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify the measured quantity and the uncertainty components	1.1. Specify an equation for the measurement 1.2. List uncertainty components that are associated with each input in the equation
2. Determine the size of each uncertainty component	2.1. Calculate the standard deviations and standard deviation of the mean from the measurement results 2.2. Use calibration reports, manufacturer's specifications, quality control and validation data, and experimental data to collect other available information on the uncertainty components
3. Reduce each uncertainty component to a standard uncertainty	3.1. Allocate an appropriate distribution for each uncertainty component 3.2. Calculate the standard uncertainties
4. Calculate an expanded	4.1. Calculate the sensitivity coefficient for each uncertainty

ELEMENT	PERFORMANCE CRITERIA
uncertainty to the required confidence level	component 4.2. Calculate a combined standard uncertainty 4.3. Determine an appropriate coverage factor based on the degrees of freedom associated with each uncertainty component 4.4. Calculate the expanded uncertainty
5. Report the expanded uncertainty	5.1. Report the result and uncertainty to an appropriate number of significant figures 5.2. Report the confidence level and coverage factor 5.3. Determine the appropriateness of the size of the expanded uncertainty relative to the tolerance or required accuracy of the test 5.4. Determine the fitness for purpose of the expanded uncertainty relative to the use of the measurement result

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- gathering information on uncertainty components from calibration reports or reference material report
- making logical assumptions based on experience or experimental data
- calculating sensitivity coefficients either experimentally or by partial differentiation
- calculating a combined standard uncertainty using root-sum-of-squares, accounting for correlations where necessary
- calculating expanded uncertainty
- using spreadsheets to calculate uncertainties
- deciding if the uncertainty is suitable for the accuracy required for the test and establishing whether it is fitforpurpose using the tolerance to uncertainty ratio (TUR)

Required knowledge

Required knowledge includes:

- knowledge of the steps in the measurement, test or calibration involved

REQUIRED SKILLS AND KNOWLEDGE
• evaluation of formulae containing powers, exponents, logarithms functions • use of scientific notation, correct units and correct number of significant figures • preparation and interpretation of linear graphs • mean, standard deviation, standard deviation of the mean and degrees of freedom • significance tests such as t-test, f-test and analysis of variance (ANOVA), variances, standard deviation of prediction and linear regression (for chemical industry sector) • the difference between errors, corrections and uncertainties • uncertainty in the uncertainty estimation process • uncertainty components that are common to the use of an instrument • uncertainty components that arise due to the instrument being used under different conditions to those when it was calibrated • procedures for determining the uncertainty components associated with each of the inputs and whether they are significant and for applying appropriate corrections • manufacturer's specifications (e.g. instrument drift specification and reference materials) • procedures for determining uncertainty components from quality control data • normal, rectangular, triangular distributions and the factors used to reduce each to a standard uncertainty • the concept of degrees of freedom and how to allocate degrees of freedom to each uncertainty component including use of the Welch-Satterthwaite equation • use of the student's t-table to get a coverage factor for a particular level of confidence • the characteristics of a valid measurement • relevant reporting requirements such as the GUM, National Association of Testing Authorities (NATA) or other applicable reference material

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • prepare a realistic uncertainty budget that is appropriate for the application • fully document the uncertainty budget

EVIDENCE GUIDE	
	• report results and uncertainties in the required formats.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL904001A Perform standard calibrations* • *MSL905001A Perform non-standard calibrations*. Resources may include: • data sets and records • test methods and description of test setup • computer and relevant software or laboratory information system • relevant workplace procedures.
Method of assessment	The following assessment methods are suggested: • review of data worksheets, calculations, computer files (such as spreadsheets and databases), statistical analysis, graphs and/or tables prepared by the candidate • questions to assess understanding of relevant procedures, trends in data and sources of uncertainty • review of reports prepared by the candidate • feedback from supervisors and peers regarding the candidate's ability to estimate uncertaintyin accordance with enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.

EVIDENCE GUIDE	
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Production workers in a water meter manufacturing company are required to batch test water meters. Twenty meters are connected together and tested at the same time using a test rig that collects the water in a tank that sits on top of a weighing instrument. The company's production technician needs to ensure that each water meter meets its maximum permissible error and that all measurements have a maximum permissible uncertainty that is below that specified by the regulator. The technician needs to consider the calibration uncertainty of the weighing instrument, any drift in it over time, the resolution of the meters under test and other factors relating to the temperature of the water, its effect on its density and the buoyancy correction for the weighing instrument. There are a number of corrections that need to be applied in order to achieve an uncertainty less than the maximum permissible uncertainty. Production workers enter readings from the meters into a palm-held device. This data is then downloaded to a computer which uses a spreadsheet program to make the required corrections, tabulate the readings, calculate the uncertainties and determine compliance of each meter with the regulations and produce a report. Uncertainty components may change for different models of water meters that have different flowrates, readability and minimum deliveries. To cope with this, the technician's spreadsheet program has 'look-up' tables for these components according to the water meter model. Once this system was setup there is no ongoing overhead costs for uncertainty estimation. The calibration uncertainty may have to be updated when the weighing instrument is recalibrated. Estimating uncertainties have highlighted which uncertainty components have the biggest effect on the final uncertainty. This tells the technician which components to focus on and which have little effect. **Chemical** A consulting laboratory analyses beef fat for a meat

EVIDENCE GUIDE	
	export company to determine the concentration of the pesticide residue Dieldrin prior to export. The maximum residue limit for Dieldrin in beef fat is 0.2 mg/kg. The technician analyses the sample using a validated gas chromatography (GC) method. To estimate the measurement uncertainty of the analysis he/she needs to take into account such things as the: • uncertainty from the GC calibration • uncertainty associated with the reference materials used • homogeneity of the sample • calibration of the glassware used for the analysis • the repeatability • reproducibility of the method • uncertainty of the method recovery. The technician calculates a result and uncertainty of 0.19 ± 0.02 mg/kg. The reported uncertainty suggests to the meat export company that the concentration of Dieldrin in the meat products could be above the residue limit. They can now make informed decisions about whether to sell the meat or not and possibly avoid exporting meat with excessive levels of pesticide residue which could cost the exporter millions of dollars in lost revenue. **Calibration** Technicians in a commercial calibration laboratory routinely calibrate digital multimeters -including 3½ digit hand-held multimeters and high accuracy 6½ digit bench mounted multimeters. From experience, they know that there are some uncertainty components common to each calibration such as the: • uncertainty of the calibration of their reference instrument (a calibrator) • drift over time of their reference which they establish from its yearly calibrations over the last 5 years • repeatability of their measured results at each test point from which they calculate a standard deviation of the mean • resolution of the multimeter being calibrated. Because of the higher accuracy of the 6½ digit multimeter, the technicians know that for these

EVIDENCE GUIDE	
	instruments they must also consider additional uncertainty components such as the input impedance of cables together with thermal and capacitive effects. (These components may be insignificant in terms of the accuracy of a 3½ digit multimeter). The uncertainty estimation and the rigour required relates to the accuracy required. The tolerance in electrical calibrations is typically the manufacturer's specification and the uncertainty needs to be smaller than that so that they can decide whether an instrument is within specification. A 4:1 tolerancetouncertainty ratio (TUR) is typical. The technician's thorough understanding of uncertainty estimation enables the laboratory to optimise their measurement effort to ensure they achieve the 4:1 ratio in an efficient manner. The laboratory has NATA accreditation which lists not only what calibrations they can perform, but their best accuracy ('least uncertainties of measurement'). As part of the process of gaining accreditation they need to submit to NATA for review their uncertainty estimations to justify the uncertainties that appear in their scope of accreditation and which they report on appropriate instruments.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards, such as: • AS ISO 1000-1998 The international system of

RANGE STATEMENT	
	units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment • AS/NZS ISO 9000 Set:2008 Quality management systems set • ISO 5725 Accuracy (trueness and precision) of measurement methods and results • ISO/IEC Guide 98-3:2008 Uncertainty of measurement-Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • Australian code of good manufacturing practice for medicinal products (GMP) • enterprise quality manual, customer quality plan • equipment manuals and warranty, supplier catalogues, handbooks • Eurolab technical report • NATA Accreditation programs requirements • principles of good laboratory practice (GLP) • NATA Technical notes • national measurement regulations and guidelines • Nordtest guide • sampling and test procedures and standard operating procedures (SOPs)
Data	Data may: • be recorded on worksheets or entered into spreadsheets or databases linked to information management systems • include the results of tests, measurements and analyses
Calculations	Calculations may be performed with or without a calculator or computer software, such as spreadsheets, databases and statistical packages

RANGE STATEMENT	
Statistical analysis	Statistical analysis may include the use of: • standard deviation, standard deviation of the mean, histograms and frequency plots • probability and normal probability plots • control charts • regression methods for calibration, linearity checks and comparing analytical methods • analysis of variance (ANOVA) • data acceptability tests, such as T and F
Records	• Records may include information associated with: • purchase of equipment and materials and service records • manufacturer's datasheets • calibration reports • history of calibration and test results
Uncertainty components	Uncertainty components may include: • calibration uncertainty • instability or drift in the calibrated instrument • repeatability of the results • resolution or readability of the instrument • environmental influences such as temperature, air pressure, humidity, vibration, electrical noise and gravity • reference material uncertainty • factors arising from using an instrument under a different operating environment or procedures (e.g. orientation of a transducer and immersion depth of a temperature probe) • reproducibility of quality control data
Confidence level	• The most common confidence level is 95% in accordance with the National Measurement Act, 1960. However, some applications require a higher level of confidence
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time

RANGE STATEMENT	
	• all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Data

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL933001A Maintain the laboratory/field workplace fit for purpose

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the general cleaning of work surfaces, cleaning and storage of equipment and the monitoring of laboratory stocks under direct supervision.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants and instrument operators working in all industry sectors. This unit of competency forms a major part of the work of laboratory assistants. They work in accordance with work instructions and standard operating procedures which incorporate all relevant aspects of occupational health and safety (OHS) legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Clean work preparation areas	1.1. Clean preparation areas using appropriate cleaning agents and equipment according to enterprise procedures 1.2. Remove spillages, if they occur, using appropriate agents, personal protective equipment and enterprise procedures 1.3. Collect and segregate wastes in accordance with enterprise procedures, relevant codes and regulations
2. Clean and store equipment	2.1. Collect used equipment, inspect for faults and, where necessary, remove from service 2.2. Use appropriate agents, apparatus and techniques to clean equipment 2.3. Store clean equipment in the designated locations and manner

ELEMENT	PERFORMANCE CRITERIA
3. Monitor stocks of materials and equipment	3.1. Perform stock checks and maintain records of usage as directed 3.2. Store labelled stocks for safe and efficient retrieval 3.3. Inform appropriate personnel of impending stock shortages to maintain continuity of supply
4. Maintain a safe work environment	4.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other personnel 4.2. Report potential hazards and/or maintenance issues in own work area to designated personnel 4.3. Minimise the generation of wastes and environmental impacts 4.4. Dispose of wastes in accordance with enterprise procedures, relevant codes and regulations

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- safely cleaning work preparation areas and equipment using appropriate cleaning agents, equipment and techniques
- safely removing spillages and disposing of wastes
- minimising the exposure to hazards of self, others and the laboratory
- safely storing equipment and materials using enterprise procedures, relevant codes and guidelines
- monitoring and reporting stock levels and the condition of laboratory materials and equipment
- keeping accurate, up-to-date records
- reporting potential hazards and maintenance issues using enterprise procedures

Required knowledge

Required knowledge includes:

- enterprise procedures for the cleaning of work preparation areas, materials and equipment

REQUIRED SKILLS AND KNOWLEDGE
• storage requirements for specific materials and equipment • enterprise procedures for minimisation and disposal of waste • enterprise procedures for monitoring of laboratory stocks • information contained in material safety data sheets (MSDS) for materials handled regularly during the performance of maintenance tasks • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • follow enterprise procedures, relevant codes and guidelines when maintaining the laboratory/field workplace • work safely and minimise exposure of hazards to self, others and the laboratory • keep accurate up-to-date records and report potential hazards and maintenance issues.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • access to work preparation areas, stocks, materials and equipment • cleaning, decontamination and/or disinfection agents and equipment • personal protective equipment • stock order firms, labels and records/forms.
Method of assessment	The following assessment methods are suggested: • observation of the candidate's techniques for cleaning

EVIDENCE GUIDE	
	and/or removal of spillages and waste disposal • review of stock records completed by the candidate • feedback from supervisors and peers • questioning to assess underpinning knowledge of regulations and procedures where direct observation is difficult (such as dealing with hazards) and choice of materials and equipment. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Manufacturing** On receipt of a bulk container of cleaning or sanitising agent, a laboratory assistant always attached to the container a description of its method of use. The assistant also attached a list of the surfaces, apparatus, utensils and machines that could be safely treated with that chemical agent as outlined in the company's quality manual. This practice reduced the likelihood of misuse of the chemical, wastage, damage to equipment and inadequate cleaning and sanitation. **Biomedical and environmental** Laboratory assistants and technical officers routinely examine fluids for micro-organisms using a microscope. They examine fluids, such as urine, seawater, chlorinated pool water, water from catchment areas and bottled water. To maintain microscopes in working order, they

EVIDENCE GUIDE	
	thoroughly clean the stage, oculars and each objective after use and sometimes between samples. The 100X objective requires particular care since this is the oil immersion objective. The oil is slightly acidic and will slowly corrode the objective if it is not cleaned thoroughly and regularly. After using the 100X objective they also take care not to drag the other objectives through the oil. **Food processing** A laboratory assistant regularly uses standard pH solutions to calibrate the laboratory's pH meters. The assistant is aware from the label that the shelf life of these solutions after opening is two months and records the opening and disposal dates on the container. The assistant is also aware that the shelf life of unopened buffer solutions is twelve months from the date of manufacture and monitors this by noting the production date on the bottle. Requests for stock replacement take into account the normal rate of use of these buffer solutions so that unopened bottles have not reached their expiry date before use.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards such as: • AS 1678 Emergency procedure guide - Transport

RANGE STATEMENT	
	• AS 1940-2004 Storage and handling of flammable and combustible liquids • AS 2252 Biological safety cabinets • AS 3780-2008 The storage and handling of corrosive substances • AS 4332-2004 The storage and handling of gases in cylinders • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS 1269 Set:2005 Occupational noise management set • AS/NZS 1337 Eye protection • AS/NZS 2161 Set:2008 Occupational protective gloves set • AS/NZS 2210:1994 Occupational protective footwear • AS/NZS 2243 Set:2006 Safety in laboratories set • AS/NZS 2243.8:2006 Safety in laboratories - Fume cupboards • AS/NZS 2865 Set:2005 Safe working in a confined space set • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements • AS/NZS 4187:2003 Cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities • AS/NZS 4452:1997 The storage and handling of toxic substances • AS/NZS 4501 Set:2008 Occupational clothing set • AS/NZS ISO 14000 Set:2005 Environmental management standards set • animal welfare legislation and codes of practice • Australian code of good manufacturing practice for medicinal products (GMP) • Australian Dangerous Goods Code • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations

RANGE STATEMENT	
	1982 • Australian Quarantine and Inspection Service (AQIS) Import Guidelines • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice • enterprise or standard operating procedures (SOPs) • equipment manuals and warranties, supplier catalogues and handbooks • gene technology regulations • guide to physical containment levels and facility types • HB 9-1994 Occupational personal protection • material safety data sheets (MSDS) • National Code of Practice for the labelling of workplace substances (NOHSC:2012 (1994)) • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • Therapeutic Goods Regulations 1009
Equipment, **material procedures and facilities**	Equipment, material procedures and facilities may include: • animal cages • autoclaves • balances • blenders, centrifuges and separating equipment • brushes • cell counters and staining machines • colorimeters/spectrometers and polarimeters • compaction rammers and soil classification equipment • conductivity meters and pH meters • dishwashers, refrigerators, freezers, ovens, microwave ovens, incubators and water baths • disintegration apparatus, thermometers and incubators

RANGE STATEMENT	
	• fume hoods, biohazard containers and biological safety cabinets • gas cylinders • glassware, plastic ware; glass, plastic and quartz cuvettes • hotplates, mantles, burners and muffle furnaces • instrument chart recorders, penetrometers, force measuring equipment and tensiometers • light and fluorescence microscopes • melting point apparatus, viscometers and hardness testing equipment • microtomes and tissue processors • mixing and separating equipment such as centrifuges, rifflers and splitters and mixers • noise meters and blasting meters • optical microscopes • pipettes, burettes and volumetric glassware • shovels, scoops, plates, rods, cylinder moulds and buckets • steel ruler/tapes and spirit levels • thermometers, thermohygrographs, instrument chart recorders, hydrometers, pH meters and ion-selective electrodes • ultrasonic cleaners • vehicles
Typical materials	Typical materials may include: • consumable items, such as syringes, pipette tips, weigh boats • disposable clothing and personal protective equipment • distilled water, reagents, chemicals, disinfectants, detergents, agar media and plates • equipment spares, such as fuses, bulbs and batteries • oils/lubricants, fuels, industrial gases and cryogenics, such as dry ice and liquid nitrogen • paper and stationery • reference samples and standards
Maintenance	Maintenance may include: • checking serviceability before storage • cleaning

RANGE STATEMENT	
	• prevention of contamination • storing
Cleaning requirements	Cleaning requirements may include: • decontamination and/or disinfection • hygiene monitoring • minimising environmental impacts • operation of automatic cleaning apparatus, such as pipette washer, ultrasonic cleaners and dishwashers • sterilisation and disposal of wastes using boiling, high pressure air or steam, microwaves, chemicals, gas, filtration, ultraviolet radiation and autoclaving • use of specialised techniques, such as chromic acid baths and soaking in hypochlorite
Preparation areas	Preparation areas may include: • benches • fume cupboards • sheds • sinks
Agents for cleaning	Agents for cleaning may include: • cleaning solutions • decontaminants • organic solvents
Spillages	Spillages may include: • chemicals • radioactive materials • biologically active materials
Wastes	Wastes may include: • broken glass • batteries • disposable personal protective equipment • excess test samples • micro-organisms • plastic and metals • sharps • solvents • spent reagents

RANGE STATEMENT	
	• spent samples and test pieces • used containers, boxes, bags and palettes
Stock records	Stock records may include: • calibration and maintenance history • data sheets • handbooks, warranty documents, catalogues, manuals and MSDS • records of usage, loans and breakages
Communication	Communication could involve other people, such as: • laboratory, production, administration and cleaning staff • internal/external contractors • emergency personnel
Maintenance issues	Maintenance issues could involve: • checking materials and equipment are fit for purpose • equipment malfunction • hygiene issues • potential hazards, incidents and emergencies • recycling and waste disposal • spillages, leakages, breakages and contamination • stock requirements and shortages
Hazards	Hazards may include: • aerosols from broken centrifuge tubes and pipetting • chemicals, such as acids, heavy metals, pesticides and hydrocarbons • crushing, entanglement and cuts associated with moving machinery or falling objects • cryogenics, such as dry ice and liquid nitrogen • electric shock • fluids under pressure, such as steam and industrial gas cylinders • manual handling, working at heights and working in confined spaces • microbiological organisms and agents associated with soil, air, water, blood and blood

RANGE STATEMENT	
	products, and human or animal tissue and fluids • occupational overuse syndrome, slips, trips and falls • pedestrian and vehicular traffic • sharps, broken glassware and hand tools • solar radiation, dust and noise • sources of ignition, flammable liquids and gases
Established safe work practices	Established safe work practices may include: • applying containment procedures through the use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets and Class PCII, PCIII, and PCIV physical containment facilities • ensuring access to service shut-off points • following established manual handling procedures for tasks involving manual handling • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • labelling of samples, reagents, aliquoted samples and hazardous materials • recognising and observing hazard warnings and safety signs • reporting to appropriate personnel of abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates • use of MSDS • use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gown, body suits, respirators and safety boots
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through

RANGE STATEMENT	
	state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL933002A Contribute to the achievement of quality objectives

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the development of a working knowledge of quality principles and their application in laboratory/field work.

Application of the Unit

Application of the unit	This unit of competency is applicable to samplers/testers, production operators and laboratory/field assistants working in all industry sectors. These personnel have defined roles and responsibilities within the enterprise's quality system which are set out in quality manuals and workplace procedures. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Apply quality control procedures	1.1. Record data for quality control purposes 1.2. Recognise and report non-conformances in keeping with job role and quality procedures
2. Contribute to quality improvements	2.1. Review own work practices for opportunities to continuously improve performance 2.2. Identify and report opportunities for improvements in procedures, processes and equipment in work area
3. Maintain commitment to enterprise quality standards in own work	3.1. Maintain an objective of 'right first time' 3.2. Conduct work in accordance with sustainable energy work practices 3.3. Minimise waste and rework in accordance with enterprise guidelines 3.4. Demonstrate 'job ownership' for whole tasks through a commitment to finish and follow-up 3.5. Ensure that personal actions conform with the code of ethics relevant to the workplace

ELEMENT	PERFORMANCE CRITERIA
4. Assist in maintaining customer relationships	4.1. Demonstrate an understanding of the business goals, products and services of the enterprise when dealing with customers in relation to own function 4.2. Communicate appropriately with customers in keeping with knowledge and authority limitations and quality requirements
5. Update knowledge and skills as required	5.1. Recognise own strengths and limitations and take advantage of opportunities for skill development

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- applying the required quality control procedures
- providing quality products and services to customers consistent with the job role
- resolving simple customer requirements
- minimising waste and rework
- contributing to improvements in productivity and quality through teamwork and commitment to personal work standards

Required knowledge

Required knowledge includes:

- concepts of metrology
- continuous improvement and waste minimisation principles
- enterprise procedures associated with the candidate's regular technical duties
- layout of the enterprise, divisions and laboratory
- lines of communication
- organisational structure of the enterprise
- products and services provided by the enterprise
- quality requirements of the candidate's job role and functions
- recording, reporting and document control requirements
- relevant health, safety and environment requirements
- role of internal and external audits
- role of laboratory services to the enterprise and customers

REQUIRED SKILLS AND KNOWLEDGE
• scheduling of tests and procedures to meet customer requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • apply the required quality control principles and procedures to their work • contribute to improvements in productivity and quality • maintain their personal commitment to quality objectives.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL913001ACommunicate with other people* • technical units of competency dealing with sampling and testing. Resources may include: • enterprise quality manual and procedures • standard operating procedures (SOPs).
Method of assessment	The following assessment methods are suggested: • review of quality control data collected by the candidate • review of quality improvements suggested by the candidate • feedback from supervisors and peers • oral or written questions about quality concepts and enterprise procedures • flow charts or diagrams prepared by the candidate to describe work flows and workplace layout (alternatively, the candidate could explain existing

EVIDENCE GUIDE	
	charts or diagrams). In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Manufacturing** Laboratory assistants must have a good working knowledge of quality control procedures and how they contribute to the achievement of enterprise quality objectives. An assistant was measuring the moisture content of coke by a standard method. The SOP for this test stated that the limits for moisture should be between 2% and 5% by weight. The assistant obtained a result of 5.8%. The assistant had followed the SOP correctly and performed the determination in triplicate and had confidence in the precision of the result. The assistant recognised and reported the non-conformance to the laboratory supervisor. The production manager took corrective action and modified the drying process to reduce the moisture content and provide a product which met the customer's requirements. **Biomedical** A laboratory assistant working in the pathology department of a rural hospital was responsible for serum lithium estimations by flame photometry. When asked by the office staff when the lithium results would be ready, the assistant replied that the testing schedule of the laboratory meant that the test would not be done until the

EVIDENCE GUIDE	
	following week and asked why the office staff needed to know. The answer was that an outpatient clinic was being held, and the results were needed for a consultation. Although samples were often taken a week before the clinic was to be held, the assistant realised that results were not always ready for the clinic because of the testing schedule of the laboratory. The assistant reported the situation to the laboratory supervisor. The supervisor rescheduled lithium testing to match the clinic times, so that results would always be ready for the clinic consultation. This pleased the clinic staff, the patient did not waste a visit, the office staff no longer got irate phone calls and the quality of service was improved overall. **Food processing** A fruit processing company produced many tonnes of solid vegetable waste annually. This was dumped as landfill at considerable cost and the local council was concerned that the method of disposal was not sustainable. The laboratory assistants at the company were included in a quality improvement team to investigate the problem. The team concentrated on alternative production methods to minimise waste yields and additional production methods that would enable the waste to be profitably utilised. They identified four potential uses of the waste: a source of pectin, alcohol and sugar and conversion of raw fruit peel to glazed peel. A cost-benefit analysis was performed in consultation with supporting industries, including a local winery to assess the merits of these value adding activities. The outcome was that the amount of waste produced by the company was significantly reduced with much of the waste channelled into marketable products with full cost recovery. After some initial doubts, the laboratory personnel realised that they were able to make useful contributions to the project. As a result, they became part of an ongoing investigation of waste minimisation and value adding practices.

Range Statement

RANGE STATEMENT

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• customer specific requirements/standards
	• National Association of Testing Authorities (NATA) Accreditation programs requirements
	• principles of good laboratory practice (GLP)
	• Therapeutic Goods Regulations 1009

Quality control procedures	Quality control procedures may include: • standards imposed by regulatory and licensing bodies • enterprise quality procedures • working to a customer brief and associated quality procedures • checklists to monitor job progress against agreed time, costs and quality standards • the use of hold points to evaluate conformance • the use of inspection and test plans to check compliance
Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates

RANGE STATEMENT	
	• measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Sustainable energy principles and work practices	Sustainable energy principles and work practices may include: • examining work practices that use excessive electricity • switching off equipment when not in use • regularly cleaning filters • insulating rooms and buildings to reduce energy use • recycling and reusing materials wherever practicable • minimising process waste
Reporting	Reporting may involve: • verbal responses • data entry into laboratory information management system (LIMS) or enterprise databases • brief written reports using enterprise proformas
Quality improvement opportunities	Quality improvement opportunities that relate to the work of laboratory assistants could include: • improved methods for sampling, testing and recording data • improved hygiene and sanitation procedures • minimisation of waste and rework • improved laboratory layout and work flow
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these

RANGE STATEMENT	
	requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL933003A Apply critical control point requirements

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to monitor critical, quality and regulatory control points related to a person's work responsibilities. This unit of competency also covers support for ongoing improvement of the enterprise hazard analysis and critical control points (HACCP) plan.

Application of the Unit

Application of the unit	This unit of competency is applicable to production operators and laboratory assistants in the food processing and manufacturing sectors. Control points refer to those key points in a work process that must be monitored and controlled. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Provide routine input to the HACCP plan	1.1. Obtain information about control points in the manufacturing process 1.2. Locate control points for own work area responsibilities 1.3. Perform relevant checks and inspections on materials and equipment to establish conformance to meet food safety requirements 1.4. Identify variations or common faults 1.5. Record inspection results and report to appropriate personnel
2. Contribute to the continuous improvement of the HACCP plan	2.1. Recognise non-conformance to the HACCP plan 2.2. Identify likely causes for non-conformance 2.3. Record and report non-conformances to appropriate personnel

Required Skills and Knowledge

Required skills
Required skills include: • monitoring of the critical, quality and regulatory control points • preventing contamination from occurring or recurring • recording of information using the enterprise reporting system • collecting and analysing data to identify variation from limits • making approved corrective actions as required • supporting continuous improvement through observation and communication
Required knowledge

Required knowledge includes:
• the seven principles of HACCP and relationship to food or pharmaceutical safety
• preliminary steps for HACCP
• benefits of HACCP
• the HACCP plan, including:
  • the critical control points and control limits
  • consequences of non-conforming products being identified
• continuous improvement practices
• quality policy, procedures and responsibilities
• the methods used to monitor each critical, quality, regulatory control point
• equipment and instrument calibration requirements
• methods for systematically investigating and responding to problems
• control points and their potential impact on work systems
• relevant health, safety and environment requirements
• products and services provided by the enterprise
• layout of the enterprise, divisions, and laboratory
• organisational structure of the enterprise
• lines of communication
• role of laboratory services to the enterprise and customers
• scheduling of tests and procedures to meet customer requirements
• enterprise procedures associated with the candidate's regular technical duties

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • correctly monitor the critical, quality and regulatory control points for their work • prevent contamination from occurring or recurring • collect, record and interpret data and take corrective actions • support continuous improvement through observation and communication.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with • *MSL922001A Record and present data* • *MSL933002A Contribute to the achievement of quality objectives*. Resources may include: • quality manuals and procedures • HACCP plans and records • recording equipment • case studies to illustrate a range of HACCP issues.
Method of assessment	The following assessment methods are suggested: • observation of the candidate monitoring control points in the work area • feedback from supervisors and peers • review of corrective action suggestions by the candidate • flow charts or diagrams prepared by the candidate, alternatively, the candidate could explain existing charts or diagrams • candidate's response to simulated problems. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess

EVIDENCE GUIDE	
	directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Food processing** The laboratory is responsible for the monitoring of the complex hazard analysis and critical control points in the food production process. The laboratory assistant gathers data at these points for the recording and checking of the process. All data outside the critical limits are immediately communicated to the laboratory manager and the production manager. Any approved corrective actions undertaken by the laboratory assistant are recorded in the laboratory log of system non-conformance. Suggestions for improvement of the system are also recorded for discussion at the regular team meeting.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australia New Zealand Food Standards (ANZFS) Code • food safety plans and/or pharmaceutical safety requirements • HACCP plans/documents/procedures • principles of good laboratory practice (GLP) • Australian code of good manufacturing practice for medicinal products (GMP) • product safety plan • production/quality procedures/requirements • quality manuals • standard operating procedures (SOPs) • state/territory/national legislation
Control points	Control points may be: • critical • quality • regulatory
Products/materials handled by laboratory assistants	Products/materials handled by laboratory assistants may include: • raw materials • ingredients • adjuncts/process aids • consumables • finished product • chemicals • food additives
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time

RANGE STATEMENT	
	• all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL933004A Perform calibration checks on equipment and assist with its maintenance

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform setup, pre-use and in-house calibration checks on equipment and assist with its maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Perform setup and pre-use checks of laboratory equipment	1.1. Perform laboratory equipment setup and pre-use checks in accordance with enterprise procedures 1.2. Perform safety checks in accordance with relevant enterprise and instrumental procedures 1.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 1.4. Complete instrument log books/records to meet enterprise requirements
2. Perform calibration checks	2.1. Start up equipment according to operating procedures 2.2. Use specified standards for calibration check 2.3. Check equipment as per calibration procedures and schedules 2.4. Record all calibration data accurately and legibly 2.5. Compare data with specifications and/or previous records to identify non-compliant equipment 2.6. Quarantine out of calibration equipment
3. Assist with equipment maintenance	3.1. Ensure all equipment work areas are clean during and after equipment use 3.2. Perform basic maintenance in accordance with enterprise procedures 3.3. Clean and store equipment according to enterprise

ELEMENT	PERFORMANCE CRITERIA
	and/or manufacturer's specifications/procedures 3.4. Identify and replace, repair or dispose of damaged/worn equipment as appropriate
4. Maintain records	4.1. Record and report information on unsafe or faulty equipment according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- performing setup, pre-use checks and shutdown procedures
- performing calibration checks of basic equipment using standard procedures
- obtaining readings of the required accuracy and precision
- identifying non-compliant equipment from specifications and/or previous checks
- recognising non-standard behaviour of instruments
- assisting with maintaining equipment in working order by performing basic maintenance tasks
- following all relevant occupational health and safety (OHS) requirements
- following enterprise recording and reporting procedures

Required knowledge

Required knowledge includes:

- operational principles and methods for equipment use
- basic sources of error in equipment operation and their control
- role and importance of correct calibration
- basic equipment maintenance procedures
- enterprise communication and reporting procedures
- relevant OHS and environment requirements

Evidence Guide

EVIDENCE GUIDE

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform setup pre-use checks and shutdown procedures • perform calibration checks of basic equipment using standard procedures • obtain readings of the required accuracy and precision • recognise non-standard behaviour of instruments • assist with maintaining equipment in working order by performing basic maintenance tasks • follow all relevant OHS requirements • follow enterprise recording and reporting procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL973001A Perform basic tests*. Resources may include: • standard laboratory equipped with appropriate equipment and reference materials • enterprise procedures and standard methods, equipment manuals • calibration check standards and procedures • maintenance procedures.
Method of assessment	The following assessment methods are suggested: • review of the quality of test data/results achieved by the candidate over time • inspection of records and workplace documentation completed by the candidate • feedback from peers and supervisors • observation of the candidate performing calibration checks and basic maintenance tasks In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess

EVIDENCE GUIDE	
	directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing and construction materials testing** Laboratory assistants perform calibration checks and operate a range of laboratory equipment to ensure the quality of products. For example, the labelling on fertilisers specifies the total percentage of nitrogen [N or N(t)], the total percentage of phosphorus [P or P(t)] in all forms and the total percentage of potassium [K]. A 5-10-5 fertiliser contains 5% N, 10% P and 5% K. During the manufacture of fertiliser, an assistant in a quality control laboratory measures the concentration of nitrogen, phosphorus and potassium using standard analytical methods to ensure that the final products are within prescribed specifications. The assistant must pay particular attention to the equipment calibration check. If the equipment is out of calibration no amount of testing skill will result in accurate results. Selling out of specification fertiliser could result in a product recall or claims from users against the manufacturer. **Biomedical and environmental services** Laboratory assistants are quite often involved in routine collections and culturing of cells. Bacterial cells are often cultured and grown to large populations in order to provide material from which to extract biological materials. A quick method of determining when the cell growth has yielded enough cells is to determine the absorbance of the cell culture by measuring absorbance at 600 nm. An absorbance of 1 to 1.5 will give a good

EVIDENCE GUIDE	
	cell harvest. This method relies on the assistant being able to perform calibration checks on an ultraviolet-visible (UV-VIS) spectrometer. **Food and beverage processing** A laboratory assistant in the quality control laboratory of a fruit canning company is required to perform calibration checks and maintain and operate a range of equipment, including a pH meter. Canned pears, for example, are routinely checked for pH to ensure safe heat processing. While checking the calibration of the pH meter with the standard buffer solutions, the laboratory assistant found that stable pH readings could not be obtained. On closer inspection, it was found that the pH probe was damaged. This was reported to the supervisor. The probe was replaced and the meter was re-checked for calibration in readiness for routine testing. **Construction Materials Testing** A laboratory assistant has been allocated the task of performing in-house calibration checks on the laboratory's equipment. He/she has previously prepared a wall chart for the year that shows when the required calibration checks fall due in accordance with the NATA Field Application Document (FAD) for construction materials testing. The assistant consults the wall chart and notes that this month's calibration checks include checking the: • ice points of the liquid-in-glass thermometers • working sieves against the reference set • compaction hammers for compliance with specifications • repeatability of the balances. A full calibration of one of the laboratory's nuclear density gauges is also required. He/she then telephones the local calibration authority to book the nuclear gauge in for calibration and prepares to perform the other in-house checks.

Range Statement

RANGE STATEMENT

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to Industry codes of practice and Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• National Association of Testing Authorities (NATA) Field Application Documents (FADs)
	• calibration check and maintenance schedules
	• enterprise recording and reporting procedures
	• equipment manuals
	• equipment start up, operation and shutdown procedures
	• material safety data sheets (MSDS)
	• material, production and product specifications
	• national measurement regulations and guidelines
	• OHS national standards and codes of practice
	• principles of good laboratory practice (GLP)
	• production and laboratory schedules
	• quality manuals
	• standard operating procedures (SOPs)

Typical equipment and instruments	Typical equipment and instruments may include: • balances, pipettes, burettes and volumetric glassware • colorimeters/spectrometers and polarimeters • compaction rammers and soil classification

RANGE STATEMENT	
	equipment • conductivity meters and pH meters • disintegration apparatus, thermometers, incubators and water baths • instrument chart recorders, penetrometers, force measuring equipment and tensiometer • melting point apparatus, viscometers and hardness testing equipment • mixing and separating equipment such as centrifuges, rifflers and splitters, and mixers • noise meters and blasting meters • optical microscopes
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL934001A Contribute to the ongoing development of HACCP plans

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to collect and analyse data obtained from hazard analysis and critical control points (HACCP) records. Personnel are required to implement approved corrective actions and complete the review and update of documents and systems related to HACCP plans.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants working in the food processing, manufacturing and pharmaceutical industry sectors. This unit of competency is relevant to experienced technical officers who may work individually or as part of a team. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Review existing HACCP plans	1.1. Collect data and results from HACCP records 1.2. Identify major and minor non-conformances to the HACCP plan 1.3. Monitor critical control points to confirm performance 1.4. Analyse problem areas using appropriate quality improvement tools and techniques 1.5. Suggest corrective actions and strategies to prevent recurrence of the problem 1.6. Document required amendments to the HACCP plan 1.7. Report and present recommendations to appropriate personnel
2. Provide support for	2.1. Analyse roles, duties and current competency of

ELEMENT	PERFORMANCE CRITERIA
the implementation of HACCP plans	associated personnel in relation to HACCP responsibilities 2.2. Identify training needs and skill development in relation to the successful implementation of the HACCP plan and assist with delivery 2.3. Maintain resource requirements to support HACCP plan
3. Review the implementation plan	3.1. Implement any approved recommendations 3.2. Update any changes to the documents 3.3. Validate the effectiveness of changes to the HACCP plan

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- reviewing existing HACCP plans
- using problem solving techniques to identify causes and options to remedy problems
- assessing risk
- using quality improvement tools and techniques, including statistical process control
- constructing flow diagrams and hazard analysis tables
- delivering training to workplace personnel to assist their understanding of their roles and responsibilities for the implementation of HACCP

Required knowledge

Required knowledge includes:

- products and services provided by the enterprise
- the production process
- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- role of laboratory services to the enterprise and customers
- enterprise procedures associated with the candidate's regular technical duties

REQUIRED SKILLS AND KNOWLEDGE

• scheduling of tests and procedures to meet customer requirements
• equipment and instrument calibration requirements
• the seven principles of HACCP and relationship to food or pharmaceutical safety
• preliminary steps for HACCP
• benefits of HACCP
• the HACCP plan, including:
  • the critical control points and control limits
  • consequences of non-conforming products being identified
• control charts, control limits and control measures
• flow chart symbols
• critical control points and their potential impact on work systems
• microbiological and chemical safety hazards
• the methods used to monitor each critical, quality, regulatory control point
• methods for systematically investigating and responding to problems
• procedures for addressing non-compliance
• communication channels and consultative arrangements
• continuous improvement practices
• quality policy, procedures and responsibilities
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • obtain necessary data and results • analyse data and identify corrective action • develop a corrective action plan • monitor and evaluate effectiveness of any changes suggested within the context of the ongoing development of HACCP plan • consult and communicate appropriately with associated personnel • recognise major and minor non-conformances

EVIDENCE GUIDE	
	• construct flow diagrams and hazard analysis tables • deliver training to workplace personnel to assist their understanding of their roles and responsibilities for the implementation of HACCP • document and present recommendations and changes.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL933002A Contribute to the achievement of quality objectives* • *MSL933003A Apply critical control point requirements* • *TAADEL301C Provide training through instruction and demonstration of work skills*. Resources may include: • access to all appropriate documentation, such as HACCP plan and quality manuals.
Method of assessment	The following assessment methods are suggested: • review of documentation completed by the candidate as part of the development of HACCP plans • review of data and reports obtained from HACCP records by the candidate • feedback obtained from managers on implementation and review of HACCP plans. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study

EVIDENCE GUIDE	
	below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food processing** The milk room at a dairy processing plant was receiving continuing high microbiological counts that were approaching levels where they could affect the safety of the final product. The laboratory supervisor began to collect and analyse information obtained from data production records, laboratory results and corrective action reports. From the information obtained, the technician produced graphs to show the microbiological count over the past few weeks. From this information he/she concluded that the contamination was due to the ineffectiveness of a sanitiser. Recommendations were forwarded to the Quality Review Committee and included a review of the: • quality of the sanitising product and an investigation of alternatives • amount of sanitiser ordered to ensure that it was not being stored beyond its recommended use by date • reliability of the suppliers to provide quality products. Following the Quality Review Committee's agreement, the laboratory technician updated the relevant documents and implemented the recommendations. This resulted in the microbiological counts declining to acceptable levels.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards,

RANGE STATEMENT	
	it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australia New Zealand Food Standards (ANZFS) Code • food safety plans and/or pharmaceutical safety requirements • HACCP plans/documents/procedures • principles of good laboratory practice (GLP) • Australian code of good manufacturing practice for medicinal products (GMP) • product safety plan • production/quality procedures/requirements • quality manuals • standard operating procedures (SOPs) • state/territory/national legislation • pharmaceutical standards codes • manufacturers/suppliers specifications • recording sheets • equipment instructions • relevant legislation • equipment operation manuals • standard operating procedures (SOPs) • work instructions • result forms
Software packages	Computer software packages used for the development and implementation of HACCP plans will vary between and within industry sectors
Control points	Control points may be: • critical • quality • regulatory
Products/materials handled by laboratory assistants	Products/materials handled by laboratory assistants may include: • raw materials • ingredients • adjuncts/process aids • consumables

RANGE STATEMENT	
	• finished product • chemicals • food additives
Members of a HACCP team	Members of a HACCP team may contribute a range of expertise and relevant technical support. They would normally share responsibilities for the development of a HACCP plan
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL934002A Apply quality system and continuous improvement processes

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the exercise of good laboratory practice and effective participation in quality improvement teams. Personnel are required to ensure the quality and integrity of their own work, detect non-conformances and work with others to suggest improvements in productivity and quality.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians working in all industry sectors who contribute to quality improvements in areas or processes associated with their own job function and/or specialisation. This unit of competency is relevant to experienced technical officers who may work individually or as part of a team. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Satisfy quality system requirements in daily work	1.1. Access information on quality system requirements for own job function 1.2. Record and report quality control data in accordance with quality system 1.3. Follow quality control procedures to ensure products, or data, are of a defined quality as an aid to acceptance or rejection 1.4. Recognise and report non-conformances or problems 1.5. Conduct work in accordance with sustainable energy work practices 1.6. Promote sustainable energy principles and work practices to other workers
2. Analyse opportunities	2.1. Compare current work practices, procedures and

ELEMENT	PERFORMANCE CRITERIA
for corrective and/or optimisation action	process or equipment performance with requirements and/or historical data or records 2.2. Recognise variances that indicate abnormal or sub-optimal performance 2.3. Collect and/or evaluate batch and/or historical records to determine possible causes for sub-optimal performance 2.4. Use appropriate quality improvement techniques to rank the probabilities of possible causes
3. Recommend corrective and/or optimisation actions	3.1. Analyse causes to predict likely impacts of changes and decide on the appropriate actions 3.2. Identify required changes to standards and procedures and training 3.3. Report recommendations to designated personnel
4. Participate in the implementation of recommended actions	4.1. Implement approved actions and monitor performance following changes to evaluate results 4.2. Implement changes to systems and procedures to eliminate possible causes 4.3. Document outcomes of actions and communicate them to relevant personnel
5. Participate in the development of continuous improvement strategies	5.1. Review all relevant features of work practice to identify possible contributing factors leading to sub-optimal performance 5.2. Identify options for removing or controlling the risk of sub-optimal performance 5.3. Assess the adequacy of current controls, quality methods and systems 5.4. Identify opportunities to continuously improve performance 5.5. Develop recommendations for continual improvements of work practices, methods, procedures and equipment effectiveness 5.6. Consult with appropriate personnel to refine recommendations before implementation of approved improvement strategies 5.7. Document outcomes of strategies and communicate them to relevant personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- applying problem solving techniques and strategies
- applying statistical analysis and statistical sampling procedures
- detecting non-conforming products or services in the work area
- documenting and reporting information about quality
- contributing effectively within a team to recognise and recommend improvements in productivity and quality
- implementing and monitoring improved practices and procedures

Required knowledge

Required knowledge includes:

- specifications for laboratory products and services in the candidate's work area
- quality requirements associated with the individual's job function and/or work area
- scientific and technical knowledge underpinning the processes, procedures, equipment and instrumentation associated with the candidate's work tasks and duties
- workplace procedures associated with the candidate's regular technical duties
- sustainable energy principles
- relevant health, safety and environment requirements
- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- lines of communication
- role of laboratory services to the enterprise and customers

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Biomedical sector:

- ethical requirements dealing with patient confidentiality
- animal welfare legislation and codes of practice
- guidelines for pre-transfusion testing
- gene technology regulations for large scale, small scale and planned release of genetically manipulated organisms

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • use the enterprise's quality systems and business goals as a basis for decision making and action • apply all relevant procedures and regulatory requirements to ensure the quality and integrity of the products/services or data provided • apply and promote sustainable energy principles and work practices • detect non-conforming products or services in the work area • follow enterprise procedures for documenting and reporting information about quality • contribute effectively within a team to recognise and recommend improvements in productivity and quality • apply effective problem solving strategies • implement and monitor improved practices and procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Process and interpret data* • *MSL954001A Obtain representative samples in accordance with sampling plan* • *relevant MSL974000 series units of competency* • *relevant MSL975000 series units of competency*. Resources may include: • enterprise quality manual and procedures • quality control data/records • customer complaints and rectifications • candidate's supervisors and peers.
Method of assessment	The following assessment methods are suggested: • review of documentation completed by the candidate

EVIDENCE GUIDE	
	as part of regular quality control • feedback from supervisors and/or customers regarding quality of products/services and/or data regularly provided by the candidate • observation of the candidate's performance and participation in quality improvement teams over time in the workplace • review of reports from quality improvement teams where the candidate's role is clearly outlined and verified • verified reports of improvements suggested and implemented by the candidate individually. Those aspects of competency dealing with improvement processes could be assessed by the use of suitable simulations and/or a pilot plant and/or a range of case studies and scenarios. In all cases, practical assessment should be supported by questions to assess essential knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A quality improvement team at a chemical manufacturing plant was asked to propose a way of minimising the cost of disposing of chromium rich waste. Using appropriate techniques, the team narrowed the alternatives down to the option of burning the waste stream. An experienced technician agreed that this was feasible, but suggested that because the waste was petroleum high in chromium the team should consider

EVIDENCE GUIDE	
	the environmental implications. Subsequent research indicated that the permitted chromium levels in the incinerated air waste stream would not exceed 10 ppm, which was less than the air emission standards for the plant. The technician analysed samples of the air waste stream and determined that the chromium levels were below the regulatory standards. He/she then supported the team's suggestion. **Environmental** The manager of an environmental testing laboratory believed that the team of laboratory technicians relied too much on external direction. As a result, the manager requested that whenever technicians asked for assistance they should also be ready to suggest a solution to the problem if at all possible. This strategy was implemented in a non-threatening manner and was accepted by the team. In time, the manager noted that many of the suggestions for solving problems and improving work practices that came from the team were effective and reasonable. Their skill in making realistic recommendations came from their familiarity with many of the issues that needed to be considered. It became the norm that the laboratory technicians were given public credit for suggesting successful strategies that improved safety, productivity and staff morale. **Food processing** A company that produces apple juice uses 30-35% hydrogen peroxide (H_2O_2) to sterilise packaging. A mist of atomised H_2O_2 is sprayed into pre-formed cartons and later removed with a jet of hot sterile air. The laboratory manager was concerned that some batches of product were not sterile after standing at room temperature for several days. The cause of the failure in the sterilisation procedure was not apparent and a technical officer was asked to investigate this problem. The technical officer examined each unit operation of juice manufacture and determined that the application of H_2O_2 was a critical sterilisation point where failure could occur. The concentration of H_2O_2 in the atomiser and in opened containers was unpredictable and several problems were found to contribute to this. H_2O_2 was left in the atomiser for up to several days between packaging runs. Containers of H_2O_2 were not always used sequentially, some being opened and then not used for a

EVIDENCE GUIDE	
	long time. The containers were stored at room temperature after opening and some may have become contaminated with atmospheric particulates that catalyse the breakdown of H_2O_2. The recommendations that emerged from the investigation were that: • fresh H_2O_2 should be used at the beginning of each packaging run • only one stock container of H_2O_2 should be open at any one time and stored chilled, with residuals discarded after 14 days • care should be taken to exclude foreign material from the opened vessels of H_2O_2 and the atomiser. In summary, the intolerance of the company to even low incidences of faulty product and the competency of the technical officer to investigate the processing stream resulted in increased product quality without significant cost.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 10005:2006 Quality

RANGE STATEMENT	
	management systems - Guidelines for quality plans • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment • AS/NZS ISO 9000 Set:2008 Quality management systems set • AS 1199 Sampling procedures and tables for inspection by attributes • BS 5750 Quality systems • Australia New Zealand Food Standards (ANZFS) Code • Australian code of good manufacturing practice for medicinal products (GMP) • customer specific requirements/standards • enterprise and customer product specifications • National Association of Testing Authorities (NATA) Accreditation programs requirements • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • quality manuals and procedures • Therapeutic Goods Regulations 1009
Quality control procedures	Quality control procedures may include: • standards imposed by regulatory and licensing bodies • enterprise quality procedures • working to a customer brief or batch card and associated quality procedures • checklists to monitor job progress against agreed time, costs and quality standards • preparation of sampling plans • the use of hold points to evaluate conformance • the use of inspection and test plans to check compliance
Methods for statistical analysis	Methods for statistical analysis may include: • means

RANGE STATEMENT	
	• median • mode • ranges • standard deviations • statistical sampling procedures
Problem solving techniques	Problem solving techniques may include: • identifying inputs and outputs • sequencing a process • identifying and rectifying a problem step • root cause analysis • implementing preventative strategies
Quality improvement tools and techniques	Quality improvement tools and techniques may include: • run charts, control charts, histograms and scattergrams to present routine quality control data • plan, do, check, act (PDCA) • Ishikawa fishbone diagrams and cause and effect diagrams • logic tree • similarity/difference analysis • Pareto charts and analysis • force field/strength weakness opportunities threats (SWOT) analysis
Sustainable energy principles and work practices	Sustainable energy principles and work practices may include: • examining work practices that use excessive electricity • switching off equipment when not in use • regularly cleaning filters • insulating rooms and buildings to reduce energy use • recycling and reusing materials wherever practicable • minimising process waste
Communication	Communication may involve: • supervisors, managers and quality managers • administrative, laboratory and production personnel

RANGE STATEMENT	
	• internal/external contractors, customers and suppliers
Reporting	Reporting may include: • verbal responses • data entry into laboratory or enterprise database • brief written reports using enterprise proformas
Quality improvement opportunities	Quality improvement opportunities could include improved: • production processes • hygiene and sanitation procedures • reductions in waste and re-work • laboratory layout and work flow • safety procedures • communication with customers • methods for sampling, testing and recording data
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL934003A Maintain and control stocks

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to order, maintain and control the use of laboratory materials and/or equipment in the work area.

Application of the Unit

Application of the unit	This unit of competency is applicable to technicians and technical officers working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Maintain and control stocks of materials or equipment	1.1. Label, document and store stocks in accordance with relevant standards and specific safety requirements 1.2. Follow stock rotation procedures to maximise use of stocks within permitted shelf life 1.3. Identify stock discrepancies and replace redundant or outdated stocks to maintain stocks at prescribed level 1.4. Identify and replace damaged/worn equipment or arrange for repairs or disposal as appropriate 1.5. Initiate quality control sampling and testing procedures when appropriate 1.6. Report stock problems outside own knowledge and authority limitations to relevant personnel
2. Order and receive materials and equipment	2.1. Determine requirements of customers and suppliers using appropriate communication and interpersonal skills 2.2. Determine demand for stock, taking into account peak and seasonal variations in stock usage and production conditions 2.3. Place and/or follow up approved orders using enterprise systems and procedures 2.4. Check condition of received goods and take appropriate action
3. Maintain stock	3.1. Record all relevant details accurately using the

ELEMENT	PERFORMANCE CRITERIA
records	specified forms/computer system 3.2. Ensure that written information is legible and indelible 3.3. File all records in the designated place
4. Maintain a safe work environment	4.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 4.2. Minimise the generation of wastes and environmental impacts 4.3. Ensure the safe collection of redundant/outdated stocks for subsequent disposal

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • maintaining and controlling stocks or materials and equipment • ordering and receiving materials and equipment • maintaining stock records • maintaining a safe work environment
Required knowledge
Required knowledge includes: • technical terminology relating to ordering and storage of stocks • laboratory stock, product and service information • types of chemical reactions and rationale for recommended storage systems • enterprise procedures and quality system requirements for stock control • codes of practice and regulations concerning the handling, storage and transport of the stock involved • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • confirm customer requirements with senior personnel where there is doubt • access online databases and/or catalogues efficiently • interpret labelling information (lot number, batch and date) and MSDS correctly • apply procedures for safe handling, storage and transport of stocks • use required safety and manual handling equipment and procedures • perform quality controlsampling and testing and rotate stock in accordance with SOPs • follow workplace procedures for predicting and/or determining demand for stock • maintain stock at prescribed levels for their work area, through regular inspections, timely ordering of replacement items and followup of late orders • cope with peak and seasonal variations in stock usage and production conditions • follow workplace procedures for researching, ordering and receipt of stock • complete and record all documentation accurately • demonstrate effective and appropriate communication and interpersonal skills when dealing with customers and suppliers.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL935004A Maintain instruments and equipment*. Resources may include: • stocks of materials and equipment • stock order forms and documentation • sampling and testing equipment.

EVIDENCE GUIDE	
Method of assessment	The following assessment methods are suggested: • review of documentation for orders prepared by the candidate • examination of stock records maintained by the candidate • observation of the candidate handling stock and conducting quality control sampling and testing • feedback from the laboratory manager, quality manager, customer service manager, supervisor, customers and peers • explanation by the candidate of the labelling and storage requirements of a selection of stock items. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biotechnology** A technical officer arrived at work on Monday morning and discovered that the freezer had been turned off over the weekend and the restriction nucleases had thawed. These enzymes were to be used that morning. The technician needed to check the enzyme activity to determine whether the enzymes had been denatured by the rise in temperature. The technician quickly set up a digestion mix of affected enzyme with some viral DNA of known sequence. The digest produced DNA fragments of expected length, showing the enzyme still had activity.

EVIDENCE GUIDE	
	The technician reported the incident along with the results to the supervisor, who decided that the enzymes could be used for that day. **Manufacturing** Neglected chemicals may deteriorate on the shelf and turn into a completely different entity. Not only can this change in identity damage a chemical manufacturing process, it can also present an immediate hazard. For example, this occurred in a storeroom where stored ether built up high levels of peroxides. When it was used in an extraction process to make a starting material in a manufacturing process, the peroxides were concentrated and exploded. The company was fortunate that loss of life didn't occur. The company revised enterprise procedures to ensure that in the future, redundant or outdated stocks are identified and removed. **Food processing** The staff in a confectionary company laboratory use enzyme based methods to routinely analyse sugars (glucose, fructose, sucrose and lactose) in products. Although the enzymes are stored as directed by the manufacturer, typically at -20(C in the dark, they do not retain their activity indefinitely. To avoid using inactive enzyme in an analytical procedure and obtaining a reduced or false negative result, several features of each enzyme preparation are routinely noted. These include the date of purchase, the number of times the enzyme has been thawed and refrozen and its initial activity. Periodically, the enzyme activity is verified and stock is discarded where its activity has fallen to a less than acceptable value. These practices ensure that the analytical methods that use enzymes are performed with functional reagents and give accurate results.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS 4332-2004 The storage and handling of gases in cylinders
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 1269 Set:2005 Occupational noise management set
	• AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• animal welfare legislation and codes of practice
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice

RANGE STATEMENT	
	• customer database and supplier catalogues • enterprise or standard operating procedures (SOPs) • equipment manuals and warranty, supplier catalogues and handbooks • gene technology regulations • internal/external stock orders and overdue actions • material safety data sheets (MSDS) • National Code of Practice for the labelling of workplace substances (NOHSC:2012 (1994)) • National Environment Protection Measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • Therapeutic Goods Regulations 1009
Workplace procedures	Workplace procedures may include: • ordering, purchase and receipt of stocks • verification of temperature control for delivered and stored stocks (e.g. reagents containing enzymes) • organisation of compatible batch or lot numbers • storage of stocks, stock control and rotation of stock • quality control testing, monitoring of use by dates of standards and shelf life of reagents (e.g. DNA, enzymes, antibodies, radioisotopes and vitamins) • reporting non-conformances
Records	Records could include: • stock usage • orders and progress of orders • equipment servicing and repairs • current inventories • quality control sampling, testing and stock rotation

RANGE STATEMENT	
Communication	Communication may require the use of equipment or systems, such as: • telephone, fax, email and mail • online information systems, inventories, print records, databases and catalogues • filing systems Communication may involve:: • suppliers • freight companies • internal customers • external customers
Hazards	Hazards may include: • electric shock • chemicals, such as acids and hydrocarbons • microbiological organisms associated with blood and blood products • radioisotopes • sharps, such as broken glassware • disturbance or interruption of services • manual handling of heavy boxes • fluids under pressure and industrial gas bottles
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses, coveralls and safety boots • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time

RANGE STATEMENT	
	• all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL935001A Monitor the quality of test results and data

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse a series of test results and data to detect potential or actual non-conformances, assess their significance and recommend preventative or corrective actions. The unit assumes personnel will have access to enterprise quality assurance procedures based on Australian and/or international standards. This unit of competency does not cover the adaptation or development of test methods or procedures.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers, technical specialists and laboratory supervisors in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL924001A	*Process and interpret data*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Verify accuracy of data and technical records	1.1. Retrieve and collate all relevant data files and technical records for the specified time interval, tests or product range or project 1.2. Inspect data records to check the integrity of data entry, alterations, transfers and calculations 1.3. Confirm that technical records contain sufficient information to provide an audit trail for the tests involved
2. Assess the quality of data/results	2.1. Use charts and tables to determine whether data/results are within specified limits 2.2. Analyse data trends and results for blanks, duplicates and/or check samples to detect systematic uncertainties 2.3. Use statistical tests and enterprise procedures to check data acceptability

ELEMENT	PERFORMANCE CRITERIA
	2.4. Check that estimations of uncertainties are reasonable and consistent with test method, client or product specification requirements 2.5. Identify results that cannot be reconciled with technical records and/or expected outcomes
3. Identify potential causes for unacceptable results	3.1. Review user checks and calibration performance records to confirm that equipment/ instrument meets test specifications 3.2. Check for obvious sources of interferences that may have occurred during measurements 3.3. Review technical records to identify human or environmental factors that could affect reliability of results 3.4. Review records of sample collection and preparation to confirm chain of custody requirements and adherence to sampling procedures 3.5. Check that any documented deviations from sampling procedures and/or test methods were technically justified and authorised 3.6. Check the condition of sampling equipment and/or stored samples if available/appropriate
4. Report findings to relevant personnel	4.1. Summarise the quality of test results and data 4.2. Document potential sources or instances of non-conforming work and assess their significance 4.3. Recommend appropriate preventative/corrective actions to improve sampling, testing and/or calibration activities 4.4. Prepare reports in a format and style consistent with their intended use and enterprise guidelines

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • verifying the accuracy and completeness of data, results and technical records

REQUIRED SKILLS AND KNOWLEDGE
• recognising significant trends in data and/or aberrant results • using statistical tests to estimate uncertainties and determine data acceptability • analysing sampling, sample preparation testing and/or calibration activities to identify potential causes of unacceptable data/results • applying effective problem solving strategies • recommending appropriate preventative/corrective actions to control potential/actual non-conforming work • following enterprise procedures for documenting and reporting information about quality
Required knowledge
Required knowledge includes: • characteristic properties of the materials in question • specifications for samples, tests and/or calibration activities under investigation • scientific and technical knowledge of the procedures, equipment, materials and instrumentation used to generate the test results and data • methods for statistical analysis of data (means, ranges, standard deviations, confidence limits and data acceptability) and sampling procedures • problem solving techniques androot cause analysis • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • verify the accuracy and completeness of data, results and technical records • recognise significant trends in data and/or aberrant results • use statistical tests to estimate uncertainties and determine data acceptability • analyse sampling, sample preparation testing and/or

EVIDENCE GUIDE	
	calibration activities to identify potential causes of unacceptable data/results • apply effective problem solving strategies • recommend appropriate preventative/corrective actions to control potential/actual non-conforming work • follow enterprise procedures for documenting and reporting information about quality.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *relevant MSL974000 series units of competency* • *relevant MSL975000 series units of competency*. Resources may include: • data files and technical records, and laboratory information management system (LIMS) • appropriate software • enterprise quality manual and procedures • access to samples, sampling equipment and test equipment/instruments/materials.
Method of assessment	The following assessment methods are suggested: • review of verified records and reports generated by the candidate • feedback from supervisors and peers about the candidate's ability to monitor the quality of test results and data • questioning to assess understanding of trends in data, sources of uncertainty, and preventative/corrective actions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or

EVIDENCE GUIDE	
	assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show their relevance in a workplace setting. **Manufacturing** The person conducting final quality assurance activities is responsible for ensuring that the results of each calibration or test carried out by the laboratory are reported accurately, unambiguously, clearly and objectively in accordance with specific instructions in the test or calibration method. Test reports and calibration certificates are checked for mistakes, including the correct transfer of data from original worksheets and to ensure all relevant information is documented and is the result of valid measurements. Quality inspectors are also ultimately responsible to their clients for the quality of work produced by outsourced subcontractors. **Environmental** A laboratory regularly collects carbon monoxide (CO) data as part of an air monitoring program. The laboratory operates several remote air sampling sites that take CO samples every three seconds using standard methods. The measurements are stored in data loggers and downloaded to the laboratory's computer every 24 hours. Using a standard software package, the laboratory technician generates 1 hour and 24 hour averages for each site. They then graph the results over a one year period and use the appropriate Australian Air Quality Standard to determine exceedances for the 1 hour and 24 hour averages. To ensure that any exceedances are genuine, the technician carefully checks factors, such as equipment calibration procedures, seasonal variations in data, artefacts, equipment downtime and maintenance of monitoring equipment over the past year. The verified data and exceedances are reported and compared with previous years' exceedances to determine long term trends in air quality at the sampling sites.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS/NZS ISO 9001:2008 Quality management systems - Requirements
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)

RANGE STATEMENT	
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • national measurement regulations and guidelines • Australian code of good manufacturing practice for medicinal products (GMP) • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • material safety data sheets (MSDS) • National Association of Testing Authorities (NATA) Accreditation programs requirements • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • standard operating procedures (SOPs) and published preparation methods
Technical records	Technical records consist of data and information generated during sampling, testing and/or calibrations which indicate whether quality or process parameters have been achieved. They may include: • request forms, service agreements and contracts • worksheets, work books, check sheets and work notes • original observations, derived data and calculations • control graphs • external, internal test reports and calibration certificates • clients notes, papers and feedback • listing of data and the personnel responsible for sampling, performance of each test/calibration and checking of results
Charts, **tables and statistical tests**	Charts, tables and statistical tests may include: • run charts and control charts • histograms, frequency plots, stem and leaf plots, boxplots and scatter plots

RANGE STATEMENT	
	• probability and normal probability plots • Pareto diagrams, Stewhart control charts and CuSum control charts • regression methods for calibration, linearity checks and comparing analytical methods • analysis of variance (ANOVA) • data acceptability tests, such as Q, T and Youden
Instrument calibration/ performance records	Instrument calibration/performance records may include: • checks that equipment/instrument complies with specifications • dates, results and copies of reports and certificates of calibrations, adjustments, acceptance criteria and due date of next calibration • maintenance plan, maintenance carried out to date • damage, malfunction, modification or repairs
Sources of interferences	Sources of interferences may include: • spectral interference (e.g. in inductively coupled plasma) • physical interference (e.g. in atomic absorption spectroscopy) • matrix effects • presence of contaminants • masking of analytes
Human and environmental factors	Human and environmental factors may include: • lack of operator competence and/or training • inadequate attention to detail, fatigue and stress • inadequate hygiene and sterility • unacceptable dust, humidity, temperature and illumination levels • electromagnetic disturbances • variations to gas, electricity and water supply • unacceptable sound and vibration levels
Sample preparation problems	Sample preparation problems could result from: • incomplete preparation

RANGE STATEMENT	
	• segregation • sample disturbance • incorrect sample containers • incorrect sample handling (filtered/non-filtered, temperature control and preservation) • incorrect particle size • incorrect matrix • incomplete digest
Preventative/corrective actions	Preventative/corrective actions could include: • regular use of certified reference materials • internal quality controls using secondary reference materials • participation in inter-laboratory comparison or proficiency testing programs • replicate tests or calibrations using the same or different methods • retesting or recalibration of retained items • correlation of results for different characteristics of an item • additional audits and management reviews • regular quality checks on consumables • enhanced staff observation, supervision and/or training • more detailed sample specifications, test methods and procedures • feedback from clients on improving quality system, testing and calibration activities
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection

RANGE STATEMENT	
	control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL935002A Assist in the maintenance of reference materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to assist in the maintenance of reference materials that can be used in the identification of new specimens and allow for the quality control of laboratory procedures. The unit of competency does not cover the scientific identification of species or specimens.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and laboratory technicians working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Acquire reference materials	1.1. Confirm that required transit conditions were maintained 1.2. Apply quarantine or isolation arrangements as necessary 1.3. Record data of accessioned reference material in the collection database 1.4. Label material to ensure that its identity is maintained during storage and issue
2. Maintain reference materials	2.1. Monitor storage conditions to ensure that they comply with suppliers' warranty specifications 2.2. Monitor storage conditions to ensure materials remain true to specification 2.3. Test material during storage, where relevant and appropriate, to report on reference characteristics and specificity 2.4. Report findings that suggest reference specimens may be deteriorating
3. Dispense reference materials to clients	3.1. Verify requests with supervisor before requests for reference materials are processed 3.2. Supply reference material without contamination of

ELEMENT	PERFORMANCE CRITERIA
	stock material 3.3. Keep records of materials issued in accordance with enterprise procedures
4. Maintain a safe work environment	4.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 4.2. Follow safety protocols when handling and processing reference materials 4.3. Minimise the generation of wastes and environmental impacts 4.4. Ensure the safe collection of redundant/outdated stocks for subsequent disposal

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- maintaining materials and specimens so that the reference characteristics and attributes are stable in storage and manifest in use after retrieval
- performing all manipulations safely
- testing stored material for reference characteristics before release or use
- communicating appropriately with all customers

Required knowledge

Required knowledge includes:

- certified reference materials - what they are, when and why they should be used
- the storage requirements of biological and non-biological materials
- quarantine or isolation procedures
- the labile nature of chemical and biological materials
- the rationale for testing reference characteristics before issuing reference materials
- reasons for testing before accession of reference materials
- relevant health, safety and environment requirements

Specific industry

Additional knowledge requirements may apply for different industry sectors. For

REQUIRED SKILLS AND KNOWLEDGE
example: Process manufacturing and construction: • drill (core) samples for mineral identification • concrete samples for analysis of composition and/or strength and suitability for application Biomedical and environmental: • bacterial cultures related to colony and microscopic morphology, specificity and reliability of staining reaction, biochemical characteristics and immunological characteristics • cell suspensions and cell and tissue preparations that can act as quantitative or qualitative controls in tests and procedures • plasma and other body fluids with known attributes or quanta that can act as standards and controls in quantitative and qualitative tests and procedures Food and beverage processing: • quality assurance for viability of enzymes used in process • bacterial or yeast cultures relating to colony and microscopic morphology for culturing purpose • grain samples used in identification of cereal specimens (e.g. barley varieties, such as Proctor, Franklin and Stirling)

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • maintain material identity during storage • perform all manipulations safely • test stored material for reference characteristics before release • communicate appropriately with all customers.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with any units

EVIDENCE GUIDE	
	that may involve using materials from a collection for example: • *MSL916003A Supervise laboratory operations in work/functional area* • *MSL975001A Perform microbiological tests* • *MSL976003A Evaluate and select appropriate test methods and procedures*. Resources may include: • equipment and materials related to the occupational task for which the reference material is relevant • reference materials • standard operating procedures (SOPs).

Method of assessment	The following assessment methods are suggested:
	• review of records for the supply of reference materials by the candidate
	• observation of the candidate performing tests of stored reference material prior to release and review of results
	• case studies, such as the:
	  • accession and processing of a plasma sample that is intended for use as a control in a blood coagulation test
	  • response to request for supply of a Staphylococcus culture with coagulase activity
	• oral/written questioning about receipt, testing during storage and release of reference materials.
	In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy
	Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
	Access must be provided to appropriate learning and/or assessment support when required.
	The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like

EVIDENCE GUIDE	
	environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show their relevance in a workplace setting. **Manufacturing** A technical officer in a pharmaceutical laboratory assays each batch of paracetamol tablets before their release for sale using ultraviolet spectrometric analysis. Twenty tablets are ground and a known weight of sample is dissolved in a specified solvent. The ultraviolet absorption is measured and compared with the absorption of a reference standard, which has been similarly treated. The potency of the tablets is calculated and compared to the release limits before being released for sale. The concentration of the reference paracetamol must be accurately known if the assay is to be correct. The standard is packed and stored under conditions that will minimise its breakdown, and the storage conditions are monitored to ensure that the potency remains with acceptable limits. **Biomedical** A technical officer in a histology laboratory was asked to perform a batch of iron stains by the Prussian Blue technique. The officer went to the block repository and chose one of the liver blocks known to contain haemosiderin. The officer checked the block number against the data in the control materials log and then cut four sections to process in parallel for the day's batch and those anticipated over the next few days. Noting that there was only one iron-positive block left, the officer wrote a short memo to the laboratory supervisor suggesting that the pathologist allow for a stock of tissue to be collected the next time they identified a suitable specimen. **Food processing** While many attributes of food can be quantified and specified using chemical reference standards, some attributes are best assessed by comparison with a physical reference sample. For example, the number of poppy seeds on a loaf of bread would be impractical to count. However, comparison with retention samples made with various levels of poppy seeds will give an

EVIDENCE GUIDE	
	approximation of the number of seeds on the bread. Suitable reference samples need to be prepared and preserved so that the handling of samples does not result in seeds falling from the sample.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	• AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• animal welfare legislation and codes of practice
	• Australian Dangerous Goods Code
	• Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice
	• cleaning, hygiene and personal hygiene requirements

RANGE STATEMENT	
	• enterprise procedures, standard operating procedures (SOPs) and operating manuals • gene technology regulations • incident and accident/injury reports • material safety data sheets (MSDS) • National Code of Practice for the labelling of workplace substances (NOHSC:2012 (1994)) • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • test procedures (validated and authorised) • Therapeutic Goods Regulations 1009 • waste minimisation and disposal procedures
Reference materials	Reference materials may include: • specimens, such as cells, tissues and samples of aqueous or proteinaceous standards • aggregates, grains and powders • materials used for checking equipment calibrations
Dispensing and storing of reference materials	Dispensing and storing of reference materials may require: • reconstitution of completely lyophilised materials • preparing materials for freeze-drying
Equipment, **materials and systems**	Equipment, materials and systems may include: • centrifuges, water baths and incubators • lyophilisers and humidifiers • equipment and material for transport, such as dry ice or ice packs • equipment and material for storage, such as liquid nitrogen • storage boxes • storage and display cabinets

RANGE STATEMENT	
	• computer information systems, databases, record and filing systems • laboratory glassware and measuring equipment • materials suitable for the safe collection and disposal of biological and non-biological wastes
Communication	Communication may involve: • supervisors and managers (laboratory, quality and customer service) • other laboratory or clinical personnel • outside suppliers, internal and external customers
Hazards	Hazards may include: • chemicals, reagents • micro-organisms associated with soil, air, water, blood and blood products and human or animal tissue and fluids • sharps, such as broken glassware • disturbance or interruption of services • manual handling of heavy boxes
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses and coveralls • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions and enterprise procedures and regulations • regular cleaning of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require

RANGE STATEMENT	
	standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL935003A Authorise the issue of test results

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to critically assess the accuracy of data and validity of test results prior to formally authorising their release to the client. Personnel are expected to investigate and, if necessary, rectify results that are not consistent with expected values.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in all industry sectors who are approved by their organisation to authorise the results obtained for specific test methods. In many instances these personnel are known as 'signatories' or 'delegates' for the tests involved. The scope of tests authorised in each case will be determined by the specialised knowledge, technical competence and experience of the personnel involved. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL925001A	*Analyse data and report results*
	MSL924001A	*Process and interpret data*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Verify the accuracy of data and technical records	1.1. Access relevant job instructions, data and technical records in laboratory information management system (LIMS) 1.2. Confirm that technical records provide sufficient information to ensure traceability for the tests involved 1.3. Compare data with expected values and identify any outliers 1.4. Inspect data records to check the integrity of data entry, alterations, transfers and calculations 1.5. Correct and initial any incorrect data records 1.6. Sign off data records as correct
2. Determine if results are acceptable and within	2.1. Compare results with expected values and identify any significant differences

ELEMENT	PERFORMANCE CRITERIA
expectation	2.2. Check the reliability of results by examining data or results from repeat tests or duplicate samples 2.3. Assess the significance of any documented observations of atypical test conditions or environment and/or sample appearance 2.4. Check that all calculations are free from error 2.5. Check that estimations of uncertainty are reasonable and consistent with the test method, client and/or product specification requirements 2.6. Authorise the issue of results that meet the organisation's quality standards and are consistent with expectations
3. Investigate unexpected or unacceptable results	3.1. Examine records of pre-use checks and calibration performance to ensure that the equipment and/or instruments used meet test specifications and enterprise requirements 3.2. Establish whether human and/or environmental factors could have affected the reliability of results 3.3. Check for obvious sources of interferences that may have occurred during measurements 3.4. Retrieve stored samples (if available) and assess whether they are atypical or contaminated 3.5. Perform control tests using the same, or new, samples to check unexpected results 3.6. Authorise the issue of unexpected results that meet the organisation's quality standards 3.7. Identify possible root causes of unacceptable results and appropriate preventative/corrective actions 3.8. Report investigation outcomes and recommendations for improvements in accordance with enterprise procedures
4. Liaise with clients about results	4.1. Establish whether sampling procedures used by the client could contribute to unexpected/unacceptable results 4.2. Arrange for new samples and/or re-testing as necessary 4.3. Explain investigation outcomes and confidence level for unexpected test results

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- verifying the accuracy and completeness of data, results and technical records
- recognising unexpected or unacceptable data and results
- using statistical tests to estimate uncertainties and determine data acceptability
- reviewing records of sampling, sample preparation, testing and/or calibration activities to identify potential causes of unacceptable data/results
- using effective problem solving strategies
- recommending appropriate preventative/corrective actions to control potential/actual non-conforming work
- applying enterprise procedures for authorising test results
- explaining technical details of sampling, test methods and results to clients
- demonstrating a professional approach and positive company/organisation image (including maintaining independence and an ability to resist improper influences)

Required knowledge

Required knowledge includes:

- scientific and technical knowledge of the samples, procedures, equipment, materials and instrumentation used to generate the test results and data
- expected values for data and results and the uncertainty components for specified test methods
- problem solving techniques and cause analysis appropriate to the test methods
- enterprise procedures for authorising the issue of test results
- relevant reporting requirements such as the Guide to the Expression of Uncertainty in Measurement (GUM), National Association of Testing Authorities (NATA)and/or test methods
- working knowledge of health, site safety and environmental management requirements relevant to job role
- working knowledge of confidentiality requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • verify the accuracy and completeness of data, results and technical records for specified tests • issue specified test results in accordance with authorisation and enterprise procedures • investigate unexpected or unacceptable results in a logical and efficient manner • explain test results to clients.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • relevantMSL09 units of competency that cover the ability to perform the tests involved, relevant data analysis and quality assurance procedures. Resources may include: • data sets and records • test methods and description of test setup • computer and relevant software or laboratory information system • relevant workplace procedures.
Method of assessment	The following assessment methods are suggested: • review of records and test results verified and issued by the candidate • feedback from supervisors and clients regarding the candidate's ability to issue authorised test results • review of recommendations and reports prepared by the candidate • questions to assess understanding of procedures governing the authorised issue of test results, acceptability of data/results, sources of uncertainty and preventative/corrective actions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and

EVIDENCE GUIDE	
	disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Calibration** A calibration technician/specialist has completed testing an instrument and places it with the test report for the relevant signatory to authorise. The laboratory manager physically examines the item to ensure all accessories have been applied. The manager checks the test report for validity and correctness and ensures any abnormalities or departures from normal or specified conditions are reported appropriately. He/she confirms that all data transfers and calculations are accurate and in accordance with SOPs, industry guidelines and the laboratory's accreditation requirements. The manager also ensures that all relevant databases are updated and client confidentiality is maintained. He/she signs the relevant certificates and reports and authorises the release of the results and return of the item to the client. **Construction materials testing** A laboratory supervisor, who is authorised to issue Atterberg Limit test results, receives a set of QC data for gravel that is to be supplied to a local council. The technician has provided Liquid Limit, Plastic Index, Linear Shrinkage data for three samples: 1. 35%, 7%, 3% 2. 35%, 4%, 3% 3. 33%, 5%, 2% Using a well known 'rule of thumb' that the P.I./L.S. ratio for gravel samples is usually between 2 and 3, the supervisor notes that the ratio for the second sample is 1.3. This indicates a possible error. Although the most

EVIDENCE GUIDE	
	likely source of error is in the determination of the Plastic Limit, he/she systematically reviews all of the technician's work. Firstly, he/she checks that all three samples are from the same source and whether their appearance was recorded on receipt. He/she reviews the relevant data records by checking for simple transcription errors, moisture calculation errors, variation in the weights of containers and straightforward weighing errors. He/she also checks if the samples were properly dried to constant mass. Then he/she accesses the client's previous test records to see if any similar sample variability has occurred in the past. After completing all the checks he/she can do from his/her desk, he/she talks to the tester and asks to see the rolled specimens before they disposed of. A visual inspection confirms his/her hunch that the technician's rolling technique is not good enough to obtain reliable results. He/she arranges for the test to be repeated under supervision using surplus sample material and also organises additional training. **Construction materials testing** Asphalt is being laid at night on a busy motorway and the road must be available for traffic by 6 am each day. The construction company's own laboratory is responsible for conducting compaction tests for each lot. The specifications require a field compaction density of 95% of the laboratory compacted density and penalties apply for lots where results are <94%. A technician who is authorised to issue compaction results uses a nuclear density gauge to determine field compaction values in accordance with an established inspection test plan and test method. The data for the latest lot is 95, 94, 93, 93, 93.5, 93 and 93%. The average result is 93.5% and the shift foreman decides to roll and then re-test the lot. The repeat test indicates an average value of 93%. Before completing the test report, the technician reviews all the data, calculations and record of 'standard counts' for the gauge. He/she also checks the laboratory compaction results, gradings and bitumen content for consistency and compliance with mix design. These results indicate a trend of the mix design moving out of specification. The technician informs the plant manager that the test results indicate unacceptable compaction. The manager maintains that the results are borderline and points out that the

EVIDENCE GUIDE	
	company has already paid $250K in penalties this month. He/she asks the technician to re-check the compaction results and repeat the tests at different inspection points. He/she also suggests that the technician should find a better sample for the maximum density test. The technician reviews the results and re-tests further samples but there are no new results that would justify any change to the test report. Therefore, the technician issues the test report unaltered.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice and Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards, such as: • AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment

RANGE STATEMENT	
	• AS/NZS ISO 9000 Set:2008 Quality management systems set • ISO 5725 Accuracy (trueness and precision) of measurement methods and results • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • Australian code of good manufacturing practice for medicinal products (GMP) • enterprise quality manual and customer quality plan • equipment manuals and warranty, supplier catalogues and handbooks • Eurolab technical report • inspection test plans, sampling plans for sites • NATA supplementary requirements for the relevant field of testing (e.g. field application document) • NATA Accreditation programs requirements • NATA Technical notes, policy circulars and guides • national measurement regulations and guidelines • Nordtest guide • principles of good laboratory practice (GLP) • sampling and test procedures and standard operating procedures (SOPs)
Data and results	Data and results may include: • entries in worksheets, spreadsheets or databases that may be linked to information management systems • observations, measurements, derived data and calculations • results of tests and analyses
Technical records	Technical records may include: • request forms, service agreements and contracts • worksheets, work books, check sheets and work notes

RANGE STATEMENT	
	• data and information generated during sampling, testing and/or calibrations that indicate whether quality or process parameters have been achieved • control graphs • external, internal test reports and calibration certificates • clients notes, papers and feedback • listing of data, personnel responsible for sampling, performance of each test/calibration and checking of results
Calculations	Calculations may be performed: • with or without a calculator or computer software, such as spreadsheets, databases and statistical packages
Statistical analysis	Statistical analysis may include the use of: • standard deviation, standard deviation of the mean, histograms and frequency plots • probability and normal probability plots • run charts and control charts, such as Shewhart and CuSum • regression methods for calibration, linearity checks and comparing analytical methods • analysis of variance (ANOVA) • data acceptability tests, such as T and F
Estimates of uncertainty	Estimates of uncertainty may include components such as: • calibration uncertainty • instability or drift in the calibrated instrument • repeatability of the results • resolution or readability of the instrument • environmental influences such as temperature, air pressure, humidity, vibration, electrical noise and gravity • reference material uncertainty • factors arising from using an instrument under a different operating environment or procedures (e.g. orientation of a transducer, immersion depth of a temperature probe) • reproducibility of quality control data

RANGE STATEMENT	
Human and environmental factors	Human and environmental factors may include: • technician preparing the sample and/or performing the test did not apply the test method correctly • inadequate attention to detail, fatigue, stress • inadequate hygiene or sterility • unacceptable dust, radiation, humidity, temperature and illumination levels • electromagnetic disturbances • unacceptable variations to gas, electricity and water supply • unacceptable sound and vibration levels
Sample preparation problems	Sample preparation problems could result from: • use of incorrect sample containers • incorrect particle size • contamination • incorrect sample handling, storage or conditioning (filtered/non-filtered, temperature control, moisture content and preservation) • incorrect matrix • incomplete digest
Sources of interference	Sources of interference may include: • presence of contaminants • spectral interference (e.g. in Inductively Coupled Plasma Spectroscopy) • physical interference (e.g. in Atomic Absorption Spectroscopy) • matrix effects • masking of analytes
Preventative/corrective actions	Preventative/corrective actions may include: • more regular use of certified reference materials • internal quality controls using secondary reference materials • participation in inter-laboratory comparison or proficiency testing programs • replicate tests or calibrations using the same or different methods

RANGE STATEMENT	
	• retesting or recalibration of retained items • correlation of results for different characteristics of an item • additional audits and management reviews • more regular quality checks on consumables • increased staff observation, supervision and/or training • more detailed sample specifications, test methods and procedures
Confidence level	• The most common confidence level is 95% in accordance with the National Measurement Act, 1960. However, some applications require a higher level of confidence
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL935004A Maintain instruments and equipment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to check the serviceability and calibration of laboratory/field instruments and equipment and perform routine maintenance, such as cleaning and replacement of consumables and minor components. Personnel are also required to perform basic troubleshooting and repairs consistent with warranty and service agreements.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants, instrument operators and technical officers working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Perform serviceability checks	1.1. Perform pre-/after-use checks in accordance with appropriate enterprise and manufacturer's procedures 1.2. Identify faulty or unsafe components and equipment 1.3. Troubleshoot basic faults or report the need for major maintenance and/or repairs 1.4. Complete instrument/equipment logbooks to enterprise requirements
2. Conduct routine maintenance safely	2.1. Identify maintenance procedures, records and safety requirements 2.2. Plan/adjust maintenance schedules in accordance with operational requirements 2.3. Identify and replace or repair damaged/worn/spent components or items 2.4. Clean equipment and instruments using recommended cleaning agents and techniques 2.5. Store equipment and instruments in accordance with

ELEMENT	PERFORMANCE CRITERIA
	enterprise/manufacturer's requirements 2.6. Update maintenance records in accordance with enterprise procedures 2.7. Arrange for reordering of consumable stocks and equipment components as necessary
3. Perform calibration/ qualification checks	3.1. Operate equipment/instrument in accordance with enterprise/manufacturer's procedures 3.2. Check calibration/qualification using specified standards and/or procedures 3.3. Record all calibration/qualification data accurately and legibly 3.4. Document calibration status and report out of calibration equipment/instruments 3.5. Quarantine out of calibration items
4. Arrange instrument servicing where appropriate	4.1. Assess instrument repair status, and determine if local repair/maintenance is possible and economical 4.2. Contact and arrange repair/maintenance of equipment from accredited service agent or other appropriate personnel in accordance with enterprise procedures

Required Skills and Knowledge

Required skills
Required skills include: • performing routine maintenance • determining whether an item of equipment/instrument is in correct working order • locating and rectifying basic faults • recognising the need for specialist servicing and/or repairs • conducting calibration status/qualification checks • following all relevant occupational health and safety (OHS) requirements • following enterprise recording and reporting procedures
Required knowledge
Required knowledge includes: • operating principles for equipment/instruments used in routine work • common sources of equipment/instrument faults and their repair

Required skills
• common errors associated with equipment use • role and importance of regular calibration checks • equipment maintenance schedules and procedures • OHS hazards and control measures • enterprise communication and reporting procedures

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform routine maintenance safely • determine whether an item of equipment/instrument is in correct working order • locate and rectify basic faults • recognise the need for specialist servicing and/or repairs • conduct calibration status/qualification checks • obtain instrument/equipment readings with the required accuracy and precision • follow all relevant OHS requirements • follow enterprise recording and reporting procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with relevant: • *relevant MSL974000* series units of competency • *relevant MSL975000* series units of competency. Resources may include: • laboratory equipped with appropriate equipment and calibration standards • SOPs, calibration and maintenance schedules and procedures.

EVIDENCE GUIDE	
Method of assessment	The following assessment methods are suggested: • review of maintenance records and equipment/instrument logbooks completed by the candidate • observation of the candidate performing serviceability and calibration/qualification checks and routine maintenance • feedback from peers and supervisors • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show their relevance in a workplace setting. **Manufacturing** Starting materials used in manufacturing are often white powders. Infrared spectroscopy is used to positively identify many materials. Two compounds are one and the same if their spectra match in all respects (the position and relative intensity of the absorption bands). For example, if the spectra of a white powder matches the spectra of caffeine, the technician can be sure that the white powder is caffeine, provided that the spectrometer has been correctly maintained and calibrated. The technician routinely checks this using a standard polystyrene film. **Food processing**

EVIDENCE GUIDE	
	Technicians in a NATA certified laboratory must do regular checks to ensure that laboratory equipment, such as balances, refractometers and spectrometers are calibrated and in working order. Balances are routinely checked using calibrated masses and appropriate documented methods to ensure that they are weighing within the correct tolerances. If the balance is out of specification, the technician follows appropriate procedures to correct this and/or notifies the manufacturer to arrange for the balance to be serviced. **Food processing** A technical assistant in the quality control laboratory of a fruit canning company is required to maintain and operate a range of equipment, including a pH meter. Canned pears, for example, are routinely checked for pH to ensure safe heat processing. While checking the calibration of the pH meter with the standard buffer solutions, the assistant identified that stable pH readings could not be obtained. On closer inspection, they found that the pH probe was damaged and reported the problem to the supervisor. The probe was replaced and the meter was re-checked in readiness for routine testing. **Biomedical** Technical assistants are quite often involved in routine collections and culturing of cells. Bacterial cells are often cultured and grown to large populations in order to provide material from which to extract biological materials. A quick method of determining when the cell growth has yielded enough cells is to determine the absorbance of the cell culture by measuring absorbance at 600 nm. An absorbance of 1 to 1.5 will give a good cell harvest. This method relies on the assistant being able to perform calibration checks on an ultraviolet-visible (UV-VIS) spectrometer.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating

RANGE STATEMENT	
conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	• AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4187:2003 Cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities
	• AS/NZS 4501 Set:2008 Occupational clothing set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice
	• calibration and maintenance schedules

RANGE STATEMENT	
	• enterprise recording and reporting procedures • equipment manuals and warranties, supplier catalogues and handbooks • equipment startup, operation and shutdown procedures • gene technology regulations • guide to physical containment levels and facility types • material safety data sheets (MSDS) • material, production and product specifications • National Code of Practice for the labelling of workplace substances (NOHSC:2012 (1994)) • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • OHS national standards and codes of practice • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals • standard operating procedures (SOPs) • Therapeutic Goods Regulations 1009
Laboratory equipment and instruments	Laboratory equipment and instruments may include: • balances • density bottles, pipettes, burettes and volumetric glassware • thermometers, melting point apparatus, water baths and incubators • optical microscopes, refractometers and polarimeters • conductivity meters and pH meters • ion selective electrodes • autoclaves • mixing and separating equipment, such as centrifuges, rifflers and splitters and mixers • noise meters and blast meters • pressure gauges, torque testers, load cells, strain gauges and tensiometers

RANGE STATEMENT	
	• disintegration apparatus, penetrometers, hardness testing equipment, viscometers, soil compaction and classification equipment • colorimeters and spectrometers • chromatographic equipment and electrochemical equipment • cell analysers and cell counters • motors, pumps and generators
Basic repairs	Basic repairs may include: • replacement of fuses and reagents and consumables • cleaning and/or replacement of cells, torches and burners • installation, conditioning and removal of columns for gas chromatographs (packed and capillary) and liquid chromatographs (columns and guard columns) • changing injection port ferrules • connecting gas supplies • maintaining syringes/injection equipment • cleaning detectors • appropriate storage of columns and other equipment not currently in use • changing detectors (for gas liquid and liquid chromatographs) • optimising nebulisers • replacement of lamps • realignment of components • replacement of hoses and belts • replacement or top up of oils, lubricants or coolants • basic electrical checks involving simple digital multimeters
Calibration status/qualification checks	Calibration status/qualification checks may include: • matching cells (for dual beam instruments) • checks for monochromator wavelength and photometric accuracy • checks for baseline flatness and stray light • checks on electrode performance • checking sensitivity

RANGE STATEMENT	
	• injection/use of standard mixtures • comparison with manufacturer's specifications/ chromatogram • use of standard masses and solutions • use of calibrated thermometers and glassware to assess instrument/component performance
Hazards	Hazards may include: • electric shock • chemicals, such as acids and cleaning agents • fluids under pressure, such as steam and industrial gases • sharps, such as broken glassware • sources of heat, such as burners, ovens and furnaces • manual handling of heavy equipment • crushing, entanglement and cuts associated with moving machinery
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as hearing protection, gloves, safety glasses, coveralls and safety boots • ensuring access to service shut-off points • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations • following appropriate manual handling procedures • regular cleaning of equipment and work areas • machinery guards • signage, barriers and service isolation tags • lockout and tag-out procedures
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time

RANGE STATEMENT	
	• all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL936001A Maintain quality system and continuous improvement processes within work_functional area

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers responsibility for the day-to-day operation of the work/functional area and ensuring that quality system requirements are met and that continuous improvements are initiated.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers and laboratory supervisors working in all industry sectors. Quality audits and evaluations for the work area may be undertaken as an individual or as part of a team under broad direction from scientists/medical staff/engineers. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop and maintain quality framework within work area	1.1. Distribute and explain information about the enterprise's quality system to personnel 1.2. Encourage personnel to participate in improvement processes and to assume responsibility and authority 1.3. Allocate responsibilities for quality within work area in accordance with quality system 1.4. Provide coaching and mentoring to ensure that personnel are able to meet their responsibilities and quality requirements
2. Maintain quality documentation	2.1. Identify required quality documentation, including records of improvement plans and initiatives 2.2. Prepare and maintain quality documentation and keep accurate data records 2.3. Maintain document control system for work area 2.4. Contribute to the development and revision of quality manuals and work instructions for the work area 2.5. Develop and implement inspection and test plans for quality controlled products
3. Provide training in	3.1. Analyse roles, duties and current competency of

ELEMENT	PERFORMANCE CRITERIA
quality systems and improvement processes	relevant personnel 3.2. Identify training needs in relation to quality system and continuous improvement processes 3.3. Identify opportunities for skills development and/or training programs to meet needs 3.4. Initiate and monitor training and skills development programs 3.5. Maintain accurate training records
4. Optimise and report performance	4.1. Review performance outcomes to identify ways in which planning and operations could be improved 4.2. Enhance customer service through the use of quality improvement techniques and processes 4.3. Adjust plans and communicate these to personnel involved in their development and implementation
5. Evaluate relevant components of quality system	5.1. Undertake regular audits of components of the quality system that relate to the work area 5.2. Implement improvements in the quality system in accordance with own level of responsibility and workplace procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • implementing and monitoring defined quality system requirements • initiating continuous improvements within the work area • applying effective problem identification and problem solving techniques • strengthening customer service through a focus on continuous improvement • implementing, monitoring and evaluating quality systems • gaining commitment of individuals/teams to quality principles and practices • implementing effective communication strategies • encouraging ideas and feedback from team members when developing and refining techniques and processes • analysing training needs and implementing training programs

REQUIRED SKILLS AND KNOWLEDGE
• preparing and maintaining quality and audit documentation
Required knowledge
Required knowledge includes: • communication/reporting protocols • continuous improvement principles • enterprise business goals and key performance indicators • enterprise information systems management • enterprise organisational structure, delegations and responsibilities • policy and procedure development processes • relevant health, safety and environment requirements • relevant national and international quality standards and protocols • standard operating procedures (SOPs) for the technical work performed in work area • the enterprise quality system

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • implement and monitor defined quality system requirements and initiate continuous improvements within the work area • apply effective problem identification and problem solving techniques • strengthen customer service through a focus on continuous improvement • implement, monitor and evaluate quality systems in the work area • initiate quality processes to enhance the quality of performance of individuals and teams in the work area • gain commitment of individuals/teams to quality

EVIDENCE GUIDE	
	principles and practices • implement effective communication strategies • encourage ideas and feedback from team members when developing and refining techniques and processes • analyse training needs and implement training programs • prepare and maintain quality and audit documentation.
Context of and specific resources for assessment	This unit of competency should be assessed in a laboratory environment that either meets Australian standards for working laboratories or is accredited by NATA or the Royal College of Pathology, as appropriate.Competency in this unit should be assessed over a sufficient period of time to enable the candidate to initiate and implement improvements. This unit of competency may be assessed with: • *MSL915001A Provide information to customers*. Resources may include: • quality manuals and documentation • quality tools, such as Pareto charts, strengths, weakness, opportunities, threats (SWOT) analysis and plan, do, check, act (PDCA) • quality and customer data.
Method of assessment	The following assessment methods are suggested: • observation of the candidate leading a quality improvement team • review of verified reports of improvement initiatives and/or projects conducted by the candidate • feedback from peers, team members, supervisors, quality manager and customers • review of quality documentation prepared and maintained by the candidate • review of training places prepared by the candidate for personnel in the work area • review of audit processes and outcomes generated by the candidate • questions to assess underpinning knowledge of procedures and contingency management. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those

EVIDENCE GUIDE	
	aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** The laboratory supervisor with a pharmaceutical company had participated in the production of a company wide quality manual. This manual was distributed to the various work teams and an induction program for all workers was undertaken to familiarise them with the demands of the quality system. A transient, sharp improvement in laboratory operations was observed after which the quality metrics fell (although not to pre-quality system levels). The supervisor investigated this phenomenon and found that many of the analytical specifications determined by the company were detailed in the quality manual and nowhere else. Put simply, after an initial period during which laboratory personnel consulted the manual for guidance, there was a tendency for the personnel to rely more on their memories and less on the manual. The supervisor made it clear to personnel that 'guessing' procedures and methodologies was unacceptable. If they were uncertain of something they must consult the manual. Awareness of this problem allowed the supervisor to be more vigilant in monitoring laboratory operations and personnel eventually developed the habit of referring to the manual as required. A subsequent review of the manual went smoothly and efficiently. The staff were familiar with the manual's strengths and shortcomings and had made annotations for

EVIDENCE GUIDE	
	improvements that were readily incorporated during the review. **Environmental** Collection of botanical specimens for research purposes required personnel to record data at the time of collection in a prescribed format. A quality audit conducted by the laboratory supervisor indicated that some documentation was incomplete. The supervisor also found that sometimes documentation was completed later, from memory, rather than in the field. The supervisor met with the collectors involved, reinforced the enterprise protocols, explained the importance of diligent record keeping in achieving valid research outcomes and gained a renewed commitment to quality from the personnel. Subsequent quality audits indicated that the personnel had met their commitment and the research work was no longer jeopardised. **Food processing** The laboratory supervisor of a food processing company had noted over recent years that the requests of some customers were virtually impossible to fulfil. For example, one customer wanted a bleached flour which had not undergone any chemical treatment or adulteration for a particular market niche. Another customer wanted analytical results within an unrealistic timeframe. While none of these requests had caused serious friction between the company and its customers, the supervisor decided to take a proactive stance to address the not altogether unreasonable ignorance of some customers. After consulting with the laboratory manager, the supervisor invited all customers to tour the laboratory, during which the aims and limitations of the analytical procedures were explained. The tour gave customers the opportunity to assess their demands of the company and generate more realistic ideas for modifying the company's products to suit their needs. The outcomes of this exercise were that company-customer relations were improved, the future expectations of some customers were more practical and the company's ongoing program of product improvement was facilitated by customer input.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1199 Sampling procedures and tables for inspection by attributes
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS ISO 10013-2003 Guidelines for quality management system documentation
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 1199 Sampling procedures and tables for inspection by attributes
	• Association of Analytical Communities International (AOAC International) Official Methods of Analysis
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• BS 5750 Quality systems
	• Codex Alimentarius standards

RANGE STATEMENT	
	• customer specific requirements/standards • enterprise and customer product specifications • hazard analysis and critical control points (HACCP) principles • National Association of Testing Authorities (NATA) Accreditation programs requirements • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • quality manuals and procedures • Therapeutic Goods Regulations 1009
Quality audits	Quality audits may include: • regular checks of laboratory procedures • daily and weekly checks of specimen reception, instrumentation and results for control and standard samples to identify non-conformance and problem areas • maintenance of appropriate certified reference materials (CRMs) • participation in external quality assurance programs
Communication	Communication may involve: • supervisors, managers and quality managers • laboratory and production personnel • customers and suppliers • auditors
Reporting	Reporting may include: • verbal responses • data entry into laboratory or enterprise databases • written reports
Documentation	Documentation may include: • sampling plans • enterprise quality manual • quality (certification or registration) requirements • audit documents

RANGE STATEMENT	
	• performance plans and reports • training records and/or plans • workplace procedures relating to occupational health and safety (OHS), equal opportunity (EO) and environmental legislative requirements • industrial awards and enterprise agreements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units	

Co-requisite units		

MSL936002A Conduct an internal audit of the quality system

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare for, carry out and document an internal audit of aspects of the laboratory's quality system. It also covers the implementation of the identified corrective action and opportunities for improvement and the monitoring of their effectiveness.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers and laboratory supervisors working in all industry sectors. These people play a key role in the audit team due to their knowledge of the quality system and their broad technical expertise and specialised knowledge of procedures and technology. This unit of competency represents a thorough examination of various aspects of the quality system. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for internal audit	1.1. Analyse brief to determine the scope and detailed requirements of the planned audit 1.2. Identify procedures and/or the work area to be audited, and collect relevant documentation 1.3. Brief relevant personnel and allocate roles and responsibilities 1.4. Develop a detailed audit plan in consultation with relevant personnel 1.5. Develop a checklist to identify conformance and non-conformance
2. Conduct audit	2.1. Explain the components of the quality system and work area to be audited 2.2. Collaborate with relevant personnel to maximise continuous improvement and ownership of the audit

ELEMENT	PERFORMANCE CRITERIA
	process 2.3. Collect sufficient evidence to identify non-conforming aspects of the quality systems 2.4. Analyse evidence to identify suitable corrective actions
3. Report findings	3.1. Document findings from the audit process in the required format 3.2. Present recommendations for corrective actions 3.3. Provide strategies for the implementation of the corrective actions
4. Complete corrective actions	4.1. Develop and implement an action plan to improve the quality system 4.2. Consult with relevant personnel regarding the necessary strategies to improve the quality system 4.3. Evaluate and report the effectiveness of the corrective action after an agreed time interval 4.4. Ensure that relevant certification is maintained

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skill include:

- preparing and conducting an audit of the quality system following enterprise procedures
- implementing corrective action and monitoring its effectiveness
- implementing effective communication strategies
- collecting and analysing all necessary data/documentation/records
- encouraging suggestions and feedback from team members when developing and refining processes
- monitoring and reviewing the team's performance
- applying effective problem identification and problem solving techniques
- preparing and maintaining quality and audit documentation
- making recommendations based on the findings of non-conformance items
- initiating and evaluating corrective action and making appropriate adjustments

REQUIRED SKILLS AND KNOWLEDGE
Required knowledge
Required knowledge includes: • enterprise quality system, relevant national and international quality standards and protocols • audit process • continuous improvement principles • importance of identifying and reporting non-conformance • documentation processes • problem solving techniques to identify causes and options to remedy problems • workplace communication reporting requirements and procedures • enterprise organisational structure, responsibilities and delegations • relevant health, safety and environment requirements • laboratory's business goals and key performance indicators **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example: Food processing: • incorporate food safety and/or hazard analysis and critical control points (HACCP) plan requirements into audit • monitor and verify critical control limits

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • prepare and conduct an audit of the quality system following enterprise procedures • implement corrective action and monitor its effectiveness • implement effective communication strategies before, during and after an audit

EVIDENCE GUIDE	
	• collect and analyse all necessary data/documentation/records • encourage suggestions and feedback from team members when developing and refining processes • monitor and review the team's performance • apply effective problem identification and problem solving techniques • prepare and maintain quality and audit documentation • make recommendations based on the findings of non-conformance items • initiate and evaluate corrective action and make appropriate adjustments.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated environment. Ideally, competency should be assessed within the context of a team based internal quality audit.Competency in this unit should be assessed over a sufficient period of time to enable the candidate to prepare and conduct the audit, report the findings and implement and evaluate any corrective action. This unit of competency may be assessed with: • *MSL916002A Manage and develop teams* • *MSL936001A Maintain quality system and continuous improvement processes within work/functional area*. Resources may include: • quality manuals and documentation • quality system requirements.
Method of assessment	The following assessment methods are suggested: • observation of the candidate's performance at key points during the audit • review of data and reports obtained from audit records • review of documentation completed by the candidate as part of the development of the audit process • feedback from team members • feedback from management regarding the implementation of the internal audit. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those

EVIDENCE GUIDE	
	aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A new laboratory is being planned and the senior technical officer has been included in the steering committee to prepare the brief. The committee has decided that the preparation of the brief will include an audit of the safety and operating standards of the current laboratory. The aim of the audit will be to compare the current safety operations and facilities that are acceptable within the framework of the current premises with those of a modern building. The audit will monitor equipment, storage facilities and current methodologies in order to determine the necessary infrastructure changes that might be incorporated into the plan, or changes in methodologies that would bypass the need for the building changes through a change in equipment. **Biomedical** There have been a few problems in the sample reception area. Not all tests specified in requests have been allocated and, on a few occasions, a test was deleted because a technical assistant decided that there was insufficient sample provided. The supervisor has decided that the processing system should be reviewed and the reasons for the mistakes and omissions identified. After tracking the sample arrival, processing, labelling and distribution, the supervisor noted that the technical

EVIDENCE GUIDE	
	assistants often could not identify the sample test code. Despite the instruction to seek assistance, they did not contact a supervisor if they could not be approached immediately. Sometimes they put the sample aside for the supervisor's attention and it was forgotten over the shift change. On other occasions, they assigned a test code in good faith. As a result of the audit, a database of the test codes, sample requirements, distribution destination and conditions for storage was established at sample reception. The technical assistants were shown how to access information that they might require if the supervisor was not available. This action reduced the number of mistakes and the frequency of test omissions, and improved throughput of samples. **Food processing** Following an internal audit, a major non-conformance was identified which had resulted in a beverage label listing an ingredient that was not present. A corrective action had been made requiring that a new form be generated for release of label details from the purchasing department. The laboratory supervisor was given the responsibility as part of the audit team to follow up three weeks later and confirm that the corrective action had been completed. The laboratory supervisor gathered the data and a copy of the corrective action report and organised a meeting with staff from the purchasing department. During the meeting, the laboratory supervisor checked the revised quality form that now included the signature of the authorising officer from the purchasing department. The laboratory supervisor also reviewed the quality procedures to ensure that the new form's code was updated and that all old copies were removed. The report was then presented to the audit team for final approval and signing off.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1199 Sampling procedures and tables for inspection by attributes
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS ISO 10013-2003 Guidelines for quality management system documentation
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • BS 5750 Quality systems
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• customer specific requirements/standards
	• HACCP principles
	• National Association of Testing Authorities (NATA) Accreditation programs requirements
	• National Health and Medical Research Council (NHMRC) Guidelines
	• national measurement regulations and guidelines
	• principles of good laboratory practice (GLP)
	• occupational health and safety (OHS) national standards and codes of practice
	• quality manuals and procedures

RANGE STATEMENT	
	• Therapeutic Goods Regulations 1009
Elements of a quality system	Elements of a quality system may include: • responsibilities of personnel within quality system • contract review • inspection and test status • control of non-conforming product • design control • document and data control • purchasing • control of customer-supplied product • product identification and traceability • process control • inspection and testing • statistical analysis • corrective and preventative action • handling, storage, packaging, preservation and delivery • control of quality records • internal quality audits • training • servicing • control of inspection, measuring and test equipment
Information sources	Information sources may include: • enterprise quality manual • documentation related to the quality elements being audited • customer complaints • training records • data records • certification documentation from clients/suppliers • material/equipment specifications
Quality improvement tools and techniques	Quality improvement tools and techniques may include: • run charts, control charts, histograms and scattergrams to present quality control data • plan, do, check, act (PDCA)

RANGE STATEMENT	
	• Ishikawa fishbone diagrams and cause and effect diagrams • logic tree • similarity/difference analysis • Pareto charts and analysis • force field/strengths, weaknesses, opportunities, threats (SWOT) analysis • process capability
Communication	Communication may involve: • managers • customers and suppliers • laboratory and production personnel • other personnel with quality assurance responsibilities
Reporting	Reporting may include: • verbal responses, • judgement and recommendations • written reports and presentations • data entry into laboratory or enterprise databases
Documentation	Documentation may include: • audit documents • enterprise quality manual and HACCP plans • safety procedures, standard operating procedures (SOPs), work instructions • quality (certification or registration) requirements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection

RANGE STATEMENT	
	control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Maintenance

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL943001A Work safely with instruments that emit ionising radiation

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to safely store, transport and operate instruments that emit ionising radiation following established safe work practices and in accordance with laboratory procedures and licensing requirements. Examples include, use of process control instrumentation, such as fluid level gauges using radioactive sources, on-site non-destructive testing of weldments using X-ray and gamma ray sources and density testing of asphaltic concrete.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory or field assistants working in construction materials testing or similar industry sectors. They work under supervision or direction of paraprofessionals. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Store instruments safely and securely	1.1. Identify state or territory requirements for storage facilities and associated document processes 1.2. Store instruments in accordance with state or territory requirements and documented procedures 1.3. Secure instruments to prevent unauthorised access 1.4. Record instruments' movements and usage in accordance with documented procedures
2. Transport instruments safely and securely	2.1. Select vehicle suitable for the purpose 2.2. Attach regulation signage in accordance with state or territory requirements to indicate that radioactive sources are being carried 2.3. Ensure that instruments are properly located and fixed securely in place

ELEMENT	PERFORMANCE CRITERIA
	2.4. Ensure security of instruments when the vehicle is unattended
3. Use instruments safely and maintain security	3.1. Follow safe working practices to minimise own exposure to radiation 3.2. Use radiation dosimeter to monitor own exposure to radiation 3.3. Follow safe work practices to minimise exposure of others to radiation 3.4. Follow safe work practices to protect the instrument from damage 3.5. Maintain instrument security
4. Monitor radiation levels	4.1. Check operation and calibration status of radiation survey meter 4.2. Perform radiation survey following documented procedure 4.3. Report atypical conditions and/or problems to appropriate personnel
5. Maintain records	5.1. Record observations, data and results in accordance with enterprise procedures 5.2. Maintain confidentiality of enterprise information
6. Perform emergency procedures	6.1. Identify potential emergency situations 6.2. Respond to emergencies in accordance with documented procedures 6.3. Report emergency situations to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • demonstrating emergency procedures • performing and documenting radiation surveys using radiation monitors • using a radiation dosimeter • placing the instrument into storage safely and securely

REQUIRED SKILLS AND KNOWLEDGE
• transporting the instrument in a motor vehicle safely • safely handling and maintaining the instrument and keeping other personnel clear of radiation sources • observing, interpreting and reporting atypical situations • promptly communicating problems to appropriate personnel
Required knowledge
Required knowledge includes: • health, safety and emergency procedures relevant to radioactive devices • factors affecting radiation intensity • principles of external radiation protection and practical methods of minimising radiation exposure • methods of measuring and detecting ionising radiation • nature of radiation, different types of radiation, their characteristics, sources and shielding methods • physiological effects of ionising radiation • state or territory licensing requirements • national codes of practice • general guidelines for safe handling of radiation sources

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform operations in accordance with standards, codes, procedures and enterprise requirements • safely handle, store and transport instruments keeping other people clear of radiation sources • perform and document radiation surveys • recognise, interpret and report problems to appropriate personnel promptly.
Context of and specific resources for	This unit of competency is to be assessed in the

EVIDENCE GUIDE	
assessment	workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Process and interpret data* • *MSL943002A Participate in laboratory/field workplace safety* • *MAL974010A Perform mechanical tests*. Resources may include: • appropriate tools, instruments, equipment and materials • enterprise procedures, test methods, equipment and manuals.
Method of assessment	The following assessment methods are suggested: • analysis of work completed by the candidate over a period of time to ensure accuracy, consistency and timeliness • observation of candidate using the instruments in a range of work contexts • review of enterprise documentation completed by the candidate • feedback from peers and supervisors • use of suitable simulation and/or a range of case studies/scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and show its relevance in a workplace

EVIDENCE GUIDE	
	setting. **Construction materials testing** Soil moisture density gauges are used extensively for measuring the density of soils, cement treated roadbase, roller compacted concrete and asphalt. They provide a non-destructive means of monitoring compaction operations during construction, so that additional rolling can be provided before the material sets or is covered with another layer. National and state/territory codes of practice regulate the use of equipment that emits ionising radiation. States and territories also have licensing and registration requirements for people involved in owning, storing, transporting or using such equipment. Soil moisture density gauges are used on construction sites, so they are transported to the test site in motor vehicles. They must be protected from damage and stored safely and securely while not in use. The operator must ensure that bystanders are kept clear to minimise radiation exposure. Owners of gauges are required to have documented procedures and ensure that operators are adequately trained. To ensure the safety and integrity of the gauge, radiation surveys are required at regular intervals. A hand-held radiation meter is used, and the results recorded.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:

RANGE STATEMENT	

	• Australian and international standards, such as:
	  • AS 2243.4-1998 Safety in laboratories - Ionising radiations
	  • AS/NZS 2243.5:2004 Safety in laboratories - Non-ionising radiations - Electromagnetic, sound and ultrasound
	• Australian Dangerous Goods Code
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• equipment manuals
	• equipment startup, operation and shutdown procedures
	• licensing requirements
	• material, production and product specifications
	• National Association of Testing Authorities (NATA) Accreditation programs requirements
	• national environment protection measures
	• National Health and Medical Research Council (NHMRC) Guidelines
	• occupational health and safety (OHS) national standards and codes of practice
	• production and laboratory schedules
	• quality manuals
	• standard operating procedures (SOPs)

Instruments and equipment used	Instruments and equipment used may include: • soil moisture/density gauges • borehole logging probes • fluid density/level detectors • battery chargers • radiation monitors/dosimeters • motor vehicles • storage areas for nuclear sources • documentation, including user manuals and enterprise safety manuals • radiation warning signs
Hazards and problems	Hazards and problems may include: • jamming of the source rod in the exposed position

RANGE STATEMENT	
	• incidents during transportation • fire • theft of equipment containing radioactive sources • on-site accidents • keeping other personnel clear of instrument • instrument breakdown
Critical elements for radiation safety	Critical elements for radiation safety include: • time (reduce the exposure time) • distance (maintain greatest distance possible at all times) • shielding (interpose as much radiation shielding between yourself and the radiation source as possible)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Occupational health and safety

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL943002A Participate in laboratory/field workplace safety

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to follow workplace occupational health and safety (OHS) policies and procedures, deal with the identification and control of hazards, work safely at all times, follow emergency response procedures and contribute to the maintenance of workplace safety.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants and instrument operators working in all industry sectors. OHS responses are restricted to a 'first response' approach, including the notification of appropriate enterprise personnel. Workers will be provided with clear directions, information, training and appropriate supervision. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify, control and report OHS and environmental hazards	1.1. Routinely check immediate work area for hazards prior to commencing and during work 1.2. Address hazards within area of responsibility 1.3. Report hazards and incidents to designated personnel according to enterprise policies and procedures
2. Conduct work safely	2.1. Select, fit and use appropriate personal protective clothing and equipment 2.2. Follow enterprise procedures when carrying out work tasks 2.3. Keep all work areas clean and free from obstacles 2.4. Maintain enterprise standards of personal hygiene 2.5. Safely store, transport and dispose of hazardous materials and dangerous goods

ELEMENT	PERFORMANCE CRITERIA
3. Follow incident and emergency response procedures	3.1. Identify incident and emergency situations 3.2. Report and record incident and emergency situations according to enterprise procedures 3.3. Follow incident and emergency procedures as appropriate to the nature of emergency, using emergency equipment according to enterprise procedures
4. Contribute to OHS in the workplace	4.1. Raise OHS and environmental issues with designated personnel in accordance with enterprise procedures and legislated rights and obligations of employees 4.2. Participate in OHS activities within scope of responsibilities

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- recognising potential incidents and taking appropriate corrective action
- demonstrating workplace fire drill, incident, first aid and emergency evacuation procedures
- hazard identification and risk control, following OHS and environmental policies and procedures
- using, storing and maintaining personal protective equipment
- storing, transporting and disposing of dangerous goods following enterprise instructions and procedures
- using equipment to protect health and safety
- promptly communicating health and safety and environmental issues to designated personnel

Required knowledge

Required knowledge includes:

- roles, rights and responsibilities of self and employer
- signage, symbols and signals relating to OHS
- hazards commonly found in own job and work area and standard risk controls

REQUIRED SKILLS AND KNOWLEDGE
• location and purpose of personal protective equipment and emergency/hazard control equipment in the work area, including first aid facilities and personnel • use, care and storage requirements for personal protective clothing and equipment used • location of advice and information on OHS issues, including material safety data sheets (MSDS) • requirements and procedures for reporting OHS hazards and incidents, including injuries, illness and near misses • the processes for raising a health and safety issue or concern • safe work practices, including handling, storage and disposal of hazardous substances and requirements for labelling of hazardous substances • work practices for use of handling equipment and any task-specific manual handling techniques as required by work role, according to enterprise procedures • standard operating procedures (SOPs) for equipment used and key safety elements of the procedures • environmental impacts and effects of interaction with hazards in the work area • enterprise procedures and instructions that govern personal work, incidents and emergencies • reporting requirements for OHS issues and potentially hazardous situations • site layout, including emergency exits, location and use of safety alarms, emergency response system, procedures and personnel • enterprise OHS and environmental policies and procedures

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • work safely • recognise potential incidents and hazards and take appropriate corrective action • follow workplace incident, first aid and emergency response procedures • promptly communicate OHS and environmental issues to designated personnel.

EVIDENCE GUIDE	
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • other relevant technical units of competency. Resources may include: • laboratory/field work environment, equipment and materials • personal protective equipment • enterprise procedures.
Method of assessment	The following assessment methods are suggested: • observation of the candidate preparing for and undertaking a range of work tasks • written and/or oral questioning to assess underpinning knowledge and likely reactions in hazardous/emergency situations • feedback from peers and supervisors • review of candidate's responses to case studies, scenarios and/or 'what ifs'. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Manufacturing** A laboratory assistant working in a laboratory was asked to produce a particular solvent-borne paint. Because of

EVIDENCE GUIDE	
	the hazardous nature of the task, the assistant referred to the MSDS which specified that a particular respirator and gloves be used. The assistant followed the requirements and safely prepared the batch of paint. **Food processing** One task of a laboratory assistant in a food processing company is the determination of total nitrogen in food samples by the Kjeldahl method. The assay involves digestion of the food with an aliquot of 30% hydrogen peroxide and several other reagents at more than 400°C. The assistant is familiar with the MSDS for hydrogen peroxide and uses this chemical with appropriate caution and personal protective equipment. Small spills of hydrogen peroxide sometimes occur. The assistant knows to clean these up immediately by liberally diluting the spill with water, mopping it up with a cloth and washing the hydrogen peroxide from the cloth into a sink with copious amounts of water. This attention to cleanliness is essential to minimise the risk of injury because 30% hydrogen peroxide has the appearance of water. Unlike water, it is corrosive to skin and presents a serious fire or explosion hazard if it should come into contact with many of the chemicals used in the laboratory. **Biomedical** After performing and verifying cell counts of plated samples, a technical assistant proceeded to dispose of the waste. The wastes were placed in a biohazard bag. The bag was sealed with a sterilisation indicator sticker that was clearly visible, and placed in the autoclave. The assistant checked the colour of the indicator sticker to ensure that the waste was correctly processed before disposing of the bag in accordance with SOPs.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, codes, procedures and/or enterprise requirements	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 2252 Biological safety cabinets
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	• AS/NZS 1269 Set:2005 Occupational noise management set
	• AS/NZS 1337 Eye protection
	• AS/NZS 2161 Set:2008 Occupational protective gloves set
	• AS/NZS 2210:1994 Occupational protective footwear
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	• AS/NZS 4501 Set:2008 Occupational clothing set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• HB 9-1994 Occupational personal protection
	• Australian Dangerous Goods Code
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• Australian Radiation Protection and Nuclear

RANGE STATEMENT	
	Safety Agency (ARPANSA) Codes of Practice • gene technology regulations • Guide to physical containment levels and facility types • National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)] • OHS national standards and codes of practice
Routine checks	Routine checks may include: • general housekeeping checks, such as obstructions which may cause trip hazards • checking of safety equipment, such as eye wash stations • checking reagents and equipment are safe to use • checking availability of emergency equipment • checking functionality of personal protective equipment
Hazards	Hazards may include: • electric shock • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • solar radiation, dust and noise • chemicals, such as acids, heavy metals, pesticides and hydrocarbons • aerosols from broken centrifuge tubes and pipetting • radiation, such as alpha, beta, gamma, X-ray and neutron • sharps, broken glassware and hand tools • flammable liquids • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam, hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry • sources of ignition • high temperature ashing processes • disturbance or interruption of services • occupational overuse syndrome, slips, trips and falls

RANGE STATEMENT	
	• manual handling, working at heights and working in confined spaces • crushing, entanglement and cuts associated with moving machinery or falling objects • pedestrian and vehicular traffic • vehicle and boat handling

Addressing hazards	Addressing hazards may include:
	• hazard and incident reporting and investigation procedures
	• elimination
	• substitution, such as review of nature of substances or processes used
	• isolation:
	  • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets
	  • Class PCII, PCIII, and PCIV physical containment laboratories
	• engineering
	• administrative procedures, such as:
	  • ensuring access to service shut-off points
	  • recognising and observing hazard warnings and safety signs
	  • labelling of samples, reagents, aliquoted samples and hazardous materials
	  • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
	  • identifying and reporting operating problems or equipment malfunctions
	  • cleaning and decontaminating equipment and work areas regularly using recommended procedures
	  • applying containment procedures
	  • following established manual handling procedures for tasks involving manual handling
	  • use of appropriate equipment and procedures to avoid personal contamination

RANGE STATEMENT	
	and contamination of others • following risk control measures to minimise environmental hazards • use of practices which minimise waste • reporting to appropriate personnel of abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates • minimising exposure to radiation, such as lasers, electromagnetic and ultraviolet • use MSDS • use of signage, barriers and service isolation tags • use of personal protective equipment, such as hard hats, hearing protection, sunscreen lotion, gloves, safety glasses, goggles, face guards, coveralls, gown, body suits, respirators and safety boots
Designated personnel	Designated personnel may include: • laboratory manager • supervisor • OHS coordinator • OHS representative
Enterprise policies and procedures	Enterprise policies and procedures may refer to: • OHS specific procedures, such as hazard and incident reporting, communication, consultation and issue resolution and risk management • controlling known hazards • minimising environmental threats • minimising and disposing of waste • responding to safety, emergency, fire and incidents • selecting/using personal protective clothing and equipment
Incidents	Incidents may include: • workplace injury and accidents • cutting, stabbing, puncturing, crushing,

RANGE STATEMENT	
	immersion in water, suffocation, hypothermia, burns, heat stress, animal bites, allergic reactions and assaults • biological, chemical or radioactive spills, fire, bomb threat, security threat and explosion
Emergency equipment	Emergency equipment may include: • first aid equipment • eye wash kit or shower • fire extinguisher
Participating in OHS activities	Participating in OHS activities may include: • seeking assistance to clarify obligations and procedures • clarifying work instructions that impact on safety and legal liability
OHS and environmental issues which may need to be raised by employees with designated personnel	OHS and environmental issues which may need to be raised by employees with designated personnel may include: • identification of hazards not otherwise addressed • assessment of risk and decisions on measures to control risk • risk reduction measures • problems with implementation of controls • problems with recycling, by-product collection and waste disposal • investigation of injury and incidents • clarification of understanding of OHS policies and procedures
OHS and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply

RANGE STATEMENT	
	current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Occupational health and safety

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL944001A Maintain laboratory/field workplace safety

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to monitor and maintain occupational health and safety (OHS) and environmental programs within a work area where the person has supervisory responsibility for others.

Application of the Unit

Application of the unit	This unit is applicable to laboratory technicians, senior technicians and laboratory managers in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Perform all work safely	1.1. Use established work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 1.2. Clean, care for and store equipment, materials and reagents as required 1.3. Minimise the generation of wastes and environmental impacts 1.4. Ensure safe disposal of laboratory/hazardous wastes
2. Ensure others in the work group are able to implement safe work practices	2.1. Ensure hazard controls and personal protective clothing and equipment appropriate to the work requirements are available and functional 2.2. Provide and communicate current information on OHS and environmental policies, procedures and programs to others 2.3. Ensure hazards and control measures relating to work responsibilities are known by those in the work area 2.4. Provide support to those in the work area to implement procedures to support safety 2.5. Identify and address training needs within level of responsibility
3. Monitor observance of safe work practices	3.1. Ensure enterprise procedures are clearly defined, documented and followed

ELEMENT	PERFORMANCE CRITERIA
in the work area	3.2. Identify any deviation from identified procedures and report and address within level of responsibility 3.3. Ensure personal behaviour is consistent with enterprise policies and procedures 3.4. Encourage and follow up others to identify and report hazards in the work area 3.5. Monitor conditions and follow up to ensure housekeeping standards in the work area are maintained
4. Participate in risk management processes	4.1. Report and address any identified hazards and inadequacies in existing risk controls within level of responsibility and according to enterprise procedures 4.2. Participate in risk assessments to identify and analyse risks 4.3. Support the implementation of procedures to control risk (based on the hierarchy of control) 4.4. Ensure records of incidents in the work area and other required documentation are accurately completed and maintained according to enterprise procedures and legislative requirements
5. Support the implementation of participative arrangements	5.1. Inform and consult work group on OHS and environmental issues relevant to the work role 5.2. Promptly report outcomes of consultation on OHS and environmental issues back to the work group 5.3. Resolve, or promptly refer to appropriate personnel, matters raised relating to OHS and the environment
6. Support the implementation of emergency procedures within the work group	6.1. Ensure that enterprise procedures for dealing with incidents and emergencies are available and known by work group 6.2. Implement processes to ensure that others in the work area are able to respond appropriately to incidents and emergencies 6.3. Participate, as required, in investigations of hazardous incidents to identify their cause

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

REQUIRED SKILLS AND KNOWLEDGE
Required skills
Required skills include: • performing all work safely • following procedures for hazard identification and risk control • ensuring others in the team are able to implement safe work practices • preparing brief reports for a range of target groups, including OHS committees, OHS representatives, managers and supervisors
Required knowledge
Required knowledge includes: • definition of hazard, physical hazard, risk and risk management • hazards commonly found in the work area and standard risk controls • signage, symbols and signals relating to OHS • location and purpose of personal protective equipment and emergency/hazard control equipment in the work area, including first aid facilities and personnel • use, care and storage requirements for personal protective clothing and equipment used in work areas • roles and responsibilities under OHS legislation of employers and employees, including supervisors and contractors • requirements for record keeping that address OHS, privacy and other relevant legislation • principles and practices of effective OHS management, including hazard identification, risk assessment and risk control • the hierarchy of control • enterprise procedures for OHS and environmental management • key personnel within enterprise management structure and the OHS management system • sources of OHS information, including specialist advisors • the elements of an OHS management system which includes that part of the enterprise's overall management system for developing, implementing, reviewing and maintaining the activities for managing OHS risks associated with their business • how the characteristics and composition of the workforce impact on OHS management

Evidence Guide

EVIDENCE GUIDE

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • work safely at all times • ensure others in the workgroup work safely and follow OHS and environmental policies and procedures for hazard identification and risk control • communicateOHS and environmental issues with designated personnel • ensure that enterprise procedures for dealing with incidents and emergencies are available and known by work group • communicate effectively with personnel at all levels within the enterprise and OHS specialists • prepare brief reports for a range of target groups.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. Resources may include: • laboratory/field work environment, equipment and materials • personal protective equipment and safety equipment • enterprise OHS management system, policies and procedures.
Method of assessment	The following assessment methods are suggested: • feedback from peers and supervisors • review of documentation prepared by candidate, such as OHS committee minutes, risk assessments and incident reports • written and/or oral questioning to assess underpinning knowledge of principles and practices of effective OHS management and the enterprise's OHS management system, OHS policies and procedures • observation of the candidate preparing for and undertaking a range of work tasks. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those

EVIDENCE GUIDE	
	aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Education** A technical officer working for a university biology school assists honours and final year undergraduate students to perform their own experiments. The students discuss what technical work they want to do with the technical officer and what reagents and equipment will be needed. The technical officer provides MSDS and other information to the student. He/she also conducts a risk assessment to identify and analyse the risks, selects appropriate controls and outlines the risk management process to be used. In some cases, the toxicity of mixtures and the waste generated by experiments may pose an unacceptable level of risk and the technical officer will suggest safer alternatives.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

RANGE STATEMENT	
regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 2252 Biological safety cabinets
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	• AS/NZS 1269 Set:2005 Occupational noise management set
	• AS/NZS 1337 Eye protection
	• AS/NZS 2161 Set:2008 Occupational protective gloves set
	• AS/NZS 2210:1994 Occupational protective footwear
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	• AS/NZS 4501 Set:2008 Occupational clothing set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• HB 9-1994 Occupational personal protection
	• Australian Dangerous Goods Code
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice

RANGE STATEMENT	
	• gene technology regulations • Guide to physical containment levels and facility types • National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)] • OHS national standards and codes of practice
Hazards	Hazards may include: • electric shock • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • solar radiation, dust and noise • chemicals, such as acids, heavy metals, pesticides and hydrocarbons • aerosols from broken centrifuge tubes and pipetting • radiation, such as alpha, beta, gamma, X-ray and neutron • sharps, broken glassware and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam, hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry • sources of ignition • high temperature ashing processes • disturbance or interruption of services • occupational overuse syndrome, slips, trips and falls • manual handling, working at heights and working in confined spaces • crushing, entanglement and cuts associated with moving machinery or falling objects • pedestrian and vehicular traffic • vehicle and boat handling • factors, such as inadequate work practices, lack of training or fatigue are not hazards but are conditions that may result in the loss of control of the hazard and cause injury or damage

RANGE STATEMENT	

Addressing hazards	Addressing hazards may include:
	• hazard and incident reporting and investigation procedures
	• elimination
	• substitution, such as review of nature of substances or processes used
	• isolation:
	  • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets
	  • Class PCII, PCIII, and PCIV physical containment laboratories
	• engineering
	• administrative procedures, such as:
	  • ensuring access to service shut-off points
	  • recognising and observing hazard warnings and safety signs
	  • labelling of samples, reagents, aliquoted samples and hazardous materials
	  • handling and storing hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
	  • identifying and reporting operating problems or equipment malfunctions
	  • cleaning and decontaminating equipment and work areas regularly using enterprise procedures
	  • applying containment procedures
	  • following established manual handling procedures for tasks involving manual handling
	  • using appropriate equipment and procedures to avoid personal contamination and contamination of others
	  • following risk control measures to minimise environmental hazards
	  • using practices which minimise waste
	  • reporting to appropriate personnel of abnormal emissions, discharges and

RANGE STATEMENT	
	airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates • minimising exposure to radiation, such as lasers, electromagnetic and ultraviolet • using MSDS • using signage, barriers and service isolation tags • using personal protective equipment, such as hard hats, hearing protection, sunscreen lotion, gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators and safety boots
Enterprise policies, procedures and programs include those that directly or indirectly cover OHS and environmental issues	Enterprise policies, procedures and programs include those that directly or indirectly cover OHS and environmental issues, such as: • hazards and control measures • minimisation of environmental threats • minimisation and disposal of waste • standard operating procedures (SOPs), work instructions, laboratory manuals, operator's manuals and manufacturers' operating manuals • safety, emergency, fire and other incidents • selection and use of personal protective clothing and equipment • reporting of hazards and incidents • consultation and issue resolution • risk management • contractor and employee handbooks • formulas and batch sheets • industry codes of practice and guidelines
Risk assessment	Risk assessment includes: • analysing the risk • identifying factors influencing the risk and the range of potential consequences • effectiveness of existing controls • likelihood of each consequence considering exposure and hazard level • combining these in some way to obtain a level of risk

RANGE STATEMENT	
	• comparison of the determined risk with pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring control

Hierarchy of control	Hierarchy of control includes:
	• the preferred order of risk-control measures from most to least preferred, that is:
	  • eliminating risk
	  • substituting with a lesser hazard
	  • isolating personnel from hazard
	  • engineering controls
	  • applying administrative controls (e.g. procedures and training)
	  • using personal protective equipment

OHS and environmental issues	OHS and environmental issues may include: • identification of hazards • assessment of risk and decisions on measures to control risk • risk reduction measures • implementation of controls • investigation of injury and incidents • hazards not otherwise addressed • problems in implementing risk controls • incidents • clarification of policies or procedures
Consultation with the workgroup on OHS and environmental issues	Consultation with the workgroup on OHS and environmental issues may involve: • following OHS procedures and environmental risk control measures • information sessions on existing or new issues • meetings between employer and employees or representatives • access to relevant workplace information • use of clear and understandable language • provision for non-English speaking personnel • provision for hearing-impaired personnel • awareness of databases and online software for the inventory, manifest and information retrieval regarding hazardous materials

RANGE STATEMENT	
	• formal arrangements, such as health and safety committees and health and safety representatives (where appointed) • informal arrangements, such as toolbox meetings and coffee breaks
Incidents and emergencies	Incidents and emergencies may include: • workplace injury and accidents • biological and chemical spills • leakage of radioactivity • fire • bomb threat • security threat
OHS and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Occupational health and safety

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL946001A Implement and monitor OHS and environmental management systems

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to implement and monitor the occupational health and safety (OHS) and environmental management systems for a work group or laboratory, within the scope of a 'head officer's' responsibilities as defined in AS/NZS 2243 Set:2006 Safety in laboratories. Where the OHS management system is already established then this unit of competency may apply to the review of the system.

Application of the Unit

Application of the unit	The unit of competency is applicable to personnel in a senior technician or laboratory supervisor role. Personnel work in accordance with work instructions and standard operating procedures (SOPs) which incorporate all relevant aspects of OHS legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods. This unit assumes that expert OHS and environmental advice is available, as required, either internal or external to the enterprise. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Implement requirements for the OHS and environmental management systems	1.1. Ensure OHS and environmental responsibilities and duties are documented and accountability processes are in place 1.2. Ensure OHS and environmental policies and procedures are documented and that documents are accessible to all relevant personnel 1.3. Ensure implications of any proposed changes to the OHS and environmental management systems are identified and addressed 1.4. Recognise limits of own professional expertise and

ELEMENT	PERFORMANCE CRITERIA
	consult specialists as necessary
2. Implement and maintain participative arrangements for the management of OHS and the environment	2.1. Implement and maintain appropriate participative processes with employees and their representatives in accordance with relevant OHS legislation and industry standards 2.2. Provide information to employees in a format that is readily accessible and understandable 2.3. Promptly and effectively deal with and resolve issues raised through participation and consultation 2.4. Provide information about the outcomes of participation and consultation to employees
3. Implement and maintain OHS and environmental risk management processes	3.1. Ensure hazard, incident and injury reporting and investigation processes are in place to meet prevention and legislative requirements 3.2. Implement a process of hazard identification and risk assessment 3.3. Ensure risk controls and hazard specific procedures for risk control comply with legislation and the hierarchy of control
4. Implement and maintain an OHS and environmental training program	4.1. Conduct a training needs assessment for the workgroup that takes account of legislative requirements, internal policies and procedures, skills of workgroup and risk control requirements 4.2. Develop and implement training programs to identify and fulfil employees' OHS and environmental training needs 4.3. Coordinate with relevant OHS and environment specialists
5. Implement and maintain a system for records	5.1. Identify and address the legal requirements for record keeping 5.2. Identify and access sources of OHS and environmental information 5.3. Ensure that records are accurately completed, collected and stored
6. Identify areas for systems improvement	6.1. Collect data and information to evaluate management systems 6.2. Analyse data and information to identify areas for improvement 6.3. Consult with stakeholders, key personnel and expert advisors 6.4. Document and communicate outcomes of analysis to

ELEMENT	PERFORMANCE CRITERIA
	key personnel and stakeholders in an easily understood format 6.5. Recognise limits of own expertise and seek appropriate advice
7. Initiate and maintain systems improvements	7.1. Determine priorities in consultation with stakeholders 7.2. Develop an OHS and environmental plan in consultation with stakeholders 7.3. Identify and source resources required for implementation of plan 7.4. Monitor achievement against plan 7.5. Monitor effectiveness of modifications to the management systems on an ongoing basis in consultation with stakeholders

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- accessing and interpreting OHS and environmental legislation, regulations, codes of practice and updates
- analysing the work environment and judging OHS and/or environmental interventions
- consulting stakeholders on safety and environmental issues, hazard identification, risk assessment, selection and implementation of control measures and their review
- raising issues related to concerns with safety of work systems and work environment through consultation with management and employees
- addressing OHS and environmental management issues
- developing and implementing improvements in work practices and procedures
- providing appropriate supervision, support and information in accordance with workplace procedures
- keeping complete, current and secure OHS and environmental records
- communicating effectively with personnel at all levels of the organisation and OHS specialists
- preparing summary reports for a range of target groups

REQUIRED SKILLS AND KNOWLEDGE

Required knowledge

Required knowledge includes:

- roles and responsibilities under OHS and environmental legislation of employers and employees, including supervisors and contractors
- legislative requirements for OHS information and consultation
- requirements for record keeping that address OHS, environmental management, privacy and other relevant legislation
- relevant national and Australian standards, including those related to OHS and environmental management systems
- guidelines for OHS and environmental management systems produced by the relevant state regulators
- principles and practices of effective OHS management, including hazard identification, risk assessment and risk control
- the hierarchy of control
- definition of risk as the chance of something happening that will result in injury or damage measured in terms of consequences and likelihood
- definition of risk management as the whole systematic process that is directed towards identifying hazards, assessing the risk, developing controls to minimise the risk, monitoring the effectiveness of the controls and taking action as required
- participative consultation processes, general and specific to OHS and environmental management systems
- hazard policies and procedures (including housekeeping and inspections)
- OHS, environmental and waste status record keeping
- enterprise purchasing policy and procedures for safety related supplies and equipment
- counselling/disciplinary/issue resolution processes
- waste minimisation, recycling of chemicals and water, by-product collection, equipment maintenance and microbiological waste disposal
- how the characteristics and composition of the workforce impact on OHS and environmental management
- sources of OHS and environmental management information, including specialist advisors
- nature of hazards relevant to the particular workplace
- key personnel within enterprise management structure and the OHS and environmental management systems
- organisational OHS and environmental management policies and procedures

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Biomedical sector:

REQUIRED SKILLS AND KNOWLEDGE
• procedures and control measures for spillage of infected material in the public or non-laboratory domain

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • access and interpret relevant sections of OHS and environmental legislation, regulations, codes of practice and updates • analyse the work environment and judge OHS and/or environmental interventions • consult employees and other stakeholders on safety and environmental issues, hazard identification, risk assessment, selection and implementation of control measures and their review • raise issues related to concerns with safety of work systems and work environment through consultation with management and employees • promptly address OHS and environmental management issues within their area of control • develop and implement improvements in work practices and procedures to reduce the risk of illness and injury and meet OHS legislative requirements • provide appropriate supervision, support and information in accordance with workplace procedures • keep OHS and environmental records complete, current and secure • communicate effectively with personnel at all levels of the organisation and OHS specialists • prepares summary reports for a range of target groups, including OHS committee, OHS representatives, managers and supervisors.
Context of and specific resources for	This unit of competency is to be assessed in the

EVIDENCE GUIDE	
assessment	workplace or simulated workplace environment. This unit of competency may be assessed with units dealing with communication, supervision and training, for example: • *MSL915001A Provide information to customers* • *MSL916003A Supervise laboratory operations in work/functional area* • *MAL916004A Maintain registration and statutory or legal compliance in work/functional area*. Resources may include: • relevant OHS and environmental legislation and regulations • codes of practice • workplace procedures.
Method of assessment	The following assessment methods are suggested: • review of information developed by the candidate and provided to the work group • review of records and reports generated by the candidate • feedback from team members and managers regarding provision of information and the candidate's ability to implement and monitor established management systems • written and/or oral questioning to assess underpinning knowledge and likely reactions to simulated incidents. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.

EVIDENCE GUIDE	
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** The smoke alarms have sounded and a general evacuation of the building has commenced. The fire brigade has been summoned in accordance with enterprise procedures. All personnel, except the designated floor wardens, have moved to the assembly area. The supervising staff report to the brigade officers that there is smoke and fumes on the first floor. The brigade officers don respirators and enter the building. A search establishes that a small fire has started in the drying oven when technicians used it to evaporate off a flammable solvent. The incident is the result of a careless mistake. With the cause of the smoke fumes identified, the brigade officers organise for the air conditioning system to exhaust the fumes. Once the building can be accessed, the laboratory supervisor prepares an incident report, organises follow-up counselling for the laboratory staff and implements measures to prevent a recurrence of the hazardous situation. **Food processing** A supervisor in the laboratory of a food processing company was concerned that an audit of the risks associated with the company's activities had never been performed. When individual risk situations were identified they were usually addressed on a case by case basis. The supervisor realised that this approach did not have the rigour to identify less obvious hazards. A risk audit was conducted in cooperation with the laboratory team to overcome this deficiency. The audit progressed well and was performed without unduly disrupting the primary functions of the laboratory. Several previously unrecognised hazards were identified. One of the more esoteric hazards concerned the use of proteases and lipases to selectively digest specific food components. Before the audit, these enzymes were thought harmless. However, it was discovered that these bacterial proteins could provoke a potentially fatal allergic reaction in sensitised individuals especially after inhalation. Furthermore, repeated exposure could induce sensitivity. After this hazard was identified, a SOP was developed

EVIDENCE GUIDE	
	for handling these enzymes. Individuals likely to come into close contact with the enzymes were required to regularly undergo an allergen sensitivity test.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.

Standards. **codes**, **procedures and/or enterprise requirements**	Standards. codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 2252 Biological safety cabinets
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	• AS/NZS 1269 Set:2005 Occupational noise management set
	• AS/NZS 1337 Eye protection
	• AS/NZS 2161 Set:2008 Occupational protective gloves set
	• AS/NZS 2210:1994 Occupational protective footwear
	  • AS/NZS 2243 Set:2006 Safety in laboratories set

RANGE STATEMENT	
	• AS/NZS 2865 Set:2005 Safe working in a confined space set • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements • AS/NZS 4187:2003 Cleaning, disinfecting and sterilizing reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities • AS/NZS 4452:1997 The storage and handling of toxic substances • AS/NZS 4501 Set:2008 Occupational clothing set • AS/NZS ISO 14000 Set:2005 Environmental management standards set • HB 9-1994 Occupational personal protection • Australian Dangerous Goods Code • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 • Australian Quarantine and Inspection Service (AQIS) Import Guidelines • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice • batch sheets • contractor and employee handbooks • emergency, fire and incident procedures • environmental incident procedures • formulas • gene technology regulations • guide to physical containment levels and facility types • handling and disposal of micro-organisms and heavy metals • hazard policies and procedures • hazardous goods manifest and substance register • immunisation registers for employees at risk • maintenance schedules • manufacturers' operating manuals • monitoring and appropriate tasking of personnel with possible infections

RANGE STATEMENT	
	• National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)] • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • OHS national standards and codes of practice • personal protective clothing and equipment procedures • safety procedures • standard operating procedures (SOPs) • work instructions
Stakeholders	Stakeholders may include: • managers • supervisors • health and safety and other employee representatives • OHS committees • laboratory and production personnel • external OHS agencies • workers' families • the community

Participative processes with employees and their representatives	Participative processes with employees and their representatives may include:
	• committees:
	  • OHS
	  • consultative
	  • planning
	• employee and supervisor involvement in OHS activities such as inspections, audits and risk assessments
	• procedures for reporting hazards and raising and addressing OHS issues
	• identification of hazards
	• assessment of level of risk
	• implementation of risk control measures and review of effectiveness
	• injury and incident investigations
	• the development of policies and procedures
	• review of OHS records and statistics
	• review of registers of hazardous substances

RANGE STATEMENT	
	and dangerous goods • audits and workplace inspections • job safety analysis • consultation with workers
Characteristics and composition of the workforce which have an impact on OHS and environmental management	Characteristics and composition of the workforce which have an impact on OHS and environmental management may include: • language and literacy • communication skills • cultural background • gender • workers with special needs • part time, casual or contract workers

Hazard identification processes	Hazard identification processes include:
	• review of hazard and incident reports
	• workplace inspections
	• pre-purchase risk assessments
	• review of relevant internal documentation, including material safety data sheets (MSDS), manufacturer's manuals and minutes of meetings
	• review of legislation, codes of practice, standards and guidelines
	• review of publications such as:
	  • OHS regulators
	  • industry bodies
	  • journals
	  • newsletters

Risk assessment	Risk assessment is a process that involves analysing the risk to identify factors influencing the risk and the range of potential consequences and assessing: • effectiveness of existing controls • likelihood of each consequence considering exposure and hazard level • combining these in some way to obtain a level of risk A complete risk assessment will also include comparison of the determined risk with

RANGE STATEMENT	
	pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring control
Hierarchy of control	Hierarchy of control, also referred to as the 'safety decision hierarchy' describes the preferred order of risk control measures from most to least preferred, that is: • elimination, or where this is not practical • substitution with a lesser hazard • isolate personnel from hazard • engineering controls • administrative controls, such as enterprise procedures and training • personal protective equipment
Data for evaluation of the management systems	Data for evaluation of the management systems may include: • hazard, incident and injury reports • workplace inspections • audit reports • formal and informal input of employees
OHS and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Occupational health and safety

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL952001A Collect routine site samples

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to collect samples at field or production sites using specified equipment and standard or routine procedures.

Application of the Unit

Application of the unit	This unit of competency is applicable to production operators, field assistants and laboratory assistants in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for sampling	1.1. Confirm the purpose, priority and scope of the sampling request 1.2. Liaise with relevant personnel to arrange site access and all necessary clearances/permits 1.3. Identify site hazards and review enterprise safety procedures 1.4. Confirm what samples are to be collected, from where, how and when 1.5. Assemble all specified sampling equipment, safety equipment, materials and containers 1.6. Conduct pre-use and cleanliness checks of all items to ensure they are fit for purpose 1.7. Check all items against given inventory and stow them to ensure safe transport
2. Conduct sampling	2.1. Locate sampling points and services at the site 2.2. Remove security devices, such as locks and covers as required 2.3. Seek advice if the required samples cannot be collected or if procedures require modification 2.4. Select and use required sampling equipment in accordance with given procedures 2.5. Closely follow sampling procedures to obtain required samples and maintain their integrity

ELEMENT	PERFORMANCE CRITERIA
	2.6. Record all labelling information in accordance with enterprise/legal traceability requirements 2.7. Record sample appearance, environmental conditions and any other factors that may impact on sample integrity 2.8. Replace security devices, such as locks and covers as required
3. Finalise sampling	3.1. Follow enterprise procedures for the cleaning/decontamination of equipment and vehicle as necessary 3.2. Check all equipment, materials and samples against inventory and stow for safe transport 3.3. Liaise with relevant personnel to restore normal production and/or services as necessary 3.4. Maintain integrity of samples during transportation 3.5. Deliver samples to the required collection point and complete all documentation to ensure traceability 3.6. On return, check and document serviceability of equipment before storage
4. Maintain a safe work environment	4.1. Use established work practices and personal protective equipment to ensure personal safety and that of others 4.2. Minimise environmental impacts of sampling and generation of waste 4.3. Dispose of all waste in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • collecting a variety of samples at a range of sites closely following sampling procedures • collecting samples safely with minimal environmental impact • maintaining the integrity and security of samples

REQUIRED SKILLS AND KNOWLEDGE
• demonstrating enterprise and/or legal traceability requirements • liaising with others to access sites and conduct sampling efficiently • recognising own limitations the seeking timely advice
Required knowledge

Required knowledge includes:
• key terminology and concepts, such as sample, contamination, traceability, integrity and chain of custody
• concepts of metrology
• the international system of units (SI)
• purpose for which the samples have been collected
• the function of key sampling equipment/materials and principles of operation
• hazards, risks and enterprise safety procedures associated with routine sampling undertaken
• enterprise procedures dealing with:
  • sampling
  • waste management, clean up and spillage
  • handling, transport and storage of dangerous goods
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • correctly follow sampling procedures and plans when collecting samples • collect samples efficiently, safely and with minimal environmental impact • maintain the integrity and security of samples following the traceability requirements • recognise limitations and seek timely advice.
Context of and specific resources for	This unit of competency is to be assessed in the

EVIDENCE GUIDE	
assessment	workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL972001AConduct routine site measurements*. Resources may include: • variety of sample types • sampling procedures • a selection of sampling containers, equipment and documentation.
Method of assessment	The following assessment methods are suggested: • review of sampling documentation completed by the candidate • review of the quality of samples collected by the candidate • observation of the candidate collecting a variety of samples at a range of sites • feedback from supervisors and clients that sampling plans were followed • oral/written questioning about sampling and safety procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Construction materials testing** A laboratory assistant takes daily tar samples from the

EVIDENCE GUIDE	
	company's retort which is used to heat tar to reduce its moisture content. The purpose of this sampling program and subsequent testing is to ensure that the water content of the hot tar is at a safe level before the tar is transferred to a road tanker and used for road construction. Serious accidents can occur during the transfer or use of tar as high water content can cause an explosion due to escape of steam. One day, the retort operator was running behind schedule and tried to convince the laboratory assistant that the water content of the tar was the same as yesterday and didn't need to be tested. The laboratory assistant was able to explain that a high water content could lead to a serious explosion and burns for the operator. **Environmental** A new field assistant was collecting samples of environmental run-off during wet weather. To successfully complete the activity, the assistant made sure that they included a sample thief, pipette, or similar to extract the sample, a container with a secure lid, and an indelible marker to write on the label. In addition, the assistant remembered to take sealable, waterproof plastic bags in which to put the containers once the samples were collected and a spare bag to protect the field notebook from rain damage. **Manufacturing** A production operator has been given the task of collecting samples of the recent batches of blended products, prior to drumming and customer delivery. In addition, the operator is required to sample the bulk raw materials stored on-site, and the drummed blend ingredients, including some powdered pigments. The operator knows that the lab needs the blend samples first and after putting on chemical gloves and safety glasses, accesses each sample point on each of the blend tanks. Because the products are under pressure in the tank manifold, it is important to guard against splashes. Some of the products are flammable hydrocarbons, so the operator ensures that static leads are connected from the tank to the sample vessel during pouring. To sample the drummed product, a sample thief is used and again, safety glasses and chemical gloves are important. The pigments present a dust hazard when being sampled, so the operator applies a protective mask over their nose and

EVIDENCE GUIDE	
	mouth, to prevent ingestion while they use a small purpose-built shovel to empty the contents into the sample container.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• enterprise sampling procedures for specific samples, sites and clients
	• environmental legislation and regulations
	• equipment manuals
	• equipment startup, operation and shutdown procedures
	• industry codes of practice
	• maps and site plans

RANGE STATEMENT	
	• material safety data sheets (MSDS) • material, production and product specifications • National Association of Testing Authorities (NATA) documents regarding construction materials testing • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • quality manuals • safety procedures • standard operating procedures (SOPs)
Site hazards	Site hazards may include: • solar radiation, dust and noise • wildlife, such as snakes, spiders and domestic animals • biohazards, such as micro-organisms and agents associated with soil, air and water • chemicals, such as acids and hydrocarbons • sharps and broken glassware • manual/handling of heavy sample bags and containers • crushing, entanglement and cuts associated with moving machinery and hand tools • falling objects, uneven surfaces, heights, slopes, wet surfaces, trenches and confined spaces • vehicle handling in rough terrain and boat handling in rough or flowing water
Safety procedures	Safety procedures may include: • use of MSDS • use of personal protective equipment, such as hard hats, heavy protection, gloves, safety glasses, goggles, faceguards, coveralls, gowns, body suits, respirators and safety boots • correct labelling of hazardous materials • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions and enterprise procedures and regulations • regular cleaning and/or decontamination of

RANGE STATEMENT	
	equipment • machinery guards • signage, barriers, service isolation tags, traffic control and flashing lights • lockout and tag-out procedures
Types of samples	Types of samples may include: • grab samples • disturbed or undisturbed materials • composite samples, such as time, flow proportioned and horizontal/vertical cross section • quality control samples, such as controls, background, duplicate and blanks
Materials sampled	Materials sampled may include: • gas or air samples • water, wastewater, stormwater, sewage and sludge • soils • construction materials • solid wastes, such as commercial, industrial and mining • raw materials, start, middle, end of production run samples and final products for a wide range of manufactured items, including food and beverages • hazardous materials and/or dangerous goods
Sampling tools and equipment	Sampling tools and equipment may include: • front-end loader, backhoe, excavator and drill rig • shovels, augers and bucket • sampling frames, sampling tubes, dip tubes, spears, flexible bladders and syringes • access valves • sample thief • weighted sample bottles, bottles, plastic/metal containers and disposable buckets • sterile containers, pipettes, inoculating loops and disposable spoons • pumps and stainless steel bailers

RANGE STATEMENT	
Maintenance of integrity of samples	Maintenance of integrity of samples could include: • appropriate containers and lids (e.g. glass, plastic, amber and opaque) • sealing of sample containers • purging of sample lines and bores • decontamination of sampling tools between collection of consecutive samples • use of appropriate preservatives (e.g. sodium azide, toluene or antibiotics) • wrapping container in foil or wet newspaper • temperature control, which may involve prevention of direct contact between the sample and coolant • transfer of sterile sample into sterile container • monitoring of storage conditions • enterprise/legal traceability through appropriate sample labelling and records
Services	Services may include: • water supply, gas and electricity • telecommunications • irrigation, stormwater and drainage systems • production plant
Minimising environmental impacts	Minimising environmental impacts may involve: • replacement of soils and vegetation • driving to minimise soil erosion and damage to fauna and vegetation • disposal of surplus, spent or purged materials • recycling of non-hazardous wastes • appropriate disposal of hazardous waste • cleaning of vehicles to prevent transfer of pests and contaminants
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time

RANGE STATEMENT	
	• all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL952002A Handle and transport samples or equipment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to pick up and transport samples or test/calibration equipment in a way which ensures the integrity of subsequent test results.

Application of the Unit

Application of the unit	This unit of competency is applicable to couriers and laboratory and field assistants in all industry sectors. The person transporting the items is not necessarily responsible for sampling or testing. This unit does not cover sample collection or the ability to handle and transport animals as might be defined under prevailing animal care and ethics legislation and practices. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for pickup	1.1. Confirm pickup sequence and any licence/permit requirements with supervisor 1.2. Check that vehicle and communication devices are in working order 1.3. Check that required transport containers and materials are in the vehicle
2. Pick up and transport items	2.1. Confirm the number and nature of items to be picked up on arrival 2.2. Ensure items match paperwork 2.3. Apply enterprise requirements to the transport of samples and/or equipment 2.4. Alert laboratory personnel to any special needs that are identified on documents accompanying the items 2.5. Complete required documentation at pickup point 2.6. Stow items in the specified transport containers and under the required conditions

ELEMENT	PERFORMANCE CRITERIA
	2.7. Maintain sample integrity at all times 2.8. Deliver items to reception point in accordance with enterprise procedures 2.9. Maintain confidentiality of information
3. Maintain transport equipment	3.1. Maintain vehicle according to enterprise requirements 3.2. Maintain state of transport containers to ensure they are fit for purpose 3.3. Requisition stocks of consumable materials as required 3.4. Replenish stocks of collecting equipment at collection centres as required
4. Maintain a safe work environment	4.1. Use established work practices and personal protective equipment to ensure personal safety and that of others 4.2. Clean up spills, if they occur, using enterprise procedures 4.3. Minimise the generation of waste 4.4. Dispose of all waste in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- planning the picking up of items in conjunction with a supervisor
- preparing a vehicle for the required journey
- using communication devices so contact is possible between the courier, reception centre, and routine pickup locations
- communicating effectively and courteously with individuals, customers, clients and reception staff
- recording details of item exchange in relevant sections of chain of custody forms, as required
- maintaining the integrity of collected samples or equipment during transport
- containing and cleaning up spillage or breakages

REQUIRED SKILLS AND KNOWLEDGE
• using appropriate techniques and equipment to safely dispose of waste materials • maintaining confidentiality in all aspects of work • reporting of problems, accidents or incidents in accordance with enterprise procedures
Required knowledge
Required knowledge includes: • the relationship between effective communication with clients and customers and enterprise business • the need for appropriate and timely transport • control measures for minimising exposure to hazardous materials and equipment • effect of changes in environmental conditions, vibration and shock on samples • procedures for the containment and cleanup of spillages and breakages • efficient waste containment and disposal practices • maintenance requirements of equipment used in the processes of handling and transporting samples • relevant health, safety and environment requirements • enterprise procedures for responding to emergencies • contact details for key personnel **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example:Biomedical samples: • labile nature of biological and environmental samples • possible infectivity of biological materials • possible effects of exposure to radioactive materials

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • follow required policies and procedures to maintain the integrity of collected samples or equipment

EVIDENCE GUIDE	
	during transport • deal with customers effectively and courteously • work safely • maintain confidentiality and report problems, accidents and incidents in accordance with procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • vehicle • enterprise procedures for the handling and transport of samples or equipment • communication devices • sample containers • containers for transporting samples and test/calibration equipment.
Method of assessment	The following assessment methods are suggested: • review of the job sheets or journal of completed activities • direct observation of work as a courier • the quality of review of results traceable to the transport of samples or equipment by candidate • oral or written questions to assess knowledge of the handling of unforseen circumstances • simulated role plays between a courier and personnel at a reception desk or customer pickup centre. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required.

EVIDENCE GUIDE	
	The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Calibration** Calibration laboratories must take special care to ensure that they do not damage test equipment during handling, testing or storage. Information relating to equipment requiring special handling, transport or storage conditions should be provided to those responsible for collecting and transporting the items. A customer-orientated calibration laboratory offers a door to door calibration service to most of its clients. Once a week their driver arrives at a major facility and takes delivery of several precision measuring instruments. As always, the driver signs the acceptance note paying particular attention that all the items are recorded correctly, including listing all accessories and associated handbooks. But this time, two delicate items require unique transit cases to ensure they are stored and transported upright. Because the laboratory received prior notice, these cases were loaded into the van before setting off as well as a copy of the special transport and packaging instructions. The driver secures all the items in accordance with the accompanied written instructions to ensure their safe travel and minimise damage during transit. Upon return, the driver unloads the van and the instruments are acquitted by administration staff, inspected for damage and booked into the laboratory. The lab supervisor makes sure that their technicians are aware of the special handling requirements of the two delicate instruments. **Biotechnology** During transit, samples must be handled and maintained under conditions which will ensure that their potency and efficacy are maintained. A courier has been asked to transport vaccine samples from the airport to the enterprise for laboratory evaluation. The supervisor faxes the courier company detailed instructions regarding

EVIDENCE GUIDE	
	pickup and handling/storage conditions during transit. In this case, the samples are in insulated containers and the temperature is monitored and recorded continuously. The courier collects the samples, puts them in the coolest part of the vehicle, ensuring that the package will not be subject to any sudden jolts, and transports them to the enterprise. After the samples arrive they are checked by the enterprise and appropriate documentation completed. **Biomedical** At 8 am the courier commences the day shift. The shift supervisor identifies the collection centres to be visited. The courier takes the mobile phone from the charger and checks their pager. In the vehicle, the courier logs in the odometer reading, makes a mental note of the fuel level, checks the cooler boxes and other equipment and carefully drives out. Today, there are pickups from four private hospitals and 12 collecting centres in a 200 sq km zone. As they approach the first hospital, there is a call from base with instructions to collect a tissue biopsy and bring it back immediately. He/she asks the base contact to tell haematology that their 10 am specimen arrival will be 40 minutes late because of this unforseen diversion. Eventually, they complete the round, having remembered to replenish specimen collecting stock at each centre visited. **Environmental (1)** A technical assistant regularly handles and transports sensitive equipment over rough terrain in a 4WD vehicle. After reaching a field site, they are asked to transport expensive water monitoring equipment across an estuary in a small aluminium boat. The assistant notes that the equipment boxes are open to the weather and will need to be made waterproof. Because the water is choppy, the assistant adds extra packing material to cushion the most shock sensitive items. They choose to travel with the equipment rather than entrusting it to the local fisherman. Together, they carefully secure the items on the seats rather than placing them on the floor of the boat which is wet. **Environmental (2)** A waste management authority has sent one of their laboratory technicians to collect six containers that have been found by a member of the public on the verge of an industrial area service road. Given that the materials may

EVIDENCE GUIDE	
	be hazardous the technician assembles a full set of safety equipment. They also locate a laptop computer with MSDS information, a list of phone contacts for agencies responsible for handling hazardous materials and suitable containers for storing/transporting potentially hazardous materials. Upon arrival at the site, the technician locates six containers of concentrated sulphuric acid which are clearly labelled. The technician consults the MSDS for information on appropriate handling, storage and transportation procedures and follows them closely.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards such as: • AS 1678 Emergency procedure guide -Transport • AS 1940-2004 Storage and handling of flammable and combustible liquids • AS 4332-2004 The storage and handling of gases in cylinders • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS 2243 Set:2006 Safety in laboratories set • AS/NZS 4452:1997 The storage and handling of toxic substances

RANGE STATEMENT	
	• AS/NZS ISO 14000 Set:2005 Environmental management standards set • animal welfare legislation and codes of practice • Australia Post Guides • Australian Dangerous Goods Code • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice • International Air Transport Association (IATA) Regulations • material safety data sheets (MSDS) • occupational health and safety (OHS) national standards and codes of practice
Paperwork and documentation	Paperwork and documentation may include: • enterprise protocols regarding customer liaison and communication • vehicle log books • protocols for use of pagers, mobile telephones and two-way radios • precautions for safe handling and handling of specific materials (e.g. toxic, infective, radioactive and dangerous goods) • precautions for the transport of volatile and unstable fluids • incident/accident report forms • spillage and waste containment and disposal protocols and containment materials
Maintenance of the integrity of samples or test/calibration equipment	Maintenance of the integrity of samples or test/calibration equipment could involve: • use of appropriate sample containers (glass, plastic and opaque) • use of appropriate preservatives • wrapping container in foil to exclude light • temperature control, which may involve prevention of direct contact between the sample and coolant • use of appropriate equipment boxes (insulated, shockproof and waterproof) • restraint of containers to prevent movement • checking sample viability during transport while avoiding unnecessary handling

RANGE STATEMENT	
Hazards	Hazards may include: • biohazards, such as micro-organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • chemicals, such as acids and hydrocarbons • sharps and broken glassware • manual handling of heavy sample bags and containers and equipment
Safety practices	Safety practices may include: • use of MSDS • use personal protective equipment, such as gloves, safety glasses, goggles and coveralls • use of biohazard containers • safe road/off road driving practices • correct labelling of hazardous materials • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontaminating of equipment and vehicle
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL953001A Receive and prepare samples for testing

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to log samples, check sample documentation, schedule and prepare samples for testing in accordance with enterprise procedures. This unit does not include testing, tissue processing or similar techniques.

Application of the Unit

Application of the unit	This unit of competency is applicable to field and laboratory assistants in all industry sectors who receive and prepare samples as part/all of their jobs in a sample reception area. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Log samples	1.1. Record date (and time of arrival, if required) of samples at enterprise 1.2. Check and match samples with request forms before they are accepted 1.3. Enter samples into the laboratory information management system (LIMS) 1.4. Apply required document tracking mechanisms 1.5. Process 'urgent' test requests according to enterprise requirements 1.6. Ensure security and traceability of all information, laboratory data and records
2. Address customer service issues	2.1. Report to referring client when samples and request forms do not comply with enterprise requirements 2.2. Refer to supervisor for instruction where 'return to source' is inappropriate or not possible 2.3. Maintain confidentiality of all client/enterprise data

ELEMENT	PERFORMANCE CRITERIA
	and information 2.4. Ensure that information provided to customers is accurate, relevant and authorised for release 2.5. Deal with customers politely and efficiently and in accordance with enterprise procedures
3. Prepare samples for testing	3.1. Perform physical separation of the samples, as required 3.2. Prepare the required number of sub-samples 3.3. Perform chemical separation of the samples as required 3.4. Place samples in appropriate transport media, if appropriate 3.5. Monitor and control sample conditions before, during and after processing
4. Distribute samples	4.1. Group samples requiring similar testing requirements 4.2. Distribute samples to work stations maintaining sample integrity 4.3. Distribute request forms for data entry or filing in accordance with enterprise procedures 4.4. Check that samples and relevant request forms have been received by laboratory personnel
5. Maintain a safe work area and environment	5.1. Apply safe work practices to ensure personal safety and that of other laboratory personnel 5.2. Use appropriate protective equipment to ensure personal safety when sampling, processing, transferring or disposing of samples 5.3. Report all accidents and spillages to supervisor 5.4. Clean up splashes and spillages immediately using appropriate techniques and precautions 5.5. Minimise the generation of wastes and environmental impacts 5.6. Ensure the safe disposal of hazardous materials and other laboratory wastes

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- receipt and logging in of samples
- checking of samples for history and acceptable transport conditions
- preparing and sub-sampling of samples
- labelling samples accurately and completely
- using standard precautions when dealing with potentially hazardous materials
- applying knowledge of the relationship between specific sample preparation and associated tests
- clarifying specific client requirements with appropriate personnel promptly
- labelling and storing samples in a way which maintains sample integrity and traceability
- disposing of samples following required procedures
- maintaining equipment and the workspace

Required knowledge

Required knowledge includes:

- enterprise procedures for the receipt, documentation, distribution and storage of samples
- potentially hazardous and unstable nature of samples
- requirement of specified sample types for specific tests
- importance of maintaining effective customer relations
- sample storage and transport requirements
- relevant health, safety and environment requirements

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:Biomedical laboratories:

- potentially infective nature of all biological materials
- nature of unstable solutions, such as anti-coagulated whole blood
- non-conformance of clotted samples for procedures, such as routine haematological tests

Evidence Guide

EVIDENCE GUIDE

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • safely receive and log samples in accordance with enterprise procedures • apply knowledge of the relationship between sample preparation requirements and associated tests • deal with customers politely and efficiently • recognise and deal with problems according to enterprise procedures • maintain sample integrity and traceability.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL913001A Communicate with other people* • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • a selection of sample containers, tubes, request forms and sample documentation • simulated samples when an authentic sample is unavailable or inappropriate.
Method of assessment	The following assessment methods are suggested: • review of sample receipt and preparation records prepared by the candidate • feedback from supervisors and peers • direct observation of sample receipt and preparation • questioning to assess knowledge of procedures where direct observation is difficult (such as sample receipt and preparation in the field). In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to

EVIDENCE GUIDE	
	accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Environmental** A laboratory assistant at a hazardous liquid waste recycling plant is required to log in all samples, match all samples with the in-house profile of the source of the waste, label them and activate the tracking procedure. He/she then prepares a sample for a series of standard tests which are determined by the profile of the waste material (acid or alkali, organic or heavy metal, etc). Given the hazardous nature of the waste, the laboratory assistant must use appropriate safety equipment at all times and ensure the safe disposal of all hazardous material. The assistant must work efficiently as these procedures are activated upon arrival of a road tanker and when the hazardous waste has been verified and judged acceptable for treatment at the plant by the laboratory supervisor. The laboratory assistant also liaises with the truck driver, or the referring client, should the samples (and/or subsequent tests) not comply with enterprise conditions for receiving the hazardous waste. **Construction materials testing and mineral assay** A laboratory assistant has received a consignment of disturbed soil samples from a client for classification testing. A test request and field logs have been sent by mail. Each sample is bagged and labelled, with the label showing the name of the client, project, date and sampling location, and a field description of the material. The laboratory policy is that samples weighing more than 20 kg must be bagged so that the individual bags do not exceed this limit and labelled as bag 1 of ..., bag 2 of ..., etc. The assistant checks to ensure all component bags of such samples are present. He/she is careful to handle the

EVIDENCE GUIDE	
	samples using safe manual handling techniques. The assistant arranges the samples in order of location and reconciles them with the test request and logs. Two samples have been shown on the request but have not been received. The assistant emails the technician who despatched them and subsequently is advised that they were overlooked during despatch and will be forwarded as soon as possible. The assistant compares the samples with the field descriptions and finds that they match. Samples that are not designated for testing immediately are set aside in the laboratory store. The remainder are placed in trays for drying in the 50ºC oven. The tray numbers are carefully written on the respective worksheets. When the samples have dried and cooled they are split out sufficiently for sieve analysis and plasticity testing, making allowance for the maximum particle size of each sample. The assistant is careful to avoid raising dust during the process. **Biomedical** A laboratory assistant has just started a shift in specimen reception and puts on a coat and gloves before touching any samples. There is a pile of samples and forms in the sample box. In some cases, the samples and forms are enclosed in a plastic bag. In other cases, they are seemingly unconnected. The assistant notices that one of the samples has a bloodstained label. She/he quickly examines the samples, isolates the leaking sample in a lockable plastic bag and places the related request form in the bag's separate compartment. The assistant then disposes of her/his dirty gloves. The assistant now logs all samples into the computer, placing to one side a sample and request form that is inadequately labelled. She/he makes a note to call the referring doctor as soon as possible. The assistant places the haematology samples in the colour-coded tray and calls the laboratory for their pickup. She/he then calls the doctor of the patient whose sample is inadequately labelled. She/he records the missing date of birth on the request form, and then barcode/labels tubes for the samples' testing. Within 30 minutes, she/he has cleared the first rush of samples. She/he takes the time to carefully empty the bin of wastes.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• Australia Post Guides
	• Australian Dangerous Goods Code
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice
	• enterprise operating procedures for preparing samples
	• enterprise quality manuals
	• gene technology regulations
	• International Air Transport Association (IATA) Regulations
	• material safety data sheets (MSDS)
	• occupational health and safety (OHS) national standards and codes of practice
	• procedure sheets for physical and chemical separation
	• procedure sheets indicating how samples and sub-samples are to be labelled, processed, distributed, flagged for urgent testing or for other non-routine requirements, including

RANGE STATEMENT	
	referral to external laboratories • procedure sheets indicating transport and storage requirements • safety manuals describing personal protective equipment requirements, control of hazardous wastes, containment and cleanup of spillages, and disposal and recycling of wastes
Samples received	Samples received may include: • gas or air samples • liquid samples, such as water and waste water, stormwater, sludges and complex mixtures and sewage • solid samples, such as soils and sediments, rocks/minerals, concrete, quarry or mining products • solid wastes, such as hazardous, non-hazardous, domestic, commercial, industrial, mining and agricultural • biological specimens such as tissue and blood • raw materials, start, middle, end of production run samples and final products
Hazards	Hazards may include: • biohazards, such as micro-organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • dust and noise • chemicals, such as acids and hydrocarbons • aerosols • sharps and broken glassware • manual handling of heavy sample bags and containers • crushing, entanglement and cuts associated with moving machinery
Safe work practices	Safe work practices may include: • use of MSDS • use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators and safety boots • use of biohazard containers and laminar flow

RANGE STATEMENT	
	cabinets • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL953002A Operate a robotic sample preparation system

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to operate a robotic sample preparation system to ensure efficient throughput of samples without sacrificing quality or safety. Personnel are expected to seek advice from their shift supervisor when non-routine problems arise.

Application of the Unit

Application of the unit	This unit of competency is applicable to instrument operators in the mining, construction materials testing and manufacturing industry sectors. Robotic sample preparation systems are used where there are high volumes of material and/or there is a need to minimise the operator's contact with potentially hazardous materials. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare robotic system for operation	1.1. Perform routine system checks at start of shift 1.2. Confirm shift priorities with supervisor 1.3. Review job requests to identify the samples, required parameters and special instructions/preparation methods for each 1.4. Identify hazards and safety equipment/procedures associated with samples, preparation methods and robotic system 1.5. Check that samples are dry and free of obvious contamination 1.6. Check that the particle size of any sample does not exceed system input size limits 1.7. Check samples against accompanying documentation and record/report any discrepancies
2. Load samples into	2.1. Scan sample barcodes into system

ELEMENT	PERFORMANCE CRITERIA
system	2.2. Load samples in the correct sequence when the system is ready 2.3. Use system monitor to ensure that correct worksheet is assigned to each sample
3. Monitor system and report errors	3.1. Monitor screen displays and conduct visual checks as necessary to ensure that system operates correctly throughout cycle 3.2. Recognise common error codes and promptly inform supervisor 3.3. Seek advice to deal with any situation beyond scope of responsibility or knowledge
4. Unload samples	4.1. Unload samples sequentially in accordance with enterprise procedures 4.2. Obtain analytical portions of each sample using enterprise procedures 4.3. Label and store analytical portions and excess sample material in accordance with enterprise procedures 4.4. Seek advice when problems are beyond scope of responsibility or knowledge
5. Maintain a safe work environment	5.1. Use safe work practices and protective equipment to ensure personal safety and that of others 5.2. Minimise the generation of waste and environmental impacts 5.3. Segregate and dispose of wastes in accordance with enterprise requirements 5.4. Clean robotic system components, care for and store equipment as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • recognising hazards and working safely at all times • interpreting and applying enterprise procedures for operating robotic system

REQUIRED SKILLS AND KNOWLEDGE
• recognising potential problems caused by prior sample handling and preparation • recognising and interpreting system error codes • communicating problems clearly and promptly to supervisor • accurately recording sample details in system
Required knowledge
Required knowledge includes: • procedures for sorting and receiving samples • sample preparation processes for common mineral ore samples • purpose of routine downstream analytical tests • procedures for preventing contamination • procedures for ensuring traceability of samples • function of key components and operating procedures forrobotic sample preparation system • hazards, control measures and operation of safety equipment relevant to job role • importance of good customer relations, throughput, costs and minimising rework • health, safety and environment requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • operate a robotic sample preparation system reliably, efficiently and safely for a range of different samples with different preparation requirements and subsequent analysis • maintain sequential control of samples through all preparation stages • recognise and report common system error codes • minimise rework, waste and environmental impacts.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment.

EVIDENCE GUIDE	
	This unit of competency may be assessed with: • *MSL953001A Receive and prepare samples for testing* • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • access to a robotic sample preparation system • a variety of mineral ore samples • sample preparation methods, equipment and reagents • safety equipment.
Method of assessment	The following assessment methods are suggested: • review of entries made by the candidate in operator and robotic system logs • review of quality control performance and analytical results traceable to samples prepared by the candidate • feedback from peers, clients and supervisors • written/oral questioning about robotic sample preparation procedures, common problems and their specified corrective actions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Mineral processing** A robot operator checks the nearby whiteboard to

EVIDENCE GUIDE	
	identify what jobs are set down for the next shift and reviews the shift handover notes. He/she locates the first rack of samples, checks that the paperwork is complete for each sample and reviews the sample preparation parameters for each. He/she checks that the samples have been dried correctly and that the listed grind times are consistent with typical values. After scanning each barcode, he loads the batch of samples from the oven racks into the input magazine and starts the robot control program. He/she checks for the sample loss indicated on the screen as each sample is prepared to ensure that any loss doesn't exceed ~2%. After 20 minutes operation, the screen displays an error code that indicates that the system has detected an air pressure problem in the pneumatic control lines. He/she promptly notifies the shift supervisor for assistance. While the supervisor is attending to the problem, the operator unloads the output magazine and removes the sample containers that have been correctly prepared according to the set parameters. He/she extracts analytical portions from each one using a standard procedure for obtaining representative samples and then boxes them up using labels generated by the system. He/she arranges for the excess sample material to be stored.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:

RANGE STATEMENT	

	• Australian and international standards, such as:
	  • AS 2939 Industrial robot systems - Safe design and usage
	  • AS 3988-1991 Copper, lead, zinc, gold and silver ores - Guide to sample preparation for the determination of gold
	  • AS 4433.2-1997 Guide to the sampling of particulate materials - Preparation of samples
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• enterprise recording and reporting procedures
	• equipment startup, operation and shutdown procedures
	• material safety data sheets (MSDS)
	• national measurement regulations and guidelines
	• principles of good laboratory practice (GLP)
	• production and laboratory schedules
	• quality manuals, equipment and procedures manuals
	• standard operating procedures (SOPs) and published preparation methods

Samples	Samples may include: • solids, such as rocks, minerals, soils, sands and stream sediments • pulverised core and other drill samples (e.g. rotary air blast (RAB), reverse circulation (RC) and aircore) • powder concentrates • dump samples and grab samples
Client requests/documentation	Client requests/documentation may include: • client profile, sample identification, sample receipt, storage and analyses • required preparation method and service charges
Sample preparation methods	Sample preparation methods may include:

RANGE STATEMENT	
	• sorting, boxing and drying • sieving • milling • primary crushing (e.g. 10 mm, 2 mm) • fine pulverising (e.g. 100 micron, 75 micron) • robotic system parameters, such as grind time, crushing time and cleaning cycles to prevent cross-contamination
Sample preparation equipment	Sample preparation equipment may include: • splitters (e.g. riffles and rotary dividers) • mills (e.g. ball, ring and rod) • bowls (e.g. chrome-steel, tungsten-carbide and zirconia) and tumblers • crushers (e.g. cone, jaw and roll), grinders and disc pulverisers • sieves • ovens • sample containers and labels
Hazards	Hazards may include: • dust, silica and fibrous materials • asbestiform minerals • naturally occurring radioactive materials (NORM) • samples containing nickel and lead-based compounds • noise and vibration • crushing, entanglement and cuts associated with moving machinery • impact injuries from contact with robot arms • failure of pneumatic hoses • manual handling of heavy loads, such as sample bags/containers, racks and trolleys • heat exhaustion/stress and fatigue
Safety equipment and procedures	Safety equipment and procedures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples and hazardous materials • extraction of dust

RANGE STATEMENT	
	• guards for moving machinery parts • noise insulation • using personal protective equipment, such as masks, heat resistant mittens, boots, goggles, coats, ear muffs, safety boots and heat reflective clothing • following established manual handling procedures • regular cleaning of equipment and work areas using enterprise procedures • reporting of abnormal emissions and airborne contaminants to appropriate personnel
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL954001A Obtain representative samples in accordance with sampling plan

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to obtain a range of samples that are representative of the source material (e.g. raw ingredients, product in process and final product) and to prepare the samples for testing. All sampling activities are conducted in accordance with a defined sampling plan. This unit does not cover the subsequent testing of the samples.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians in all industry sectors. It involves: • a range of sampling plans, samples and sampling procedures, which apply to the enterprise site, plant laboratory or field sites • enterprise products/materials and hazardous materials • a range of sampling points and/locations. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for sampling	1.1. Confirm the sampling location, number and type of samples, and timing and frequency of sampling from enterprise or client's sampling plan 1.2. Liaise with relevant personnel to arrange site access and, if appropriate, all necessary clearances and/or permits 1.3. Select sampling equipment and conditions to achieve representative samples and preserve sample integrity during collection, storage and transit 1.4. Check that all procedures are in accordance with client or enterprise requirements, relevant standards and codes 1.5. Identify site and sampling hazards and review enterprise safety procedures

ELEMENT	PERFORMANCE CRITERIA
	1.6. Assemble and check all sampling equipment, materials, containers and safety equipment 1.7. Arrange suitable transport to, from and around site as required
2. Conduct sampling and log samples	2.1. Locate sampling sites and, if required, services at the site 2.2. Conduct representative sampling in accordance with sampling plan and defined procedures 2.3. Record all information and label samples in accordance with traceability requirements 2.4. Record environment or production conditions and any atypical observations made during sampling that may impact on sample representativeness or integrity 2.5. Transport all samples back to base according to standard operating procedures (SOPs) and relevant codes
3. Prepare samples for testing	3.1. Prepare sub-samples and back-up sub-samples that are representative of the source 3.2. Label all sub-samples to ensure traceability and store in accordance with SOPs 3.3. Follow defined preparation and safety procedures to limit hazard or contamination to samples, self, work area and environment 3.4. Distribute sub-samples to defined work stations maintaining sample integrity and traceability requirements
4. Address client issues	4.1. Enter approved information into laboratory information management system (LIMS) 4.2. Report all relevant aspects of the sampling and preparation phases in accordance with enterprise procedures 4.3. Ensure that information provided to client is accurate, relevant and authorised for release 4.4. Maintain security and confidentiality of all client/enterprise data and information
5. Maintain a safe work environment	5.1. Clean all equipment, containers, work area and vehicles according to enterprise procedures 5.2. Check serviceability of all equipment before storage 5.3. Use defined safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel

ELEMENT	PERFORMANCE CRITERIA
	5.4. Minimise the generation of wastes and environment impacts 5.5. Ensure the safe collection of all hazardous wastes for appropriate disposal

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • collecting representative samples in accordance with a sampling plan • techniques to preserve the integrity of samples • identifying atypical materials and samples and taking appropriate action • maintaining sampling equipment • completing sampling records • working safely • following requirements for the disposal of waste and the preservation of the environment
Required knowledge
Required knowledge includes: • principles of representative samples • principles and procedures for random, systematic and stratified sampling, consistency of sampling procedures • preservation of the integrity of samples • maintaining identification of samples relative to their source • enterprise and/or legal traceability requirements • cost effectiveness of sampling • characteristics of product/material to be sampled and likely contaminants • links between quality control, quality assurance, quality management systems and sampling procedures • enterprise procedures dealing with legislative requirements for the handling, labelling and transport of hazardous goods • links between correct occupational health and safety (OHS) procedures and personal and environmental safety particularly at high risk sites

REQUIRED SKILLS AND KNOWLEDGE
Specific industry Additional knowledge requirements may apply for different industry sectors. For example:Biomedical and environmental services: • specific legislation on biohazards • documentation procedures for the chain of custody for samples to be used as evidence or for blood transfusion

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • collect the specified quantity of sample to enable all processing and testing to occur and back-up samples to be stored • obtain a sample that is representative of the bulk material • preserve the integrity of samples by closely adhering to procedures • label samples and sub-samples to satisfy enterprise/legal traceability requirements • identify atypical materials and samples and take appropriate action • maintain sampling equipment in appropriate condition • complete sampling records using enterprise procedures • follow safety regulations and enterprise OHS procedures during sampling, transport and storage • follow relevant legislative requirements for the disposal of waste and the preservation of the environment.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment.

EVIDENCE GUIDE	
	This unit of competency may be assessed with: • *MSL924001A Process and interpret data* • *MSL943002A Participate in laboratory/field workplace safety* • *relevant MSAL974000 series units of competency* • *relevant MSAL975000 series units of competency relevant to the sampling*. Resources may include: • variety of sample types • sampling plans • a selection of sampling containers and sampling equipment.
Method of assessment	The following assessment methods are suggested: • inspection of samples collected by the candidate • review of sampling documentation completed by the candidate • feedback from peers, customers and supervisors that sampling plans were followed • questioning to assess underpinning knowledge of representative sampling procedures • observation of the candidate taking a range of samples. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace

EVIDENCE GUIDE	
	setting. **Manufacturing** A metallurgical laboratory technician is very familiar with preparing representative samples for a range of final products in a steelmaking plant. One day, he/she is asked to sample a 50 tonne small-particle coal delivery which is believed to have a higher than acceptable sulphur content. Having never prepared representative samples for such a large quantity of material, the technician consulted their supervisor and developed an appropriate sampling plan. The technician arranged for the operator of a small front-end loader to take buckets of coal from five equally spaced points around the pile. The resulting material was then combined and mixed in one heap. The technician coned and quartered the heap enough times to obtain a representative sample of about 5kg. He/she arranged for the unwanted material to be returned to the stockpile. On return to the laboratory, the technician crushed the sample and repeatedly coned and quartered the material to obtain an analytical portion. **Environmental** A field technician trained in sampling natural water systems is asked to sample a bright yellow industrial wastewater discharge into a small creek. The relevant sampling plan specifies that the samples should be collected where the waste water is well mixed near the centre of the creek and at the mid-depth point. The technician also notes that the samples must be collected where turbulence is at a maximum so that the settling of solids is minimal. On arrival at the site, the technician locates where the wastewater is entering the creek. He/she moves downstream to where the waste water and creek water is well mixed and there is little apparent loss of the yellow suspended solids. The technician dons the required personal protective equipment and uses a convenient bridge to collect a set of six samples and duplicates over a half-hour period using the equipment and procedures specified in the sampling plan. Using a field notebook, the technician records all information specified in the laboratory's chain of custody requirements and safety plan for handling potentially hazardous industrial waste.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1199 Sampling procedures and tables for inspection by attributes
	  • AS 1678 Emergency procedure guide -Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS 4433.2-1997 Guide to the sampling of particulate materials - Preparation of samples
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	• American Association of Cereal Chemists (AACC) Approved Methods of Analysis
	• Australian Dangerous Goods Code
	• enterprise and/or client sampling schemes and sampling plans
	• enterprise recording and reporting procedures
	• gene technology regulations
	• material safety data sheets (MSDS)
	• methods and procedures which may be written to meet enterprise, client and/or regulatory/certifying body requirements
	• National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)]
	• site plans, maps and specifications

RANGE STATEMENT	
Basic principles of sampling	Basic principles of sampling include: • representative samples • preservation of integrity of samples • maintaining identification of samples relative to their source, enterprise and legal traceability • cost-effectiveness of sampling • consistency of sampling procedures • sampling principles, including random, systematic and stratified sampling
Materials sampled	Materials sampled may include: • gas or air samples • liquid samples, such as water, groundwater, waste water, stormwater, sludges and sewage • solid samples, such as soil, sediments, rocks, concrete, quarry and mining material • solid wastes • raw materials, start, middle, end of production run samples, final products and materials used in production processes, such as flocculants • plants • animals • microbiological samples
Types of samples	Types of samples may include: • grab samples • composite samples • quality control samples • research or one-off samples • environmental or survey samples
Sampling tools and equipment	Sampling tools and equipment may include: • shovels, augers and chain saws • sampling frames, sampling tubes, dip tubes, spears, flexible bladders and syringes • front-end loader, backhoe, excavator and drill rig • sample bottles or containers, plastic containers and disposable buckets • access valves • sample thief • auto samplers

RANGE STATEMENT	
	• pumps and stainless steel bailers • traps and cages • sterile containers, pipettes, inoculating loops and disposable spoons
Maintenance of integrity of samples	Maintenance of integrity of samples may include: • use of compatible container, such as glass, plastic, amber and opaque bottles • use of appropriate preservatives, such as sodium azide, toluene or antibiotics • decontamination of sampling tools between collection of consecutive samples • wrapping container in foil • purging of sample lines and boxes • handling and transport to avoid disturbance or damage • temperature control which may involve insulation of sample without direct contact with the coolant • wrapping in wet newspaper, cloth, sand or sawdust • transfer of sterile sample into sterile container • monitoring of storage conditions
Site and sampling hazards	Site and sampling hazards may include: • solar radiation, dust and noise • wildlife, such as snakes, spiders and domestic animals • biohazards, such as micro-organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • chemicals, such as acids and hydrocarbons • aerosols • sharps and broken glassware • manual handling of heavy sample bags and containers • crushing, entanglement and cuts associated with moving machinery and hand tools • vehicular and pedestrian traffic
Safety procedures	Safety procedures may include: • use of MSDS

RANGE STATEMENT	
	• use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators and safety boots • use of biohazard containers and laminar flow cabinets • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontaminating equipment and work areas • machinery guards • signage, barriers, service isolation tags, traffic control and flashing lights • lockout and tag-out procedures
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL954002A Prepare mineral samples for analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	The unit of competency covers the ability to reduce given mineral samples to representative client samples and analytical portions that meet client requirements for analysis. Personnel are also required to recognise problems and invalid preparation steps and take appropriate corrective actions.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants working in the mineral assay and construction materials testing sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule client requirements	1.1. Review client request to identify sample/analysis requirements, preparation methods and equipment involved 1.2. Inspect samples, compare with specifications, record and report any discrepancies 1.3. Liaise with client when samples and/or request forms do not comply with enterprise procedures 1.4. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and equipment 1.5. Plan parallel work sequences to optimise throughput of multiple sets of samples 1.6. Assemble all required equipment materials, reagents and check they are fit for purpose
2. Prepare client samples for analysis	2.1. Estimate safe times for the preparation of required sample proportions 2.2. Split samples to obtain representative sub-samples as

ELEMENT	PERFORMANCE CRITERIA
	required 2.3. Safely operate comminution equipment 2.4. Monitor texture of the samples as an indicator of particle size and adjust milling times accordingly 2.5. Monitor sample compaction and build up of residues on equipment and rectify as necessary 2.6. Record preparation difficulties that may impact on quality or cause additional client costs 2.7. Report any departure from preparation methods or client specifications 2.8. Label client samples and record chain of custody information 2.9. Store all client samples in accordance with enterprise procedures
3. Use non-destructive methods to prepare laboratory portions for analysis	3.1. Examine the recommended preparation method to identify critical steps that will affect the quality of analytical results 3.2. Closely follow each preparation step with particular attention to safety, precision and minimisation of cross-contamination of samples 3.3. Monitor parameters that indicate completion or failure of each preparation step 3.4. Analyse and record invalid preparation steps and take corrective action before repeating the procedure 3.5. Present laboratory portions for analysis in appropriate containers with all required chain of custody documentation
4. Maintain a safe work environment	4.1. Apply established safe work practices and use protective equipment to ensure personal safety and that of other laboratory personnel 4.2. Minimise the generation of waste and environmental impacts 4.3. Ensure the safe disposal of all hazardous waste and spent/surplus samples 4.4. Clean, care for and store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • using preparation equipment • recognising hazards and working safely at all times • interpreting and following preparation methods • recognising problems and implementing corrective actions • recognising limitations and seeking timely advice • minimising rework, waste and environmental impact
Required knowledge
Required knowledge includes: • geological properties of common samples, such as sulphides, oxides and silicates • terminology, such as homogeneous, heterogeneous, integrity and segregation • distribution of common analytes in a matrix • chemical reactions associated with common preparation methods • effects of reagents on the element of interest • reaction and recovery rates, solubility and equilibria • tracking analytes of interest during changes of state • safety information, such as material safety data sheets MSDS • function of key equipment components and principles of operation • calculation steps in preparation methods (for example, serial dilution) • non-SI units (ppm, ppb) and SI units, and conversions • enterprise and/or legal traceability requirements • relevant health, safety and environmental requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • recognise hazards and work safely at all times • interpret and closely follow preparation methods • prepare a range of samples that consistently meet client requirements (that is, representative, free of contamination, specified quantity and particle size and ready for analysis) • recognise problems, atypical preparation stages and implement corrective actions • achieve required sample throughput • recognise limitations and seek timely advice • minimise rework, waste and environmental impact • dispose of all waste, surplus and spent samples responsibly.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Record and present data* • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • a variety of mineral samples • mineral preparation methods • standard operating procedures (SOPs) • mineral preparation equipment, materials and reagents • safety equipment.
Method of assessment	The following assessment methods are suggested: • sizing checks and grind performance for samples prepared by candidate • review of preparation and production documentation prepared by the candidate • review of quality control performance and analytical results traceable to samples prepared by the candidate • written/oral questioning about preparation methods, critical steps, typical problems and corrective actions • feedback from peers clients and supervisors. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those

EVIDENCE GUIDE	
	aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Mineral processing** A mining company provides a drill-core sample to a laboratory to determine its gold content as part of the company's resource estimation. A technician receives the sample and registers the details from the client specification sheet. He/she confirms that a 100g (75 micron) analytical portion is required with the coarse split to be retained for possible future testing. Noting from the sheet that the sample is likely to contain high levels of free gold, the technician carefully segregates it from all other samples. After drying and crushing the sample, the technician splits the coarse material and pulverises a sub-sample to the required particle size. He/she places it in a labelled packet and presents it to the assay section. The technician carefully cleans all the equipment used during processing the sample to prevent cross-contamination of samples.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised

RANGE STATEMENT	
wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1199 Sampling procedures and tables for inspection by attributes
	  • AS 1678 Emergency procedure guide -Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS 3988-1991 Copper, lead, zinc, gold and silver ores - Guide to sample preparation for the determination of gold
	  • AS 4433.2-1997 Guide to the sampling of particulate materials - Preparation of samples
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	• enterprise recording and reporting procedures
	• equipment startup, operation and shutdown procedures
	• MSDS
	• national measurement regulations and guidelines
	• principles of good laboratory practice (GLP)
	• production and laboratory schedules
	• quality manuals, equipment and procedures manuals
	• standard operating procedures (SOPs) and

RANGE STATEMENT	
	published preparation methods
Samples	Samples may include: • solids, such as rocks, minerals, soils, sands and stream sediments • core and other drill samples (e.g. rotary air blast (RAB), reverse circulation (RC) and aircore) • slurries, powder concentrates and metallurgical solutions • dump samples and grab samples
Client requests/documentation	Client requests/documentation may include: • client profile, sample identification and sample receipt • preparation methods, storage and analyses required • service charges
Preparation methods	Preparation methods may include: • sorting, boxing and drying • sieving • primary crushing (e.g. 10 mm, 2 mm) • fine pulverising (e.g. 100 micron, 75 micron) • partial digestion requiring separation (e.g. aqua regia) • complete digestion (e.g. multi-acid digest) • non-destructive (e.g. LIF, $Li_2B_4O_7$ disks) • solvent extraction (e.g. di isobutyl ketone dibK)
Preparation equipment	Preparation equipment may include: • splitters (e.g. riffles and rotary dividers) • mills (e.g. ball, ring and rod) • bowls (e.g. chrome-steel, tungsten-carbide and zirconia) and tumblers • crushers (e.g. cone, jaw and roll), grinders and disc pulverisers • sieves • ovens, muffle furnaces, hot plates and microwave ovens • ultrasonic baths • centrifuges and vacuum and pressure

RANGE STATEMENT	
	filtration • volumetric glassware/plastic ware and dispensers • analytical balances • auto-samplers • sample containers and labels
Hazards	Hazards may include: • asbestiform minerals, dust, silica and fibrous samples • chemicals, such as hydrofluoric acid, bromine, perchloric acid, aqua regia, cyanide, lead-based compounds, free-mercury and nickel compounds • noise and vibration • crushing, entanglement and cuts associated with moving machinery • manual handling of heavy loads, such as sample bags • heat, exhaustion, stress and fatigue
Safety equipment and hazard control measures	Safety equipment and hazard control measures may include: • ensuring assess to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents and hazardous materials • direct extraction and fume hoods • guards for moving machinery parts • noise insulation • using personal protective equipment, such as masks, gloves, boots, goggles, coats, ear muffs and safety boots • following established manual handling procedures • regular cleaning of equipment and work areas using enterprise procedures • antidotes for specific hazards, such as hydrofluoric acid and cyanide • reporting of abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water,

RANGE STATEMENT	
	gasses, smoke, vapour, fumes, odour and particulars to appropriate personnel
Critical preparation steps that determine analytical accuracy and precision	Critical preparation steps that determine analytical accuracy and precision may include: • monitoring drying (incipient and total) • mixing to ensure homogeneity before sub-sampling • suitability of reagents for purpose (e.g. dryness) • accurate operation of dispensers and balances • critical/non-critical volumes and critical reagent quantities • temperature control during digests • loss of solution prior to/after mixing • type and acid strength in final solutions • mechanical loss of digest (sputtering, residues on glassware/plastic ware and filtering)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL955001A Supervise a robotic sample preparation system

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to ensure that an enterprise's robotic sample preparation system operates safely and continuously to provide clients with samples that meet their specifications. This includes prioritising and planning job sequences, solving common system problems as they arise and working closely with system operators to ensure safety and achievement of production targets and quality standards. Personnel are not expected to undertake system repairs, servicing or non routine cleaning and maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory supervisors in charge of robotic sample preparation systems in the mining industry sector. Robotic sample preparation systems are used where there are high volumes of material and/or there is a need to minimise the operator's contact with potentially hazardous materials. Therefore, this unit of competency may also be relevant for some laboratories in the construction materials testing and manufacturing sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL953002A	*Operate a robotic sample preparation system*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan work for shift	1.1. Review job requests to determine nature of samples, required parameters and any specific client instructions or preparation methods for each 1.2. Assess hazards associated with samples and identify the need for specific safe work procedures and use of safety/personal protective equipment 1.3. Determine job sequence after consideration of the dryness of samples, need for further drying or pre-treatment and client/production priorities

ELEMENT	PERFORMANCE CRITERIA
	1.4. Record job sequence and confirm details with operators
2. Oversee system setup	2.1. Check that data entry for samples is complete, accurate and matches accompanying documentation 2.2. Check that sample preparation parameters assigned to each sample are appropriate and adjust as necessary 2.3. Conduct pre-use system checks, make necessary system adjustments and authorise startup
3. Monitor system performance and recover from errors and breakdowns	3.1. Conduct regular system checks to determine whether system outputs are consistent with normal operation 3.2. Conduct regular visual checks to identify signs of malfunction, equipment wear or impending system failure 3.3. Interpret error codes and analyse system/equipment outputs to investigate the nature of problems 3.4. Shut down and/or isolate faulty system components to enable safe investigation and continuation of unaffected work tasks 3.5. Troubleshoot causes of problems and take appropriate corrective actions within scope of responsibility and technical competence 3.6. Seek advice when problems are beyond scope of responsibility or knowledge 3.7. Arrange for servicing and/or repairs in response to mechanical breakdowns 3.8. Prior to restart, conduct pre-use checks, adjust job sequence and sample preparation parameters and re-synchronise system components as necessary
4. Maintain system safety	4.1. Ensure operators know about sample and system hazards, required safe work procedures and use of safety/personal protective equipment 4.2. Ensure that safety equipment and required personal protective clothing and equipment is available and fit for purpose 4.3. Conduct regular checks to ensure that operators work safely when handling hazardous samples, operating the system and performing authorised cleaning/maintenance of system components
5. Maintain system records	5.1. Ensure that the data, results and comments entered by operators into system are complete and accurate for each shift

ELEMENT	PERFORMANCE CRITERIA
	5.2. Maintain the security, integrity and traceability of samples and system documentation 5.3. Record and report system/equipment use, errors, breakdowns, maintenance and repairs in accordance with enterprise procedures
6. Contribute to system improvements	6.1. Identify and report opportunities to improve system safety to appropriate personnel 6.2. Examine system logs and outputs to identify instances or emerging trends of sub-standard performance 6.3. Recommend appropriate preventative/corrective actions for improving performance to relevant personnel 6.4. Implement authorised system improvements 6.5. Train operators to improve performance and minimise recurrence of preventable problems

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- planning and prioritising jobs for a shift
- recognising, assessing and controlling hazards associated with samples and system
- working safely at all times
- interpreting, applying and improving enterprise procedures for operating robotic system
- explaining system operation and safe work procedures to operators
- recognising and rectifying problems caused by prior sample handling and preparation
- interpreting system error codes and taking appropriate corrective actions
- troubleshooting and solving common system problems within scope of responsibility
- communicating clearly with clients, operators, maintenance/IT technicians and production managers
- maintaining system records

REQUIRED SKILLS AND KNOWLEDGE
Required knowledge
Required knowledge includes: • procedures for sorting, receiving and analysing samples • geological and chemical characteristics of mineral ores • sample preparation processes for a wide range of mineral ore samples • purpose and key steps in routine downstream analytical tests • procedures for preventing contamination • procedures for ensuring security, integrity and traceability of samples • procedures for ensuring confidentiality of results • function of key components and operating procedures for robotic sample preparation system • function of key components of laboratory information management system (LIMS), system software and layout of screens • error codes for system errors, recommended preventative/corrective actions and breakdown procedures • system hazards, control measures and operation of system safety equipment • troubleshooting and problem solving skills relevant to job role • importance of good customer relations, throughput, costs and minimising rework • health, safety and environment requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • plan, monitor and adjust work flow to manage competing client/production priorities • ensure that the robotic sample preparation system operates efficiently and safely to produce outputs that meet the enterprise/client quality requirements • promptly identify/rectify common system problems • work closely with operators to improve safety, efficiency and quality.

EVIDENCE GUIDE	
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL944001A Maintain laboratory/field workplace safety* • *MSL977002A Troubleshoot equipment and/or production processes*. Resources may include: • access to a robotic sample preparation system • a variety of mineral ore samples, sample preparation methods, equipment and reagents • safety equipment • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • review of production logs, quality control, performance and analytical results traceable to samples prepared on shifts supervised by the candidate • review of system records prepared by the candidate • feedback from operators, service/maintenance technicians, clients and laboratory/production managers • written/oral questioning about robotic sample preparation procedures, common problems and their specified corrective actions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.

EVIDENCE GUIDE	
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Mineral processing** An operator observes that the robotic sample preparation system is displaying an 'incorrect weight' error code and informs the shift supervisor. The supervisor notes that although the input weight for the sample being processed was 800g, the indicated output weight is zero. He/she immediately suspects that the sample is stuck in the bowl. He/she switches off the mill and tags it out so that the operator can continue unloading the completed samples. The supervisor checks the mill for a faulty hose but they are all functioning correctly. He/she decides that the problem could be in the grinding vessel and tries to manually discharge the sample with a pendant without success. After opening up the grinding vessel, he/she finds that a 'plastic' sample is stuck in the bowl. He/she replaces the grinding vessel with a new one. As he/she extracts the sample from the bowl, he/she notices a very strong smell of diesel. He/shesubsequently finds that the client's other samples are also contaminated and removes them from the input magazine. He/she deletes the client's worksheets from the robot control program, checks and synchronises the system and then restarts the robot. He/she reports the problem to the laboratory manager and asks him/her to notify the client of the diesel contamination and the laboratory's inability to prepare their batch of samples.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2939 Industrial robot systems - Safe design and usage
	  • AS 3988-1991 Copper, lead, zinc, gold and silver ores - Guide to sample preparation for the determination of gold
	  • AS 4433.2-1997 Guide to the sampling of particulate materials - Preparation of samples
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• enterprise recording and reporting procedures
	• equipment startup, operation and shutdown procedures
	• material safety data sheets (MSDS)
	• national measurement regulations and guidelines
	• principles of good laboratory practice (GLP)
	• production and laboratory schedules
	• quality manuals, equipment and procedures manuals
	• standard operating procedures (SOPs) and published preparation methods

Samples	Samples may include: • solids, such as rocks, minerals, soils, sands and stream sediments • pulverised core and other drill samples (e.g. rotary air blast (RAB), reverse circulation (RC) and aircore) • powder concentrates • dump samples and grab samples

RANGE STATEMENT	
Client requests/documentation	Client requests/documentation may include: • client profile, sample identification, sample receipt, storage and analyses • required preparation method, service charges
Sample preparation methods	Sample preparation methods may include: • sorting, boxing and drying • sieving • milling • primary crushing (e.g. 10 mm, 2 mm) • fine pulverising (e.g. 100 micron, 75 micron) • robotic system parameters such as grind time, crushing time and cleaning cycles to prevent cross-contamination
Sample preparation equipment	Sample preparation equipment may include: • splitters (e.g. riffles and rotary dividers) • mills (e.g. ball, ring and rod) • bowls (e.g. chrome-steel, tungsten-carbide and zirconia) and tumblers • crushers (e.g. cone, jaw and roll), grinders and disc pulverisers • sieves • ovens • sample containers and labels
Hazards	Hazards may include: • dust, silica and fibrous materials • asbestiform minerals • naturally occurring radioactive materials (NORM) • samples containing nickel and lead-based compounds • noise and vibration • crushing, entanglement and cuts associated with moving machinery • impact injuries from contact with robot arms • failure of pneumatic hoses • manual handling of heavy loads, such as sample bags/containers, racks and trolleys • heat exhaustion/stress and fatigue

RANGE STATEMENT	
Safety equipment and procedures	Safety equipment and procedures may include: • ensuring assess to service shut off-points • recognising and observing hazard warnings and safety signs • labelling of samples and hazardous materials • extraction of dust • cages and guards for moving machinery parts • noise insulation • using personal protective equipment, such as masks, heat resistant mittens, boots, goggles, coats, ear muffs, safety boots and heat reflective clothing • following established manual handling procedures • regular cleaning of equipment and work areas in accordance with enterprise procedures • reporting of abnormal emissions and airborne contaminants to appropriate personnel

Common system errors and corrective actions	Common system errors and corrective actions may include:
	• sample losses:
	  • inspect mill for mechanical problems and worn hoses
	  • inspect balance/load cell, clean and check calibration
	  • check sample for dryness and contamination
	• collision of sample buckets, transport belt problem:
	  • clear obstruction, cross-check sample, worksheet, job sequence and synchronise belt
	• loss of air pressure:
	  • check pneumatic lines, compressor and solenoid values
	• LIMS network connections:
	  • check all parameters are saved in system, if not, unload and reload data and cross-check samples with worksheets

Occupational health and safety	OHS and environmental management

RANGE STATEMENT	
(**OHS**) **and environmental management requirements**	requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Sampling

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL963001A Operate basic handblowing equipment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to operate handblowing equipment to perform basic glasswork. Personnel may be less experienced workers working under the guidance of an experienced scientific glassblower.

Application of the Unit

Application of the unit	This unit of competency is applicable to personnel working with experienced scientific glassblowers, generally in scientific educational institutions. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for handblowing operations	1.1. Identify job, appropriate procedure, hazards and safety requirements 1.2. Use personal protective equipment and safety procedures specified for the job and materials to be used 1.3. Record description of the job to be undertaken, compare with specification and report any variations 1.4. Select and prepare tools and equipment in accordance with job requirements 1.5. Identify glass stocks and components required for the job
2. Follow sequence of operations for glasswork procedure to be performed	2.1. Prepare glass stocks and components as required for the job 2.2. Check and adjust equipment and tools for the job as applicable 2.3. Start up equipment using enterprise procedures 2.4. Carry out glasswork procedure using the appropriate standard method 2.5. Monitor process and rectify routine problems 2.6. Follow equipment shutdown procedures

ELEMENT	PERFORMANCE CRITERIA
3. Use annealing equipment	3.1. Prepare annealing equipment for the job 3.2. Start up, operate and shut down annealing equipment using enterprise procedures 3.3. Monitor, adjust and record annealing operation 3.4. Rectify routine problems
4. Maintain a safe work environment	4.1. Follow established work practices to ensure safety of self and other workers 4.2. Minimise the generation of wastes 4.3. Ensure the safe disposal of wastes 4.4. Clean, care for and maintain work area, equipment and tools 4.5. Report any hazards or incidents according to enterprise procedures
5. Maintain records	5.1. Record data as per enterprise requirements 5.2. Maintain equipment logs as per enterprise requirements 5.3. Maintain security and confidentiality of enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- working safely with glass
- using tools and equipment to perform basic glassblowing operations
- using appropriate glassblowing hand manipulation techniques
- cutting, heating, bending, shaping, sealing and related glassworking techniques
- techniques for minimising strain
- using coefficients of expansion
- maintaining safe working pressures
- storing glass appropriately
- making and grinding components, such as stopcocks than meet specifications
- starting up, setting up, shutting down and maintaining equipment in accordance with work instructions

REQUIRED SKILLS AND KNOWLEDGE
• selecting appropriate grades of glass and preparation for use • optimising of equipment operating parameters • maintaining temperature and stress parameters • reporting atypical results and problems to appropriate personnel according to enterprise procedures • recording and communicating of work results • following correct occupational health and safety (OHS) and principles of good laboratory practice (GLP)
Required knowledge
Required knowledge includes: • composition and nature of glass types • function and correct use of apparatus • basic chemical and physical concepts relating to properties and behaviour of glass • safe startup and shutdown procedures • critical material properties and appropriate glassworking parameters • pre-heating procedures • basic theory of re-entry angles and stress points • setup and annealing/conditioning process • relationship of temperature and temporary and permanent stress • pre-annealing, annealing and post-annealing processes • potential quality problems • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • use basic bench/hand glasswork techniques and equipment to fabricate general glass apparatus • start up, set up and shut down equipment in accordance with work instructions • report atypical results and problems to appropriate

EVIDENCE GUIDE	
	personnel.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. Resources may include: • access to a scientific glassblowing facility, appropriate equipment, materials and procedures • a bank of case studies is required where these form part of the assessment method.
Method of assessment	It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical additional assessment techniques must be used. The following assessment methods are suggested: • inspection of glasswork and workplace documentation completed by the candidate • analysis of work outputs over a period of time to ensure accurate and consistent work is obtained within required timelines • feedback from peers and supervisors • use of suitable simulation and/or a range of case studies/scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of

EVIDENCE GUIDE	
	competency and show its relevance in a workplace setting. **Education** A trainee glassblower has been requested by her/his supervisor to make 100 Pasteur pipettes for a university chemistry practical class the next day. The trainee selects the appropriate glass and type and cuts 50 lengths of glass (two pipettes per length). She/he then proceeds to pull points at the designated markings in the centre of the glass tube using the bench burner. At the conclusion of this operation, the pipettes are cut to the relevant length and then flared at the other end using a specially profiled carbon hand tool. The pipettes are then annealed to eliminate stress caused by the manufacture process. After inspection through a polariscope, the pipettes are delivered to the laboratory for use.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry codes of practice • material safety data sheets (MSDS)

RANGE STATEMENT	
	• material, production and product specifications • National Environment Protection Measures • OHS national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Tools and equipment	Tools and equipment may include: • bench burner, hand torch, micro torch and ribbon burner, gas supplies and gas economiser • dydinium glasses and polariscope • glassworking lathe • annealing oven • measuring and recording equipment • hand tools, such as carbon paddles and mandrels, range of forceps, glass tubing gauges, angle setting jigs, calipers, glass support rollers, brass shapers, carbon rods, glass knife, stainless steel gauze, vernier calipers and other measuring tools, and strain viewer • mechanical glass cutters and saws • mechanical glass grinding equipment • communication equipment
Quality problems	Quality problems may include: • temperature and strain problems • devitrification • non-uniform thickness of seals or joints • equipment problems • quality problems, such as poor optics, distortion, excessive breakage, non-uniform break pattern, incorrect cross bend, excessive bow, scratches and poor glass shape • loss of utilities
Hazards	Hazards may include: • sharps and broken glassware • heat sources, such as burners and ovens • fluids under pressure (acetylene and oxygen) • glass dust • cuts associated with glass grinders and cutters • manual handling of heavy sample bags and

RANGE STATEMENT	
	containers
Safe work practices	Safe work practices may include: • use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators and safety boots • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Scientific glassblowing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL963002A Repair glass apparatus using simple glassblowing equipment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform basic repairs to glass apparatus using simple glassblowing equipment. It includes the ability to assess the economics of salvage and to follow a procedure of disassembly/assembly of the apparatus in accordance with specifications.

Application of the Unit

Application of the unit	This unit of competency is applicable to scientific glassblowers. It covers work that will sometimes be performed by less experienced workers under the guidance of an experienced scientific glassblower. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL963001A	*Operate basic handblowing equipment*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for repair operations	1.1. Identify job, appropriate procedure, hazards and safety requirements, and apparatus required 1.2. Establish correct cleaning procedure for contaminated glassware before commencing repair operations 1.3. Use personal protective equipment and safety procedures as specified for job and materials to be used 1.4. Record job description, compare with blueprint, drawing, sketch, design or similar specification and report perceived difficulties 1.5. Prepare equipment for repair in accordance with job requirements 1.6. Identify, select and prepare glass stocks and

ELEMENT	PERFORMANCE CRITERIA
	components for job
2. Repair apparatus	2.1. Check and adjust equipment and tools for job requirements 2.2. Check and adjust equipment and tools for the job 2.3. Start up equipment using enterprise procedures 2.4. Follow supplied designs and enterprise procedures to perform the repairs required 2.5. Follow equipment shutdown procedures
3. Operate annealing equipment	3.1. Prepare annealing equipment for the job 3.2. Start up, operate and shut down annealing equipment using enterprise procedures 3.3. Monitor, adjust and record annealing operation 3.4. Rectify routine problems
4. Maintain a safe work environment	4.1. Follow established safe work practices to ensure safety of self and other workers 4.2. Minimise the generation of wastes 4.3. Ensure the safe disposal of wastes 4.4. Clean, care for and maintain work area, equipment and tools 4.5. Report hazards and incidents according to enterprise procedures
5. Maintain records	5.1. Record data as per enterprise requirements 5.2. Maintain equipment logs as per enterprise requirements 5.3. Maintain security and confidentiality of enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • determining types of contaminants present on/in apparatus • cleaning techniques for contamination carried out before repair operations are

REQUIRED SKILLS AND KNOWLEDGE
undertaken • using appropriate treatment processes, with particular attention to risks associated with blowing used and possibly contaminated glass • reading and following blueprints, drawings, sketches and designs relevant to repair work • selecting appropriate grades of glass and preparing for use • preparing apparatus for repair • optimising and using glassblowing equipment • identifying atypical or out of normal repair problems • reporting problems to either supervisor or outside service technician according to enterprise procedures • recording and communicating work results • following correct occupational health and safety (OHS) and principles of good laboratory practice (GLP)
Required knowledge
Required knowledge includes: • relevant glassblowing techniques • the risks associated with blowing used and contaminated glass • contamination cleaning techniques to be carried out before repair operations are undertaken • use and function of the broken apparatus • repair materials and reason for their choice • use of appropriate tools and equipment • basic chemical and physical concepts related to behaviour of glass under heat and stress • basic knowledge of how apparatus to be repaired is used • critical material properties and appropriate glassworking parameters • pre-repair apparatus preparation procedures • annealing procedures • methods of minimising potential quality problems • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • safely repair glass apparatus following enterprise procedures • assess the economics of salvage • follow a procedure of disassembly/assembly of apparatus in accordance with specifications • apply contamination cleaning techniques before repair operations are undertaken • report problems to appropriate personnel.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL963001AOperate basic handblowing equipment*. Resources may include: • access to a scientific glassblowing facility, appropriate equipment, materials and procedures • a bank of case studies where these form part of the assessment method.
Method of assessment	It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical additional assessment techniques must be used. The following assessment methods are suggested: • inspection of glasswork and workplace documentation completed by the candidate • analysis of work completed over a period of time to ensure accurate and consistent work is obtained within required timelines. • feedback from peers and supervisors • use of suitable simulation and/or a range of case studies/scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess

EVIDENCE GUIDE	
	directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Education** A trainee glassblower has been asked by his/her supervisor to repair several pieces of used and broken laboratory glassware as part of a cost saving exercise. Firstly, he/she determines whether the glassware will be used for general tasks or for qualitative analysis and how urgently the job is required. He/she then clarifies whether any hazardous material has been used in the equipment and applies the correct cleaning procedures. After determining the nature of the glass and the appropriate glassworking parameters, he/she repairs the equipment using safe apparatus. Finally the glassblower subjects the equipment to the appropriate annealing/conditioning process and checks the final outcome with his/her supervisor. Any contaminated or used glass waste is disposed of appropriately.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry codes of practice • material safety data sheets (MSDS) • material, production and product specifications • national environment protection measures • OHS national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Tools, **materials and equipment**	Tools, materials and equipment may include: • burners, gas supplies and gas economisers • glassworking lathes • mechanical glass cutters and saws • mechanical glass grinding equipment • annealing ovens • measuring and recording equipment • hand tools, such as carbon paddles and mandrels, range of forceps, glass tubing gauges, angle setting jigs, calipers, glass support rollers, brass shapers, carbon rods, glass knife, stainless steel gauze, vernier calipers and other measuring tools, and strain viewer • various glass types, including soda-lime, borosilicate, quartz, silica and special formula glasses • glass to metal seals • communication equipment

RANGE STATEMENT	
Hazards	Hazards may include: • sharps and broken glassware • heat sources, such as burners and ovens • fluids under pressure (acetylene and oxygen) • glass dust • cuts associated with glass grinders and cutters • manual handling of heavy sample bags and containers
Safe work practices	Safe work practices may include: • use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators and safety boots • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Scientific glassblowing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL965001A Design and manufacture glass apparatus and glass systems

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to design and manufacture glass apparatus and glass systems. It includes consulting with clients regarding design specifications and cost, as well as designing equipment and systems to improve efficiency, increase production capabilities and improve safety of equipment and processes.

Application of the Unit

Application of the unit	This competency is applicable to skilled and experienced scientific glassblowers. They will apply specialised technical knowledge and precise technical skills and considerable planning and judgement in their work. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL963001A	*Operate basic handblowing equipment*
	MSL963002A	*Repair glass apparatus using simple glassblowing equipment*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the design of glass apparatus and system	1.1. Clearly identify the function, operating procedures and requirements for apparatus and/or glass system 1.2. Confirm details of glass apparatus and glass systems required 1.3. Prepare specifications for new glass apparatus and glass system requirements 1.4. Prepare design proposal and timelines 1.5. Obtain client's approval for design proposal
2. Design glass apparatus and systems	2.1. Identify or prepare appropriate blueprints, drawings or designs 2.2. Consult with clients regarding design specifications and cost

ELEMENT	PERFORMANCE CRITERIA
	2.3. Design the equipment 2.4. Obtain client's approval for manufacture
3. Manufacture glass apparatus and systems	3.1. Identify hazards and enterprise safety requirements 3.2. Select and prepare glass stock and materials 3.3. Select and prepare tools and equipment in accordance with job requirements 3.4. Construct apparatus or system 3.5. Perform annealing operations 3.6. Perform glass finishing operations 3.7. Trial and commission apparatus or system
4. Maintain a safe work environment	4.1. Use established safe work practices and personal protective equipment to ensure safety of self and other workers 4.2. Minimise the generation of wastes 4.3. Ensure the safe disposal of wastes 4.4. Clean, care for and maintain work area, equipment and tools 4.5. Report any hazards or incidents according to enterprise procedures
5. Maintain records	5.1. Record data into reporting system 5.2. Maintain glass apparatus and system equipment logs as per enterprise requirements 5.3. Ensure security and confidentiality of enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • designing and manufacturing glass apparatus systems • interpreting briefs, including design requirements and cost • selecting appropriate grades of glass and components and preparing for use • applying basic theoretical knowledge and making relevant design conclusions

REQUIRED SKILLS AND KNOWLEDGE
• identifying atypical situations and taking appropriate action • communicating problems to either the supervisor or outside service technician • recording and reporting work results • following correct occupational health and safety (OHS) and principles of good laboratory practice (GLP)
Required knowledge
Required knowledge includes: • design principles for glass apparatus • types of glass (including special formula glass), their properties and applications • incompatible glass types • glass to glass and glass to metal seals • theoretical and practical knowledge of glassworking methods and procedures, including chemistry, physics, electrode sealing techniques and electrode placement in glass • basic theory of equipment operation and use for which design and manufacture is required • characteristics, capabilities and limitations of glassblowing techniques • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • design and manufacture glass apparatus systems • interpret a brief, including design requirements and cost • prepare apparatus and system designs • incorporate appropriate design factors relevant to use requirements of apparatus • select appropriate grades of glass and components and prepare for use • apply basic theoretical knowledge of chemistry and

EVIDENCE GUIDE	
	physics and make relevant design conclusions • identify atypical situations and take appropriate action • communicate problems to either supervisor or outside service technician • record and report work results • follow correct OHS and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical additional assessment techniques must be used. This unit of competency may be assessed with: • *MSL965002A Perform glass coating, grinding and finishing operations* • *MSL965003A Construct, modify and maintain high vacuum systems*. Resources may include: • access to a scientific glassblowing facility, appropriate equipment, materials and procedures • access to more than one workplace or simulated learning environment if the primary workplace or learning environment is unable to provide a suitable range of equipment.
Method of assessment	The following assessment methods are suggested: • inspection of examples of glasswork and workplace documentation completed by the candidate • analysis of the candidate's work records over a period of time to ensure accurate and consistent work is obtained within required timelines • feedback from peers and supervisors • oral/written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made

EVIDENCE GUIDE	
	to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A scientific glassblower, who works for a town gas company, has been requested by the research laboratory to design and manufacture a complex gas extraction train. The equipment will be used to burn town gas under a range of conditions and analyse the exhaust gases by bubbling them through a number of gas extraction bottles. The apparatus will be used around the plant and therefore it must be portable, small and contained within a safety box in the event that there is an explosion in the apparatus. After scoping the general design with the research staff, the glassblower prepared a detailed design with particular emphasis on the size and the technical requirements associated with the need for metal electrodes in glass and metal to glass seals. They also analysed the risks of an explosive air/gas mixture developing in the apparatus and the use of hazardous chemicals in the gas bubbling/extraction bottles. The glassblower selected the glass, prepared the glassblowing tools and equipment and constructed the apparatus according to the detailed design. They carefully performed the annealing operation given the complexity of the apparatus. They then liaised with the workshop staff who were building the box to contain the apparatus. Finally, the whole system was checked under operational conditions and handed over to the research staff.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry codes of practice • material safety data sheets (MSDSs) • material, production and product specifications • national environment protection measures • OHS national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Tools, **materials and equipment**	Tools, materials and equipment may include: • bench burner, hand torch and ribbon burners, gas supplies and gas economisers • glassworking lathes • annealing ovens • measuring and recording equipment • hand tools, such as carbon paddles and mandrels, range of forceps, glass tubing gauges, angle setting jigs, calipers, glass support rollers, brass shapers, carbon rods, glass knife, stainless steel gauze, vernier calipers and other measuring tools, and strain viewer • mechanical glass cutters and saws

RANGE STATEMENT	
	• mechanical glass grinding equipment • special formula glasses • glass to glass and glass to metal seals
Hazards	Hazards may include: • sharps and broken glassware • residues on used glassware, such as mercury • heat sources, such as burners and ovens • fluids under pressure (acetylene and oxygen) • glass dust • cuts associated with glass grinders and cutters • manual handling of heavy equipment and containers
Safety practices	Safety practices may include: • use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators and safety boots • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Scientific glassblowing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL965002A Perform glass coating, grinding and finishing operations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform glass coating, grinding and finishing operations for scientific glassware.

Application of the Unit

Application of the unit	This unit of competency is applicable to skilled and experienced scientific glassblowers. They will apply specialised technical knowledge and precise technical skills and considerable planning and judgement in their work. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL963001A	*Operate basic handblowing*

Prerequisite units		
		equipment
	MSL963002A	*Repair glass apparatus using simple glassblowing equipment*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for work	1.1. Identify appropriate specifications and procedures, and discuss any issues or problems with customer and work team 1.2. Identify hazards and enterprise safety requirements 1.3. Record description of the job, compare with specification and plan work activities 1.4. Prepare equipment in accordance with job requirements
2. Perform glass coating operations	2.1. Identify, select and prepare appropriate grades of glass, coating materials, abrasives, solutions and finishing agents as appropriate for the job 2.2. Clean and prepare glass as required for coating operation 2.3. Perform glass coating operation according to

ELEMENT	PERFORMANCE CRITERIA
	standard procedure 2.4. Perform post-coating procedures to maintain coated surface 2.5. Perform coating removal processes 2.6. Ensure appropriate disposal of all waste
3. Perform glass grinding operations	3.1. Identify and prepare grinding tools as required for procedure 3.2. Select appropriate abrasives for grinding operations 3.3. Perform grinding and repairing/re-grinding processes as appropriate 3.4. Test ground surfaces to ensure they meet compliance requirements 3.5. Identify and rectify problems that arise during operations
4. Perform glass finishing operations	4.1. Establish finishing requirements for the job 4.2. Perform finishing procedures as required for job
5. Maintain a safe work environment	5.1. Use established safe work practices and personal protective equipment to ensure safety of self and other workers 5.2. Minimise the generation of wastes 5.3. Ensure the safe disposal of wastes 5.4. Clean, care for and maintain work area, equipment and tools 5.5. Report any hazards or incidents according to enterprise procedures
6. Maintain records	6.1. Record data as per enterprise requirements 6.2. Maintain glass apparatus and system equipment logs as per enterprise requirements 6.3. Ensure security and confidentiality of enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

REQUIRED SKILLS AND KNOWLEDGE
Required skills include: • following correct occupational health and safety (OHS) and principles of good laboratory practice (GLP) • applying knowledge of chemical and physical science to glassblowing situations and making appropriate conclusions • selecting appropriate grades of glass, coating materials, abrasives and finishing agents for the job • cleaning and preparing glass surfaces • metal coating glass surfaces and applying opaque treatments to industry standards • grinding and hand lapping glass to be used in fabrication and for precision fit • applying finishing techniques • optimising and using materials and equipment • identifying atypical situations and taking appropriate action • communicating with customers/research team to meet timeline commitments • recording and reporting work results
Required knowledge
Required knowledge includes: • use of glassblowing materials, equipment, tools and techniques • chemistry of coating materials and coating process • theoretical and practical principles of materials and processes for glass coating, glass grinding and glass finishing • theory of equipment operation and use • common faults in coating, grinding and finishing operations and methods for control • safety procedures relevant to coating, grinding and finishing operations • waste disposal procedures • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • apply appropriate techniques to clean and prepare glass surfaces • apply knowledge of chemical and physical science to glassblowing situations and make appropriate conclusions • metal coat glass surfaces or apply opaque treatments to industry standards • grind and hand lap glass to be used in fabrication and for precision fit • apply finishing techniques to complete job • identify atypical situations and take appropriate action • select appropriate grades of glass, coating materials, abrasives and finishing agents for job • optimise and use materials and equipment • communicate with customers/research team to meet timeline commitments • record and report work results • follow correct OHS and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL965001A Design and manufacture glass apparatus and glass systems* • *MSL965003A Construct, modify and maintain vacuum systems*. Resources may include: • access to scientific glassblowing facility, appropriate equipment, materials and procedures which will allow for appropriate and realistic simulation • access to more than one workplace or simulated learning environment if the primary workplace or learning environment is unable to provide a suitable range of equipment.
Method of assessment	It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical additional assessment techniques must be

EVIDENCE GUIDE	
	used. The following assessment methods are suggested: • inspection of examples of glasswork and workplace documentation completed by the candidate • analysis of the candidate's work records over a period of time to ensure accurate and consistent work is obtained within required timelines • feedback from peers and supervisors • oral/written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Education** A request has been made for a non-standard, 30mm diameter optical cell with a 125mm path length that has a silvered evacuated jacket for insulation properties and stopcock for filling. The scientific glassblower completes a full scale drawing from the schematic sketch provided with the request and determines the type of glass to be used from the transmittance wavelength properties of the light source used. The two optical discs are then ground and polished and tested for flatness. The custom dimension stopcock is manufactured and stopcock barrel and key are ground on specialised mandrel tapers using carborundum slurries. The stopcock is then tested to British Standards to ensure compliance with leakage

EVIDENCE GUIDE	
	rates. The cell is then assembled by sealing the stopcock and optical discs to the insulated jacketed glass tube. Annealing protocols are followed and then the jacket is silvered, mindful of the safety issues related to the chemicals used. The jacket is emptied of the silver solution, dried, evacuated using a vacuum line and then sealed. The optical cell is then delivered for use.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry codes of practice • material safety data sheets (MSDS) • material, production and product specifications • national environment protection measures • occupational health and safety national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Tools and equipment	Tools and equipment may include:

RANGE STATEMENT	
	• coating solutions and baths • grinding tools and abrasives • bench, handlamp and ribbon burners • gas supplies and gas economisers • glass working lathes • annealing ovens • measuring and recording equipment • hand tools, such as carbon paddles and mandrels, range of forceps, glass tubing gauges, angle setting jigs, calipers, glass support rollers, brass shapers, carbon rods, glass knife, stainless steel gauze, vernier calipers and other measuring tools, and strain viewer • mechanical glass cutters and saws • mechanical glass grinding equipment • safety clothing and equipment
Glass coating	Glass coating may include: • cleaning and preparation of glass • preparing coating solutions • coating/strip coating and dedicated coating • protecting coated surfaces • electroplating • removal/partial removal of coating
Grinding	Grinding may include: • selection of abrasives and metal grinding tools • interpreting specifications for glass-ground joints • using grinding procedures • testing ground surfaces for leakage • preparing glass stopcocks
Finishing	Finishing may include: • cleaning, rinsing and drying • evacuating and sealing • metallising (if applicable) • flame and/or mechanical polishing
Hazards	Hazards may include: • sharps and broken glassware

RANGE STATEMENT	
	• residues on used glassware, such as mercury • heat sources, such as burners and ovens • fluids under pressure (acetylene and oxygen) • glass dust • cuts associated with glass grinders and cutters • manual handling of heavy equipment and containers
Safety practices	Safety practices may include: • use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators and safety boots • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Scientific glassblowing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL965003A Construct, modify and maintain high vacuum systems

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to construct, monitor, modify and maintain high vacuum systems. Personnel are required to use advanced bench/hand glasswork techniques and equipment to fabricate glass apparatus.

Application of the Unit

Application of the unit	This unit of competency is applicable to skilled and experienced scientific glassblowers. They will apply specialised technical knowledge and precise technical skills and considerable planning and judgement in their work. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL963001A	*Operate basic handblowing equipment*
	MSL963002A	*Repair glass apparatus using simple glassblowing equipment*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Construct high vacuum systems	1.1. Consult with clients regarding design specifications and cost 1.2. Identify or prepare appropriate blueprints, drawings, sketches and designs 1.3. Identify hazards and enterprise safety requirements 1.4. Prepare equipment in accordance with job requirements 1.5. Construct and install vacuum apparatus 1.6. Trial and commission vacuum apparatus 1.7. Use leak detection equipment to vacuum check system 1.8. Complete records and file in the reporting system

ELEMENT	PERFORMANCE CRITERIA
2. Modify high vacuum systems	2.1. Identify opportunities to improve efficiency of vacuum system 2.2. Use leak detection equipment to vacuum check system 2.3. Identify gaps and deficiencies which limit system's usefulness 2.4. Confirm modification requirements with appropriate personnel 2.5. Modify system to meet requirements
3. Maintain high vacuum systems	3.1. Identify maintenance procedures and appropriate records 3.2. Plan and evaluate maintenance according to appropriate quality standards 3.3. Identify, document and report need for maintenance for faulty or damaged equipment 3.4. Maintain vacuum and associated systems as per standard procedures 3.5. Use leak detection equipment to vacuum check system
4. Monitor and finetune vacuum operation	4.1. Monitor system to determine whether equipment is operating to specification 4.2. Evaluate equipment outputs to determine nature of problem 4.3. Define nature of sub-standard performance clearly 4.4. Finetune system to restore system to specification
5. Maintain a safe work environment	5.1. Follow established safe work practices and personal protective equipment to ensure safety of self and other workers 5.2. Minimise the generation of wastes 5.3. Ensure the safe disposal of wastes 5.4. Clean, care for and maintain work area, equipment and tools 5.5. Report any hazards or incidents according to enterprise procedures
6. Maintain records	6.1. Record data as per enterprise requirements 6.2. Maintain glass apparatus and system equipment logs as per enterprise requirements 6.3. Maintain security and confidentiality of enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • preparing and interpreting blueprints, drawings, sketches, designs and customer requirements • applying theoretical concepts and practical principles to constructing, modifying and maintaining vacuum systems • evaluating and making recommendations for modifications to vacuum systems • modifying high vacuum systems to meet new requirements • using appropriate procedures to monitor and maintain high vacuum systems • following enterprise procedures to document and communicate work details
Required knowledge
Required knowledge includes: • principles of design of high vacuum apparatus • principles of working with high vacuum systems • theoretical and practical knowledge of glassworking methods and procedures • practices to control stress and strain in glass systems • theory of equipment operation and use • characteristics, capabilities and limitations of glassblowing techniques • properties of glass and specific ways to join glass for high vacuum applications • ideal joint placement for high vacuum systems • ultra cleaning procedures for glass in high vacuum systems • preparation and use of glass to metal seals • safety procedures relevant to constructing and working with high vacuum systems

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • prepare and interpret blueprints, drawings, sketches, designs and customer requirements • apply theoretical concepts and practical principles to construct, modify and maintain vacuum systems • evaluate and make recommendations for modifications to vacuum systems • modify high vacuum systems to meet new requirements • use appropriate procedures to monitor and maintain high vacuum systems • use advanced bench/hand glasswork techniques and equipment to fabricate glass apparatus • follow enterprise procedures to document and communicate work details.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical additional assessment techniques must be used. This unit of competency may be assessed with: • *MSL965001A Design and manufacture glass apparatus and glass systems* • *MSL965002A Perform glass coating, grinding and finishing operations*. Resources may include: • access to a scientific glassblowing facility, appropriate equipment, materials and procedures which will allow for appropriate and realistic simulation • access to more than one workplace or simulated learning environment if the primary workplace or learning environment is unable to provide a suitable range of equipment.
Method of assessment	The following assessment methods are suggested: • inspection of examples of glasswork and workplace documentation completed by the candidate

EVIDENCE GUIDE	
	• analysis of the candidate's work records over a period of time to ensure accurate and consistent work is obtained within required timelines • feedback from peers and supervisors • oral/written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Education** A major research organisation has requested assistance with the design and construction of an ultra high vacuum line to work in conjunction with a recently purchased mass spectrometer. The scientific glassblower identifies the location of the backing pump, vapour jet pump, turbo-molecular pump and getter pumps. After finalising the design, they manufacture the main components in the glassblowing workshop. They then take the portable glassblowing station, including hand torch, gas supplies and hand tools to the research laboratory and proceed to link these components with various sizes of glass tubing and transition glass/metal vacuum flanges. Having completed the vacuum system, the glassblower assists with checking all joints and seals under vacuum conditions and undertakes any repairs and modifications. Finally they dispose of all waste appropriately and return the equipment to the workshop.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry codes of practice • material safety data sheets (MSDS) • material, production and product specifications • national environment protection measures • occupational health and safety (OHS) national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Tools and equipment	Tools and equipment may include: • leak detection equipment • pumps and lubricants • pressure measuring equipment • bench, handlamp and ribbon burners, gas supplies and gas economisers • glass working lathes • annealing ovens • measuring and recording equipment • hand tools, such as carbon paddles and

RANGE STATEMENT	
	mandrels, range of forceps, glass tubing gauges, angle setting jigs, calipers, glass support rollers, brass shapers, carbon rods, glass knife, stainless steel gauze, vernier calipers and other measuring tools, and strain viewer • mechanical glass cutters and saws • mechanical glass grinding equipment
Vacuum apparatus	Vacuum apparatus includes items, such as: • manometers • vacuum traps • vacuum manifolds • vacuum distillation apparatus • gas handling systems
Maintenance procedures	Maintenance procedures may include: • cleaning and maintaining work area, equipment and tools • checking and maintaining gas manifolds, cylinders and pumps • ensuring safety of vacuum and related equipment • evaluating and troubleshoot high vacuum systems • evaluating and restoring efficiency of systems
Hazards	Hazards may include: • sharps and broken glassware • residues on used glassware, such as mercury • heat sources, such as burners and ovens • fluids under pressure (acetylene and oxygen) • glass dust • cuts associated with glass grinders and cutters • manual handling of heavy sample bags and containers
Safety practices	Safety practices may include: • use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators and safety boots • correct labelling of reagents and hazardous

RANGE STATEMENT	
	materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Scientific glassblowing

Competency field

Competency field	

Co-requisite units

Co-requisite units	

Co-requisite units		

MSL972001A Conduct routine site measurements

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to make direct measurements using enterprise procedures. Measurements will be straightforward and involve a minimal number of steps, take a short time, have easily recognised control limits and use equipment calibrated by others.

Application of the Unit

Application of the unit	This unit of competency is applicable to production operators, field assistants and laboratory assistants in manufacturing, construction materials and environmental services industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for measurements	1.1. Confirm the purpose, priority and nature of measurements required 1.2. Liaise with relevant personnel to arrange site access and all necessary clearances/permits 1.3. Identify site hazards and review enterprise safety procedures 1.4. Assemble all measuring and safety equipment and check they are fit for purpose 1.5. Check all equipment/materials against a given inventory and stow them to ensure safe transport 1.6. Arrange appropriate transport for site access as required
2. Perform measurements	2.1. Locate measurement points and services at the site 2.2. Gain access to measurement points by removing covers and locks as appropriate 2.3. Seek advice if the required measurements cannot be

ELEMENT	PERFORMANCE CRITERIA
	made or if procedures require modification 2.4. Operate measuring equipment in accordance with enterprise procedures and manufacturer's instructions 2.5. Take sufficient readings to ensure reliable data 2.6. Record data with appropriate accuracy, precision and units 2.7. Record environmental/site conditions and any other observations that may impact on data quality 2.8. Recognise obvious errors/atypical data and take appropriate corrective action 2.9. Secure measuring points by replacing covers and locking as appropriate
3. Finalise measurements	3.1. Follow enterprise procedures for the cleaning/decontamination of equipment and vehicle as necessary 3.2. Check all equipment and materials against inventory and stow for safe transport 3.3. Liaise with relevant personnel to restore normal production and/or services as necessary 3.4. Report all measurements in accordance with enterprise procedures 3.5. On return, check and document serviceability of equipment before storage
4. Maintain a safe work environment	4.1. Use established work practices and personal protective equipment to ensure personal safety and that of others 4.2. Minimise environmental impacts of measurements and generation of waste 4.3. Dispose of all waste in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include:

REQUIRED SKILLS AND KNOWLEDGE
• performing a variety of measurements at a range of sitesfollowing procedures • making measurements with minimal environmental impact • accuratelyreading scales/displays for a wide range of values • recording data which is legible, free of errors and uses appropriate accuracy, precision and units • demonstrating enterprise and/or legal traceability requirements • liaising with others to access sites and perform measurements efficiently • recognising own limitations and the seeking timely advice
Required knowledge

Required knowledge includes:
• key terminology and concepts, such as analogue, digital, accuracy, precision, traceability, uncertainty and chain of custody
• purpose of the measurements
• concepts of metrology
• the international system of units (SI)
• the function of key equipment/materials and principles of operation
• hazards, risks and enterprise safety procedures associated with routine measurements undertaken
• enterprise procedures dealing with:
  • measurements
  • waste management, cleanup and spillage
  • handling, transport and storage of dangerous goods
• relevant health, safety and environmental requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • follow procedures when performing a variety of measurements at a range of sites • work safely and with minimal environmental impact

EVIDENCE GUIDE	
	• liaise with people effectively and courteously • maintain confidentiality and report problems and incidents in accordance with procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL952001A Collect routine site samples*. Resources may include: • access to a variety of sites • measurement and safety procedures • a selection of measuring equipment and documentation.
Method of assessment	The following assessment methods are suggested: • review of the quality of data and documentation provided by the candidate • observation of the candidate performing a range of measurements • feedback from supervisors and clients that relevant procedures were followed • oral/written questioning about measurement procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting.

EVIDENCE GUIDE	
	Manufacturing and construction materials testing A laboratory assistant is required to conduct daily routine site measurements around the plant. Each day they contact the engineering department to arrange for an engineer to accompany them to operate all mechanical systems (e.g. valves and pitcovers) associated with collection of samples and/or site measurements. The laboratory assistant locates the required safety equipment, ensures that all measurement equipment is operational and pre-calibrated and dons appropriate personal protective equipment. They record site measurements directly in the plant monitoring log book along with any comments concerning plant operating conditions. Upon returning to the laboratory they enter this information into the laboratory information management system (LIMS). The laboratory assistant then cleans and stores all equipment used in the routine site measurements. **Environmental** A field assistant is part of a team examining the rehabilitation of a mine site. They help to construct a grid map of the study area. The assistant is given identification photo cards for six species of plant and asked to count the number of each species in part of the grid, taking care to minimise environmental impact. They then record the data on a map using a predetermined key.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

RANGE STATEMENT	

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• enterprise procedures for specific client measurements at particular sites
	• enterprise recording and reporting procedures
	• equipment manuals
	• equipment startup, operation and shutdown procedures
	• maps and site plans
	• material safety data sheets (MSDS) and safety procedures
	• material, production and product specifications
	• national measurement regulations and guidelines
	• occupational health and safety (OHS) national standards and codes of practice
	• standard operating procedures (SOPs)

Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Hazards	Hazards may include:

RANGE STATEMENT	
	• solar radiation, dust and noise • wildlife, such as snakes, spiders and domestic animals • biohazards, such as micro-organisms and agents associated with soil, air and water • chemicals, such as acids and hydrocarbons • manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery • falling objects, uneven surfaces, heights, slopes, wet surfaces, trenches and confined spaces • vehicle handling in rough terrain and boat handling in rough or flowing water • vehicular or pedestrian traffic
Safety practices	Safety practices may include: • use of MSDS • use personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face-guards, coveralls, gowns, body suits, respirators and safety boots • correct labelling of hazardous materials • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations • regular cleaning and/or decontaminating of equipment • machinery guards • signage, barriers, service isolation tags, traffic control, flashing lights • lockout and tag-out procedures
Measurements	Measurements could include the use of instruments and/or kits to test: • pH, specific ions, such as iron in water using dipsticks • dissolved oxygen (DO) • electrical conductivity (EC)
Other measurements	Other measurements may include:

RANGE STATEMENT	
	• sound (e.g. dB level and dBA) • light levels and illumination • basic production/process parameters (e.g. flow, temperature, pressure, mass and depth) • simple surveys (e.g. number of trees in quadrant) • background radiation (e.g. Geiger counter) • dimensions • meteorological measurements (e.g. temperature, rainfall and wind)
Common measuring equipment	Common measuring equipment may include: • tape measure, rulers, micrometers callipers and water level indicators • balances • meter/probe systems (e.g. DO and EC) • analogue and digital meters (e.g. voltage, current, resistance, pressure, temperature, barometers, anemometers and hygrometers) • dipsticks or spot test kits • clocks and timing devices
Services	Services may include: • water supply, gas and electricity • telecommunications • irrigation, stormwater, drainage and sewerage systems • production plant
Appropriate corrective actions	Appropriate corrective actions may include: • logical check of equipment setup • check of calibration, zero error and drift for basic instruments • careful re-reading of procedures • repeat measurements • seek advice
Minimising environmental impacts	Minimising environmental impacts may involve: • disposal of surplus, spent or purged materials • recycling of wastes • responsible driving to avoid damage to vegetation and fauna • cleaning of vehicles to prevent transfer of pests

RANGE STATEMENT	
	and contaminants
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973001A Perform basic tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform tests and measurements using standard methods with access to readily available advice from supervisors.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory/field assistants working in all industry sectors. In general, they do not calibrate equipment and make only limited adjustments to the controls. They do not interpret or analyse results or troubleshoot equipment problems. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Interpret test requirements	1.1. Review test request to identify samples to be tested, test method and equipment involved 1.2. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and/or equipment
2. Prepare sample	2.1. Record sample description, compare with specification, record and report discrepancies 2.2. Prepare sample in accordance with appropriate standard methods
3. Check equipment before use	3.1. Set up test equipment in accordance with test method 3.2. Perform pre-use and safety checks in accordance with enterprise procedures and manufacturer's instructions 3.3. Identify faulty or unsafe equipment and report to appropriate personnel 3.4. Check calibration status of equipment and report any out of calibration items to appropriate personnel
4. Perform tests on samples	4.1. Identify, prepare and weigh or measure sample and standards to be tested

ELEMENT	PERFORMANCE CRITERIA
	4.2. Conduct tests in accordance with enterprise procedures 4.3. Record data in accordance with enterprise procedures 4.4. Perform calculations on data as required 4.5. Identify and report out of specification or atypical results promptly to appropriate personnel 4.6. Shut down equipment in accordance with operating procedures
5. Maintain a safe work environment	5.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 5.2. Minimise the generation of wastes and environmental impacts 5.3. Ensure safe disposal of laboratory and hazardous wastes 5.4. Clean, care for and store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting enterprise procedure or standard methods accurately
- using safety information, such as material safety data sheets (MSDS) and performing procedures safely
- checking test equipment before use
- completing all tests within required timeline without sacrificing safety, accuracy or quality
- calculating, recording and presenting results accurately and legibly
- maintaining security, integrity and traceability of all samples, data/results and documentation
- cleaning and maintaining equipment

Required knowledge

REQUIRED SKILLS AND KNOWLEDGE
Required knowledge includes: • concepts of metrology • the international system of units (SI) • purpose of test • principles of the standard method • pre-use equipment checks • relevant standards/specifications and their interpretation • sources of uncertainty in measurement and methods for control • enterprise and/or legal traceability requirements • interpretation and recording of test result, including simple calculations • procedures for recognition/reporting of unexpected or unusual results • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • accurately interpret enterprise procedures or standard methods • complete all tests within the required timeline without sacrificing safety, accuracy or quality • demonstrate close attention to the accuracy and precision of measurements and the data obtained • maintain the security, integrity and traceability of all samples, data/results and documentation.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL922001A Record and present data*. Resources may include: • standard laboratory equipped with appropriate

EVIDENCE GUIDE	
	equipment standards and materials • enterprise procedures and standard methods, and equipment manuals • MSDS.
Method of assessment	The following assessment methods are suggested: • review of the quality of test data/results achieved by the candidate over time • inspection of records and workplace documentation completed by the candidate • feedback from peers and supervisors • observation of the candidate performing a range of basic tests • oral or written questioning to check underpinning knowledge of test procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Standard testing methods may be viewed as legal requirements that must be followed to ensure that a product manufactured in a chemical plant meets the specification by which it is sold to the customer. Technical assistants perform tests in a quality control laboratory to ensure that material meets legal requirements and the material is safe and effective in use. Peroxides may be present in ether as a result of

EVIDENCE GUIDE	
	light-catalysed air oxidation. Peroxides are toxic and can give rise to mixtures which are explosive when distilled. Technical assistants test ether to ensure that the level of peroxide is within acceptable limits. The test is done by shaking ether with a solution of potassium iodide. After standing for 30 minutes in the dark the yellow colour of the aqueous phase, due to the liberation of iodine, must not be more intense than a prepared standard solution. These tests ensure the quality and safety of the ether. **Food processing** A snack food company produces a range of high quality, impulse purchase snack foods. Some of these products are moisture and/or oxygen sensitive and are therefore packaged in multi-layer flexible packaging to provide optimum shelflife. The packaging must also be able to withstand the rigours of the production and distribution process. While the packaging is purchased to meet the shelflife and distribution specifications, the quality assurance program requires the periodic evaluation of the packaging materials against these specifications. A laboratory assistant uses standard methods to test the tearing resistance, bursting strength, impact resistance and permeability and/or leakage of the snack food packaging. Tests are also conducted on aspects of the manufacturing process that can affect shelflife. These tests involve the measuring of the heat-seam strength and the sealing performance of the closure process. The test results are recorded by the laboratory assistant to verify the conformance of the materials to the supplier specifications and of the process to the manufacturing specifications. The assistant reports any anomalies or non-conformances to the appropriate personnel. **Construction materials testing** A technician performs an Aggregate Stripping Test (AS 1141.50) and enters the results in the laboratory's information management system (LIMS). The resulting 20-30% stripped values (i.e. 70-80% adhering) indicate a 'fail' result. The technician notes that he has repeated the test and obtained the same 'fail' result. The laboratory manager reviews the results and asks the technician to explain how he performed the test. He describes how he prepared 3-4 mm thick plates of bitumen and binding agent in the mould and then placed 50 small clean pieces of aggregate on top. After treatment in an oven for 24

EVIDENCE GUIDE	
	hours and a 50°C water bath in accordance with the test method, the technician had then carefully pulled out the pieces of aggregate and avoiding any twisting motion. He then estimated the % of bitumen adhering to each of the stones with the expectation that the stripped value would be about 5% (i.e. 95% adhering). The manager is satisfied that the technician has performed the test in accordance with the method and suggested that he now re-run the test with a known aggregate as a control. This test gives a stripped value of 5-7% (i.e. 93-95% adhering). The manager is now sufficiently confident of the laboratory's results to sign and issue the test report and explain the aggregate's 'test failure' to the client.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• calibration and maintenance schedules

RANGE STATEMENT	
	• enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • MSDS and safety procedures • material, production and product specifications • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Preparation of samples	Preparation of samples may include: • sub-sampling or splitting using procedures, such as riffling, coning and quartering, manual and mechanical splitters • diluting samples • physical treatments, such as ashing, dissolving, filtration, sieving, centrifugation and comminution • moulding, casting or cutting specimens
Typical tests carried out by laboratory/field assistants	Typical tests carried out by laboratory/field assistants may include: • visual/optical tests of appearance, colour, texture, identity, turbidity, refractive index (alcohol content and Baume/Brix) • physical tests: • density, specific gravity and compacted

RANGE STATEMENT	
	density • moisture content and water activity • particle size, particle shape and size distribution • chemical tests: • gravimetric • colorimetric • electrical conductivity (EC) and pH • specific ions using dipsticks and kits • nutrients (e.g. nitrates and orthophosphates) using basic kits • ashes, including sulphated ashes • biological/environmental tests: • pH, oxygen reduction potential (ORP), dissolved oxygen (DO) and (EC) • E coli using test kits • surface hygiene/presence of microbes • packaging tests: • tearing resistance, bursting strength and impact resistance • permeability and/or leakage • mechanical tests: • Emerson class • concrete slump
Measurements	Measurements may include: • simple ground surveys • meteorological parameters, such as wind direction/strength, rainfall, maximum/minimum temperature, humidity and solar radiation • simple background radiation survey • production/process parameters, such as temperature, flow and pressure • gas levels in a confined space
Common measuring equipment	Common measuring equipment may include: • dimension apparatus • DO and EC • analogue and digital meters and charts/recorders

RANGE STATEMENT	
	• basic chemical and biological test kits • dipsticks and site test kits (e.g. HACK) • timing devices • temperature measuring devices, such as thermometers and thermocouples
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • solar radiation, dust and noise • chemicals, such as sulphuric acid, fluorides and hydrocarbons • aerosols • sharps, broken glassware and hand tools • flammable liquids • dry ice and liquid nitrogen • fluids under pressure • sources of ignition • occupational overuse syndrome, slips, trips and falls • manual handling, working at heights and working in confined spaces • crushing, entanglement and cuts associated with moving machinery or falling objects
Enterprise controls to address hazards	Enterprise controls to address hazards may include: • use of MSDS • use of signage, barriers and service isolation tags • use of personal protective equipment, such as hard hats, hearing protection, sunscreen lotion, gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators and safety boots • use of appropriate equipment, such as biohazard containers and cabinets and laminar flow cabinets • recognising and observing hazard warnings and safety signs

RANGE STATEMENT	
	• labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions, and enterprise procedures and regulations • cleaning and decontaminating equipment and work areas regularly using recommended procedures • following established manual handling procedures for tasks involving manual handling
Minimising environmental impacts	Minimising environmental impacts may involve: • recycling of non-hazardous waste, such as chemicals, batteries, plastic, metals and glass • appropriate disposal of hazardous waste • correct disposal of excess sample/test material • correct storage and handling of hazardous chemicals
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973002A Prepare working solutions

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare working solutions and to check that existing stocks are suitable for use. Calculations of quantities, choice of reagent grades and required dilutions will be specified by the supervisor.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants working in all industry sectors. Test solutions include those required to perform laboratory tests. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Safely use laboratory chemicals, glassware and equipment	1.1. Apply appropriate safety precautions for use of laboratory equipment and hazardous chemical materials 1.2. Use appropriate laboratory glassware and measuring equipment 1.3. Clean and store glassware and equipment in accordance with enterprise procedures
2. Make up working solutions	2.1. Identify the relevant standard methods for solution preparation 2.2. Assemble specified laboratory equipment 2.3. Select and prepare materials and solvent of specified purity 2.4. Measure appropriate quantities of reagents for solution preparation and record data 2.5. Prepare labels and log solution details in laboratory register 2.6. Transfer solutions to appropriately labelled containers
3. Check existing stock of solutions	3.1. Monitor shelf life of working solutions according to laboratory procedures

ELEMENT	PERFORMANCE CRITERIA
	3.2. Replace out-of-date or reject solutions according to laboratory procedures 3.3. Conduct routine titrimetric analyses, if appropriate, to determine if solutions are fit for purpose

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- using appropriate materials, equipment and procedures to prepare solutions
- following appropriate occupational health and safety (OHS), and hygiene procedures, if appropriate
- using all equipment safely and efficiently
- using enterprise procedures to calculate concentrations
- identifying solutions not fit for use
- using titrations to determine the concentration of solutions
- labelling, storing and disposing of solutions appropriately
- recording and presenting data appropriately

Required knowledge

Required knowledge includes:

- relevant biological, chemical, food and laboratory terminology
- principles of metrology
- the international system of units (SI)
- concentration terms, such as % w/w, % w/v, % v/v, ppm (mg/L) and molarity
- basic theory of acids, bases, salts, buffers and neutralisation
- enterprise procedures for preparing solutions
- calculations required to prepare specified amounts of solutions of specified concentration
- appropriate OHS procedure for preparing, handling and disposal of solutions
- use of material safety data sheets (MSDS)
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • prepare working solutions in compliance with relevant standards, appropriate procedures and/or enterprise requirements • follow OHS procedures to safely use laboratory chemicals glassware and equipment • make up working solutions according enterprise procedures • check existing stocks of solutions as being fit for purpose.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL922001A Record and present data* • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • standard laboratory equipped with appropriate equipment and reagents • SOPs and testing methods • access to appropriate containers and storage facilities.
Method of assessment	The following assessment methods are suggested: • inspection of solutions prepared, labelled and stored by the candidate • review of solution records and workplace documentation completed by the candidate • feedback from peers and supervisors • observation of the candidate preparing working solutions • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess

EVIDENCE GUIDE	
	directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Manufacturing** When starting materials used for the manufacture of common household materials are in transit from the supplier to the manufacturer, they may degrade if subjected to conditions, such as heat, moisture, light and oxygen. Even when the supplier ships quality materials to the manufacturing plant, the materials may be sub-standard when they arrive. Quality control tests are designed to test starting materials to ensure they are within specification. For example, aspirin forms salicylic acid when stored under adverse conditions. Laboratory assistants prepare and monitor the quality of solutions, such as ferric chloride solution, which gives an intense violet colour when added to salicylic acid but gives no colour with aspirin. Absence of the violet colouration indicates that breakdown of the aspirin hasn't occurred. **Biomedical** A laboratory assistant made up 1 litre of buffer solution using buffer tablets and a 1 litre volumetric flask as specified in the method. To ensure the solution was suitable for use the assistant measured the pH and found it was within acceptable range. The assistant then appropriately labelled a storage vessel and stored the buffer according to requirements. By following enterprise procedures the shelf life of the buffer was maximised.

EVIDENCE GUIDE	
	Environmental An environmental laboratory is contracted to determine the acidity of water samples taken from local lakes and streams. A laboratory assistant is required to make up small batches of 0.01M sodium hydroxide and to determine its concentration by titrating it against a standard solution of potassium acid phthalate using phenolphthalein indicator. This procedure is carried out monthly to ensure that the concentration of the sodium hydroxide solution is accurately known. Alternatively, the laboratory assistant may be required to prepare and standardise a fresh batch of sodium hydroxide on a monthly basis. In this case, he/she must understand the underpinning knowledge of basic acid/base theory, potential problems of interferences (such as slow absorption of carbon dioxide by sodium hydroxide solution) so as to ensure that the concentrations of workup solutions are accurately known. He/she must also be skilled in calculating and performing dilution when required to prepare such low concentrations (0.01M) of working solutions.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards, such as: • AS 2163-2000 Laboratory glassware - Measuring cylinders

RANGE STATEMENT	
	• AS 2165-1996 Laboratory glassware - Burettes AS 2162.1-1996 Verification and use of volumetric apparatus - General - Volumetric glassware • AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS 2243 Set:2006 Safety in laboratories set • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • MSDS and safety procedures • material, production and product specifications • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Typical test solutions	Typical test solutions may include: • solutions required for diagnostic/analytical and limit tests in food and chemical laboratories,

RANGE STATEMENT	
	such as sulphates, chlorides and heavy metals • solutions, such as stains for standard diagnostic/analytical procedures in biomedical/environmental laboratories, such as cell staining, fixation of cells and tissues, suspension of cells and titrimetric indicators • solutions required for laboratory maintenance and disinfection, such as 70% ethanol and hypochlorite
Laboratory equipment	Laboratory equipment may include: • pH meters • balances • magnetic stirrers, water baths and hot plates • measuring cylinders, beakers, conical flasks, volumetric flasks, pipettes and burettes • filter papers and funnels • fume cupboards
Hazards	Hazards may include: • corrosive chemicals, such as acids and alkalis • sources of heat, such as burners • sharps and broken glassware • spillages
Safety precautions	Safety precautions may include: • use of MSDS • use of personal protective equipment, such as safety glasses, gloves and coveralls • correct labelling of reagents and hazardous materials • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Monitoring quality of solutions	Monitoring quality of solutions may include: • noting turbidity to exclude absorption of moisture • noting deposits to exclude microbial contamination or chemical degradation

RANGE STATEMENT	
	• noting crystals to exclude evaporation • conducting titrations to check concentration • noting colour changes indicating a pH shift with solutions containing indicators • checking expiry dates on solution containers
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

Co-requisite units		

MSL973003A Prepare culture media

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare culture media which is free of contamination to facilitate optimal growth of organisms and cells. It includes the ability to organise the materials, equipment and work environment and follow standard methods.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants in the biomedical, biological, environmental, food processing and pharmaceutical industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare culture media	1.1. Prepare mixture of media and solvent to ensure solution and even settling of heat soluble materials 1.2. Label media to allow tracking in subsequent processes 1.3. Use a vessel large enough to endure adequate mixing and heating of the media 1.4. Dispense media into vessels for sterilisation, leaving room for expansion during heating and cooling
2. Sterilise media	2.1. Load the steriliser in keeping with maximum permitted loads and appropriate positioning of materials 2.2. Ensure a sterilisation indicator is correctly placed with the load to monitor sterilisation process 2.3. Operate sterilisation cycle in accordance with manufacturer's requirements to achieve sterilisation at the required settings 2.4. Cool media to the temperature specified in the media formulation procedures
3. Pour, label and store media	3.1. Add labile constituents where necessary, under conditions that will not lead to their denaturation or

ELEMENT	PERFORMANCE CRITERIA
	contamination of media 3.2. Ensure even mixing of additives and media before dispensing 3.3. Aseptically dispense media to minimise occurrence of procedural contamination 3.4. Label media to allow for selection, avoiding areas of the culture vessel required for examination of colony growth 3.5. Store media to maximise shelf life and minimise contamination 3.6. Date batch media to ensure correct batch rotation 3.7. Incubate control plates as a sterility check
4. Perform quality control checks	4.1. Inspect media for any evidence of possible contamination or problems with structure or sterilisation 4.2. Check useability of selective media by growth of expected organism 4.3. Check stored stocks at regular intervals for conformance to required standards
5. Maintain work area and equipment to prevent cross-infection and contamination	5.1. Use personal protective equipment and safe work practices to ensure safety of self and others 5.2. Place disposable and reusable items into relevant receptacles 5.3. Clean and disinfect work area and equipment after use 5.4. Transport disposable and reusable contaminated materials to relevant areas for disinfection, sterilisation and cleaning or disposal

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • calculating mass and volume • measuring accurately

REQUIRED SKILLS AND KNOWLEDGE
• making media to support growth of the relevant micro-organism or tissue • preventing cross-contamination • following enterprise procedures consistently • labelling and storing culture media according to enterprise procedures • accurately recording data • reporting non-compliance, anomalies or out of specification results • sorting, collecting, treating, recycling or disposing of waste • using appropriate personal protective equipment
Required knowledge
Required knowledge includes: • basic microbiological concepts and terminology such as growth rates in culture, production of gas and haemolysis of red cells in media • growth requirements of micro-organisms (bacteria, fungi, protozoans, viruses and multi-cellular parasites) in terms of their laboratory culture • the purpose, content and features of culture media and the relationship between the correct preparationof culture media and the optimal growth of organisms or cells • nature, properties and use of a range of biological media • the relationship between sterile practices, hygiene procedures and the ability to obtain growth free of contamination • the importance of physical requirements, such as pH and temperature on optimal growth of organisms and cells • the effect of inappropriate storage on culture media quality and performance • cleaning and sanitising requirements of equipment and work area • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure candidates can: • prepare culture media which is free of contamination to facilitate the optimal growth of organisms and

EVIDENCE GUIDE	
	cells • use appropriate sterilisation techniques, such as maintaining adequate space between containers • perform post-sterilisation procedures, such as dispensing or adding using aseptic technique • ensure the sterilised media has cooled down sufficiently to ensure that heat labile constituents, such as blood, hormones or antibodies are not inactivated when added to the media • consistently follow enterprise procedures • report non-compliances, anomalies or out of specification results.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL943002A Participate in laboratory/field workplace safety* • *MSL973004A Perform aseptic techniques*. Resources may include: • work schedule and enterprise procedures, including advice on safe work practices • relevant equipment and personal protective equipment • MSDS.
Method of assessment	The following assessment methods are suggested: • review of quality assurance results and examination of batches of media prepared by the candidate • observation of the candidate preparing culture media • written and/or oral questioning to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or

EVIDENCE GUIDE	
	assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Food processing** A laboratory assistant's task was to prepare and pour agar plates in readiness for milk sampling. The assistant collected all the equipment and material needed to make an agar plate and ensured the working area was suitably prepared. The agar solution was carefully prepared and poured into a large conical flask prior to sterilisation in the autoclave. On completion of the sterilisation cycle, the agar was cooled to 42ºC in a water bath. It was then poured into the plates after flaming the neck of the flask. The lids were quickly replaced on the plates to minimise contamination. The plates were then stored. Any excess plates were bagged in a laminar flow unit and then placed in the fridge. The equipment was hot washed and the benches swabbed with 70% ethanol solution. **Biomedical** Media preparation is a routine task of the technical assistant. The methods and standard procedures are all documented but common working knowledge and standard 'don'ts' are not always written into the methods. Some ingredients, such as labile nutrients and antibiotics must be added under sterile conditions after the basic ingredients have been mixed and autoclaved. In one laboratory there is a list of ingredients not to be autoclaved posted on the notice board, in the media recipe book and for good measure, on the autoclave itself. One day, a technical assistant who was preparing media added all the ingredients, including the glucose, then autoclaved all 20L of it. The technical assistant learned the consequences of not paying full attention to the procedure the hard way and spent most of the day removing the 'toffee' residue from inside the autoclave!

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes procedures and/or enterprise requirements**	Standards, codes procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4187:2003 Cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment and maintenance of associated environments in health care facilities
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• client and product specifications
	• HB 9-1994 Occupational personal protection
	• manufacturer's instructions or verbal direction from laboratory manager, supervisor or senior technician
	• material safety data sheets (MSDS)
	• National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)]
	• occupational health and safety (OHS) national standards and codes of practice
	• operation and maintenance manuals for

RANGE STATEMENT	
	automated media preparation equipment • principles of good laboratory practice (GLP) • production schedules and instructions • standard operating procedures (SOPs)
Equipment	Equipment may include: • balance • pH meter • hot plate stirrer and Bunsen burners • autoclave and Arnold steamer • membrane filtration equipment • measuring cylinders, flasks and glassware and Petri dishes • distilled water apparatus • automatic agar pourers • labelling equipment • refrigerators • sterilisation indicators • self-refilling syringes • Falcon dishes • media storage bottles and tissue culture bottles
Media	Media maybe prepared from: • formulated powders obtained from microbiological companies • first principles under supervision of a technical officer or scientist
Cell and tissue culture media	Cell and tissue culture media may include: • agars • broths • solutions • slopes • basic balanced salt solutions, such as Hank's or Kreb-Ringer's • deeps • enriched media, such as blood sugar, chocolate agar, tetrathionate broth and selenite broth • control media • differential media, such as eosin-methylene blue agar and MacConkey's agar • selective media, such as deoxycholate-citrate

RANGE STATEMENT	
	agar, Lowenstein-Jensen medium • tissue culture media • labile constituents, such as blood, hormones or antibodies
Sterilisation techniques	Sterilisation techniques may include: • autoclaving • steam and membrane filtration • boiling • microwaving • radiation • high temperature • high pressure steam • gas • chemical treatments
Quality control checks	Quality control checks may include: • streaking out of cultures to a single colony • lawn cultures
Hazards	Hazards may include: • micro-organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • sources of heat, such as ovens, burners and autoclaves • sharps and broken glassware • fluids under pressure and such as steam • radiation used for sterilisation
Safe work practices	Safe work practices may include: • use of MSDS • use of personal protective equipment, such as safety glasses, gloves and coveralls • use of biohazard containers and laminar flow cabinets • correct labelling of reagents and hazardous materials • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • allowing the chamber pressure of the autoclave

RANGE STATEMENT	
	to return to zero and temperature to cool to 80-90ÂºC before opening autoclave door to prevent boil over or plugs/caps being blown off flasks or tubes • regular cleaning and/or decontaminating equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units	

Co-requisite units		

MSL973004A Perform aseptic techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform aseptic techniques to maintain the integrity of both the sample source and the sample. It applies to sampling techniques in tissue culture and to generic microbiological procedures.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants and technicians working in the field or laboratory in the biomedical, biological, food processing and environmental industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for aseptic sampling or transfer	1.1. Ensure that any sampling procedure conforms with the requirements of the sampling plan 1.2. Use specified personal protective clothing and equipment 1.3. Prepare the work area for safe and effective sample transfer 1.4. Select equipment and materials specified by the procedure 1.5. Organise equipment to minimise contamination during manipulations 1.6. Label containers for clear identification 1.7. Record details in relevant log or database
2. Transfer materials aseptically	2.1. Protect the integrity of the sample source by sterilising the sampling site and the mouth of transport or culture vessel 2.2. Sterilise inoculating loops and/or pipette where used

ELEMENT	PERFORMANCE CRITERIA
	to prevent contamination 2.3. Perform transfer while minimising opportunities for contamination and cross-infection 2.4. After transfer, and before sealing the transport or culture vessel, flame the vessel mouth to maintain sterility 2.5. Re-sterilise inoculating loops, minimising the generation of aerosols 2.6. Perform quality control checks, if required 2.7. Label transport or culture vessels for clear identification
3. Maintain work area and equipment to prevent cross-infection and contamination	3.1. Place disposable and reusable items into relevant receptacles 3.2. Clean and disinfect work area and equipment after use 3.3. Transport disposable and reusable contaminated materials to relevant areas for disinfection, sterilisation and cleaning or disposal

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- sterilising equipment such as flasks, loops and pipettes
- handling of laboratory equipment and glassware to prevent contamination
- streak plating of inoculations
- sampling transfers
- labelling and storing culture media according to enterprise procedures
- recording data accurately
- reporting non-compliance, anomalies or outofspecification results
- sorting, collecting, treating, recycling or disposing of waste
- following enterprise procedures consistently
- using appropriate personal protective equipment

Required knowledge

REQUIRED SKILLS AND KNOWLEDGE
Required knowledge includes: • the relationship between sterile practices, hygiene procedures and the ability to obtain growth free of contamination • cleaning and sanitising requirements of equipment and work areaand effects of physical and chemical agents on microbial growth and death • principles of infection control related to occupational health and safety (OHS), sampling and transfer of materials in microbiological investigations • disinfection and sterilisation procedures used in the collection, processing and safe disposal of samples and materials • importance of pure culture techniques and aseptic transfer to the successful microbiological investigation and correct interpretation of laboratory results • growth requirements of micro-organisms (bacteria, fungi, protozoans, viruses and multi-cellular parasites) in terms of their laboratory culture • relevant health, safety and environment requirements **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example: Food processing: • food spoilage symptoms • food safety principles • beneficial/detrimental organisms relevant to specific food industry sector

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	In particular, assessors should look to see that the candidate: • follows established laboratory procedures, including recording of samples, operation of equipment and cleaning/decontamination • prevents cross-contamination of sample source and sample

EVIDENCE GUIDE	
	• manipulates equipment to prevent contamination of culture medium during transfer • sterilises equipment as required to prevent cross-contamination of work area, personnel and environment.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL943002A Participate in laboratory/field workplace safety* • *MSL973003A Prepare culture media*. Resources may include: • standard laboratory with appropriate equipment and materials • enterprise procedures and standard methods • MSDS.
Method of assessment	The following assessment methods are suggested: • review of quality assurance results and examination of samples transferred by the candidate • observation of the candidate successfully transferring a range of samples • written and/or oral questioning to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of

EVIDENCE GUIDE	
	competency and show its relevance in a workplace setting. **Food processing** As part of the quality assurance program at an ice-cream manufacturer, six ice-creams were removed from the production line, placed in sterile bags and then stored in a freezer in the microbiology laboratory. Later in the morning, the laboratory assistant removed the samples from the freezer, registered the samples with the date received and test code and signed the register book. She/he then placed the samples in a water bath set at 42(C. While the samples were melting, the laboratory assistant labelled the respective agar plates with the registered codes. Using aseptic techniques she/he carefully transferred 1ml of ice-cream mix into the total plate count agar. The plates were then placed in the incubator. The final results were noted and recorded. **Biomedical** In preparation for antibiotic sensitivity testing and biochemical identification of presumed pathogenic bacteria, a technical assistant was asked to prepare a sterile peptone suspension of a lactose fermenting colony. The colony had been previously identified by the supervisor on a MacConkey's agar plate. The assistant labelled a 5mL tube of peptone broth with the sample number and a code for the identified colony and then donned a pair of disposable gloves. Bringing the labelled tube and the MacConkey's plate near to the Bunsen, she/he took an inoculating loop and sterilised it in the incandescent flame. She/he carefully cooled the loop in a sterile area of the agar and gently scraped off half the colony. With the other hand, and in the vicinity of the heated air of the Bunsen, she/he removed the cover of the peptone tube in her/his crooked finger. In a continuous and coordinated way she/he flamed the lip of the tube and emulsified the colony in the broth. She/he then flamed the lip of the tube and replaced its cover. Finally, the technical assistant re-sterilised the inoculating loop by introducing and holding it in the Bunsen flame to minimise the generation of bacterial aerosols.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4187:2003 Cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment and maintenance of associated environments in health care facilities
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• HB 9-1994 Occupational personal protection
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• client and product specifications
	• manufacturer's instructions or verbal direction from laboratory manager, supervisor or senior technician
	• material safety data sheets (MSDS)
	• National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)]
	• National Health and Medical Research Council (NHMRC) Guidelines
	• OHS national standards and codes of practice

RANGE STATEMENT	
	• operation and maintenance manuals for automated media preparation equipment • principles of good laboratory practice (GLP) • production schedules and instructions • standard operating procedures (SOPs)
Personal protective equipment	Personal protective equipment may include: • gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits and respirators • biohazard containers and laminar flow cabinets
Sample pot and transfer media and the subculturing and/or passaging of culture	Sample pot and transfer media and the subculturing and/or passaging of culture to: • sterile broth • media for isolation of colony • tissue culture media • media for continuous culture systems
Samples	Samples may include: • body fluids and liquids • water and soil • sterile pharmaceuticals • yeasts and moulds • milk and yoghurt • swabs and smears • propagation tissue • plant material • fermented foods and beverages
Equipment	Equipment may include: • transfer equipment, such as inoculating loops, pipettes (quantitative and qualitative), flasks, tubes and spatulas • Bunsen burners and bench incinerators • anaerobic jars • incubators, water baths, refrigerators, freezers and possibly dry ice and liquid nitrogen cylinders • laminar flow units and biohazard cabinets • autoclave or pressure cooker • swabs • continuous culture systems

RANGE STATEMENT	
The range of material	The range of material may involve: • solid and/or liquid media • supplied media, such as media manufactured in the enterprise or raw material supplies for media • disinfecting and sterilising agents and materials, such as methylated spirits, ethanol and ether • disposable equipment and clothing • tissue culture media • growth media in broths, plates, deeps or slopes • receptacles for safe disposal of wastes and for processing of reusable materials • bar coding material and labels
Sterilisation techniques	Sterilisation techniques may include: • autoclaving • flaming • steam and membrane filtration • boiling • microwaving • radiation • high temperature • high pressure steam • gas and chemical treatments
Quality control checks	Quality control checks may include: • streaking out of cultures to a single colony • lawn cultures
Hazards	Hazards may include: • accessing the sample from difficult or dangerous areas • dry ice and liquid nitrogen vapour • ultraviolet (UV) light sources • heat from Bunsen burners • molten agar • sharps • hazardous substances and/or infectious agents
Workplace information	Workplace information may include: • SOPs

RANGE STATEMENT	
	• specifications for safe waste disposal of bio-hazardous materials • production schedules and instructions • work notes • MSDS • manufacturer's instructions • verbal instructions from laboratory manager, supervisor or senior technician • guidelines for small scale genetic manipulation work
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973005A Assist with fieldwork

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency describes the ability to perform tasks associated with the organisation of fieldwork and field surveys. It also covers basic field survival skills and collection of samples in the field.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory and field assistants working in the environmental, mining, construction materials testing and rural industry sectors. All aspects of field and laboratory work covered by this unit of competency would be supervised by a scientific officer or technical officer. Though a supervisor may not always actually be present, the worker will follow standard operating procedures that clearly describe the permitted scope of practice. This unit of competency does not include gaining clearance for animal trapping, tagging, keeping or experimentation. It does not cover animal handling techniques. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Assist with organisation of fieldwork	1.1. Purchase supplies and equipment as specified by senior staff 1.2. Assemble supplies and equipment and check against inventory 1.3. Pack supplies and equipment appropriately for safe transport
2. Support field operations	2.1. Check unpacked items against inventory 2.2. Store supplies and equipment as specified 2.3. Restock supplies as necessary 2.4. Collect and/or dispose of waste in accordance with enterprise and environmental requirements
3. Assist with field activities	3.1. Assemble equipment and materials for fieldwork as directed

ELEMENT	PERFORMANCE CRITERIA
	3.2. Collect samples, if required, in accordance with enterprise procedures, animal care and ethics and other legislative requirements 3.3. Store samples in accordance with special requirements for continued wellbeing, viability or integrity of sample 3.4. Perform simple field measurements as directed 3.5. Collect and maintain records of site data as directed
4. Demonstrate basic field survival skills	4.1. Follow specified safety procedures 4.2. Follow specified survival procedures in the event of emergencies and accidents 4.3. Wear suitable clothing as protection against solar radiation, extreme temperatures and impact injury
5. Assist with the completion of fieldwork	5.1. Pack supplies, equipment and samples appropriately for safe return transport 5.2. Check and clean used equipment to prevent deterioration and contamination 5.3. Check that the condition of vehicles, equipment and materials comply with environmental/quarantine requirements for preventing transfer of pests 5.4. Return supplies and equipment to storage at enterprise location 5.5. Conduct a stocktake of equipment and supplies for replenishment where required 5.6. Assist with the dispatch of collected samples for laboratory analysis, as necessary

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • using two-way radio and satellite phone in accordance with enterprise procedures • using basic field survival strategies, such as map reading, use of compass and global positioning system (GPS) and 'stay with vehicle' in the event of accident or emergency

REQUIRED SKILLS AND KNOWLEDGE
• organising, packing/unpacking and stowing materials and equipment with close attention to detail • collecting samples in accordance with enterprise procedures and legislative requirements • storing andmaintaining samples in accordance with special requirements for continued wellbeing, viability and integrity of sample • maintaining accurate and complete data records and checklists • working safely and in accordance with environmental requirements • cleaning equipment and collecting and disposing of wastes in accordance with safety and environmental requirements
Required knowledge
Required knowledge includes: • terms used to describe the relevant industry sector's field equipment, materials, samples and specimens • enterprise procedures relating to sample collection, maintenance and storage • enterprise procedures relating to field testing • specific legislation and codes of practice related to sample and animal collection (if relevant in the industry sector) • principles of safety relating to fieldwork, such as use of LPG, operation of generators and use of protective clothing • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform all field activities according to enterprise procedures, legislative and environmental requirements, industry guidelines and codes of practice • complete all tasks efficiently and safely.
Context of and specific resources for	This unit of competency is to be assessed in the

EVIDENCE GUIDE	
assessment	workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL913001A Communicate with other people* • *MSL913002A Plan and conduct laboratory/field work.* Resources may include: • enterprise procedures, regulations and codes of practice • relevant field equipment, samples, test kits and reagents.
Method of assessment	The following assessment methods are suggested: • review of performance with a focus on completing field activitiessafely and efficiently, collection of field samples and data, basic field survival skills, teamwork and accurate record keeping • paper exercises associated with organisation of fieldwork, fieldwork operations and basic field survival strategies • role plays based on possible accident and emergency situations requiring use of communication procedures and basic field survival strategies • oral or written questions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace

EVIDENCE GUIDE	
	setting. **Environmental** (**1**) On a field trip to determine the biodiversity of an island fringing reef, a technical assistant assists with constructing a grid map of the study area. The assistant counts the number of six different species of plant in part of the grid, taking care to minimise the impact on the environment. He/she also accurately records the data on a map to show the location of each plant using a predetermined key. **Environmental** (**2**) A technical assistant is asked to pack and safely transport water sampling and monitoring equipment to a distant field site. Firstly, the assistant checks that all the equipment is in working order and that he/she is able to use and maintain it. Given that the technical assistant is licenced to operate a small boat and is a competent underwater diver, he/she also performs a simple underwater survey of macrophytes in a lake in the study area. The assistant follows standard safety and operating procedures and records the results on a grid map and in the daily log book. **Construction materials testing** A contract laboratory has assigned a team of three to conduct pavement investigations in a rural/remote region. The field assistant uses a checklist to assemble all the required equipment and supplies for a three day trip. The assistant checks the vehicle, toolkit and spares, communication equipment, GPS, water, first aid kit and personal protective equipment. He/she also checks that the generator, fuel, jackhammer,dynamic cone penetrometer (DCP), sample bags, measuring devices and camera are all present and in good working order. Because the team will be working away from base for three days, the assistant knows that it is vital that all items are present and stowed safely before he/she tells the team leader that the vehicle is ready for departure.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide -Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 4332-2004 The storage and handling of gases in cylinders
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	• animal welfare legislation and codes of practice
	• Australian Dangerous Goods Code
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice
	• basic sampling procedures (labelling, preparation, storage, transport and disposal)
	• basic test procedures (validated and authorised)
	• cleaning, hygiene and personal hygiene requirements
	• environmental requirements related to disposal

RANGE STATEMENT	
	of waste • first aid kit and survival manual • incident and accident/injury reports • instructions to comply with new legislation, standards, guidelines and codes • material safety data sheets (MSDS) • occupational health and safety (OHS) national standards and codes of practice • safety requirements for equipment, materials or products • written fieldwork procedures, standard operating procedures (SOPs) and operating manuals
Items of equipment	Items of equipment may include: • pH meters, dissolved oxygen probes, portable colourimeters, field microscopes, hand centrifuges, sieves and filters • chemical field test kits • environmental monitoring systems • equipment required for the collection of samples and animals • equipment required for ensuring the wellbeing of animals • equipment suitable for the safe collection and disposal of biological and non-biological wastes • basic first aid equipment • data loggers • communication systems, such as two-way radio and conventional codes and symbols for signalling • tools, vehicle recovery equipment and spare parts • navigation and communication equipment, including GPS
Hazards	Hazards may include: • solar radiation, dust and noise • personnel getting lost • incidents or emergencies, such as snake or animal bites • severe weather conditions

RANGE STATEMENT	
	• manual handling of heavy objects • vehicle and boat handling in rough/remote conditions • moving machinery and hand tools • driving vehicles in rough terrain and over long distances during day or night
Safety procedures	Safety procedures may include: • use of personal protective equipment, such as sunscreen, hats, safety glasses, gloves and safety boots • 'stay with vehicle' and other basic survival techniques • use of a regular communication schedule • handling, storage and disposal of all hazardous materials/waste in accordance with MSDS, labels, and enterprise procedures and regulations
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973006A Prepare trial batches for evaluation

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare trial batches of materials for evaluation. Materials can include soil, minerals and manufactured products, such as concrete, asphalt, food, plastics, paint and other industrial chemicals.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants working in all industry sectors. It describes work conducted by laboratory assistants, generally working under the guidance of a senior technician or laboratory supervisor/manager. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for trial batch mixing	1.1. Identify the job, materials, appropriate procedures and safety requirements 1.2. Record description of the job to be undertaken, compare with specification and report any variations 1.3. Select and prepare tools, equipment and materials in accordance with job requirements 1.4. Confirm the properties and quantities of materials to be used 1.5. Confirm that the required materials are available and ready for use
2. Mix trial batch for evaluation	2.1. Measure out quantities of materials ready for mixing 2.2. Mix the materials according to established procedures 2.3. Discharge the mixture ready for inspection and testing according to established procedures 2.4. Record details of the mix and any observations

ELEMENT	PERFORMANCE CRITERIA
	according to established procedures
3. Evaluate properties of the mixture by inspection and standard test methods	3.1. Obtain representative samples of the mix for testing 3.2. Perform specified tests according to established procedures 3.3. Handle and transport samples in accordance with established procedures 3.4. Label samples and record details in accordance with established procedures
4. Clean equipment and dispose of materials	4.1. Clean mixing, measuring, sampling and testing equipment after use 4.2. Return unused materials to storage 4.3. Dispose of excess materials safely and ethically
5. Maintain records	5.1. Record data in accordance with established procedures 5.2. Maintain equipment records in accordance with established procedures 5.3. Maintain confidentiality of enterprise information
6. Maintain a safe work environment	6.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes and environmental impacts 6.3. Ensure safe disposal of laboratory and hazardous wastes 6.4. Clean, care for and store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- performing simple calculations
- making accuratemeasurements of volume and mass
- representative sampling

REQUIRED SKILLS AND KNOWLEDGE
• working safely with equipment and hazardous materials • working safely in laboratory and field conditions • setting up and maintaining tools and equipment • using tools and equipment to perform basic sampling and testing techniques • observing and recording information on testing and sampling • handling, transporting and storing materials • observing interpreting and reporting atypical situations
Required knowledge
Required knowledge includes: • the international system of units (SI) • concepts of metrology • the properties of mixing materials and how they affect the properties of the final product • hazards involved with materials and equipment involved • representative sampling • uses of various materials/enterprise products • basic testing methods for relevant materials • enterprise traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform operations in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements • accurately measure, calculate and record batch quantities, concentrations and other relevant parameters • evaluate properties of the mixture by inspection and standard test methods

EVIDENCE GUIDE	
	• recognise and report problems and atypical situations to relevant personnel.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL952002A Handle and transport samples or equipment* • *MSL954001A Obtain representative samples in accordance with sampling plan* • *MSL973001A Perform basic tests*. Resources may include: • standard facility with appropriate tools, equipment and materials • enterprise procedures, MSDS and product formulation/specifications.
Method of assessment	The following assessment methods are suggested: • analysis of trial batches prepared by the candidate over a period of time to ensure accurate and consistent work is obtained within required timelines • inspection of workplace documentation completed by the candidate • feedback from peers and supervisors • use of suitable simulation and/or a range of case studies/scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study

EVIDENCE GUIDE	
	below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Construction materials** A laboratory assistant works for a concrete manufacturer. A client requires concrete for a specific project that cannot be supplied using existing standard mixes. The manufacturer must use special aggregates and cement to meet the durability and strength specifications for the project. The laboratory manager obtains quantities of the materials for evaluation purposes. The assistant tests the aggregates to determine their grading properties. From these results, he/she designs a mix to satisfy the project specifications using a standard design method. The mix requires the use of pozzolanic materials and admixtures that were obtained from the suppliers. The manager provides the assistant with the batch quantities required to produce one cubic metre of concrete. To test the mix design, the assistant will produce a 20litre batch in the laboratory. He/she calculates that this quantity will provide sufficient material for the required tests, without undue waste. He/she calculates the quantity of each material required for the trial batch. The assistant selects and prepares the tools and equipment she needs to mix, sample and test the concrete. He/she wears overalls, safety boots and glasses, and uses a barrier cream. He/she measures out the quantities required for the trial batch, charges the mixer and allows it to mix for the specified time. He/she then discharges the concrete onto a suitable surface. He/she checks its slump, cohesiveness and air content, recording the data on standard enterprise forms. The manager inspects the concrete, and decides that it is over-sanded and has excessive slump. He/she adjusts the batch quantities and draws up amended values. He/she disposes of the excess concrete and cleans the equipment and tools. He/she then mixes a new batch using the amended figures. This process continues until the manager is satisfied with the concrete quality. He/she then mixes a larger batch so that he/she can prepare specimens for testing its hardened-state properties.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards such as: • AS ISO 1000-1998 The international system of units (SI) and its application • enterprise recording and reporting procedures • enterprise sampling procedures for specific samples, sites and clients • equipment manuals • equipment startup, operation and shutdown procedures • maps and site plans • material safety data sheets (MSDS) • material, production and product/formulation specifications • national measurement regulations and guidelines • production and laboratory schedules • safety procedures • standard operating procedures (SOPs)
Materials, **tools and equipment**	Materials, tools and equipment may include: • soils, concrete, asphalt, aggregates, polymers, ceramics, metals, foodstuffs and solvents • ovens, sieves, balances, volumetric measures and mixers • hand tools, including shovels, scoops and spatulas • consumables, including sample bags and labels • documentation, including specifications,

RANGE STATEMENT	
	manufacturers' handbooks and worksheets • test equipment appropriate to the various materials
Simple calculations	Simple calculations may include: • proportion, ratio and percentage for batch quantities • concentrations • other relevant parameters
Concepts of metrology	Concepts of metrology may include: • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Typical problems	Typical problems may include: • not following SOPs • measurement errors • calculation errors • materials of unreliable quality • insufficient mixing • poor sampling procedures • equipment breakdown and breakage
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air and water • solar radiation, dust and noise • chemicals • sharps, broken glassware and hand tools • flammable liquids and gases • fluids under pressure • manual handling heavy objects • crushing, entanglement and cuts associated

RANGE STATEMENT	
	with moving machinery or falling objects
Safety procedures	Safety procedures may include: • recognising hazard warnings and safety signs • use of personal protective equipment, such as hard hats, hearing protection, sunscreen lotion, gloves, safety glasses, goggles, face guards, coveralls and safety boots • use of MSDS • following established manual handling procedures • regular cleaning and/or decontaminating of equipment and work areas • ensuring access to service shut-off points • identifying and reporting operating problems or equipment malfunctions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973007A Perform microscopic examination

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to set up a light microscope for optimum resolution, to prepare routine samples and to observe, identify and report sample characteristics.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory or technical assistants in all industry sectors. The unit of competency covers limited interpretation and analysis of results. Troubleshooting of equipment and procedures is not required. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret test requirements	1.1. Review test request to identify samples to be tested, test method and equipment involved 1.2. Identify hazards associated with the sample, preparation methods and equipment and implement enterprise control measures
2. Set up work area for preparation and examination of samples	2.1. Collect equipment and arrange the workspace so that equipment can be used safely and efficiently 2.2. Perform pre-use and safety checks to ensure equipment is fit for purpose and report faulty or unsafe equipment to appropriate personnel
3. Prepare samples for examination	3.1. Log and label samples according to enterprise procedures to ensure traceability 3.2. Check suitability of the original and prepared sample for the examination and report unsuitable samples to appropriate personnel 3.3. Prepare and store the sample for examination following enterprise methods

ELEMENT	PERFORMANCE CRITERIA
4. Set up and use a light microscope	4.1. Set up the light path to optimise resolution 4.2. Select the appropriate objectives and filter for the sample being examined 4.3. Ensure that the lenses are clean 4.4. Adjust settings and alignment of the light path to optimise performance 4.5. Place sample correctly on the stage
5. Observe, identify and report sample characteristics	5.1. Recognise and identify significant sample characteristics 5.2. Perform required calculations accurately 5.3. Prepare and view control samples and check that results are consistent with expected values 5.4. Identify and report out of specification or atypical results promptly to appropriate personnel 5.5. Record and report data in accordance with enterprise procedures
6. Maintain a safe work environment	6.1. Ensure safety and minimise cross-contamination through the use of personal protective clothing and safety equipment 6.2. Handle all samples and equipment in accordance with enterprise safety protocols 6.3. Clean up spills using appropriate techniques to protect personnel, work area and environment 6.4. Minimise generation of waste and environmental impacts 6.5. Collect and dispose of all wastes safely 6.6. Report hazards and incidents to designated personnel using enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • setting up the workbench and microscope ergonomically

REQUIRED SKILLS AND KNOWLEDGE
• setting up, cleaning and using a light microscope to achieve optimum resolution of the specimen • using personal protective clothing and other safety equipment correctly • performing counts on samples • performing basic measurements using grids • logging and tracking samples through all steps from receiving a sample through to completion of a procedure and reporting • interpreting and recording test results, including simple calculations • correctly handling and storing samples and equipment
Required knowledge
Required knowledge includes: • parts and functions of a light microscope • importance and appropriate use of controls and certified reference materials • hazards and risks in laboratories associated with performing microscopic examination • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example: Biological industry: • basic structure and function of cells and organelles • basic classes and classification of organisms of organisms, such as prokaryotes, eukaryotes, plants, animals, bacteria, viruses and prions • cell physiology and processes, such as simple and facilitated diffusion, plasmolysis, osmosis, tonicity, active transport, energy production, mitosis, motility, phagocytosis and pinocystosis • purposes and mechanisms of staining (e.g. Gram +ve and -ve)

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • follow enterprise standards, procedures and practices • prepare suitable samples • recognise, identify and document significant sample characteristics • set up a light microscope for optimal resolution • maintain personal safety and that of others • minimise cross-contamination and contamination of the laboratory and environment.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL922001A Record and present data* • *MSL933002A Contribute to the achievement of quality objectives* • *MSL943002A Participate in laboratory/field workplace safety* • *MSL953001A Receive and prepare samples for testing*. Resources may include: • standard laboratory equipped with appropriate equipment, such as light microscopes and samples • enterprise procedures, standard methods and materials.
Method of assessment	The following assessment methods are suggested: • observation of the candidate performing microscopic examinations • review of data records prepared by the candidate, such as counts, observations and results • feedback from supervisors and peers about adherence to enterprise/technical procedures • questioning to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and

EVIDENCE GUIDE	
	disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Construction materials testing** The supply of river sand is running out and quarries are accessing alternative sources of sand for use in concrete mixes in construction. The sand should not be an aggregate that is likely to break down into smaller particles. A technician in a quarry company is required to analyse samples of crushed rock using a light microscope. The technician looks for characteristics of the sample, such as angularities, roundness, sharpness, cracks, presence of organic matter, mineral structure and whether the particles are a conglomerate. If the sample does not meet the characteristics, the company will need to treat it to make it suitable for use in concrete mixes (for example by washing, crushing and sieving). **Food processing** A customer complaint is received about the baking properties of a flour delivery. The laboratory assistant at the flour mill is given the task of testing the starch content of the suspect flour. He/she prepares iodine stained samples of the returned flour and a range of baked and partially baked products prepared from it. First, the assistant makes up fresh iodine staining solution and then prepares slides of each sample for microscopic examination. He/she identifies the characteristic starch granules of the flour sample and records the degree of gelatinisation in the starch granules in the baked samples. He/she discusses the results with the supervisor and prepares a report for the customer. **Biomedical** A laboratory assistant works in the microbiology laboratory of a public hospital and is responsible for

EVIDENCE GUIDE	
	preparing and staining sputum smears from patients for micro and culture. The assistant puts on a clean gown and gloves before collecting the specimens from the reception area of the laboratory. The assistant prepares cultures of the sputum specimens on simple and selective media before preparing, fixing and staining smears for microscopic examination. The results are checked by the supervisor, entered into the laboratory information management system (LIMS) and sent to the appropriate section of the hospital. **Environmental** A laboratory assistant prepares media for plant tissue culture. There has been some contamination of Gram-positive bacteria in the last two batches and the supervisor has initiated an overhaul of the preparation and aliquotting procedure. The laboratory assistant has been asked to follow the new procedure exactly and to remove samples at each stage of ingredient addition for microscopic examination. The laboratory assistant records the exact addition amounts, batch numbers and brands of the reagents, the location of the addition (which biohazard cabinet), the equipment used and the pre-sterilisation records of all equipment. The laboratory assistant then prepares slides, fixes them and performs a Gram stain on each of the aliquots removed from the new preparation run. Microscopic analysis of each aliquot reveals nil contamination. The supervisor decides that there has been a breach in the old procedure and the laboratory assistant is asked to follow the new procedure and to perform a routine microscopic check on all batches for the next month.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• principles of good laboratory practice (GLP)
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• safety manuals
	• quality manuals and equipment and procedure manuals
	• standard operating procedures (SOPs)
	• material safety data sheets (MSDS)
	• enterprise recording and reporting procedures
	• production and laboratory schedules
	• material, production and product specifications

Preparation of samples	Preparation of samples may include: • aseptic transfer of specimen • centrifugation • cooling • drying • filling a counting chamber in one continuous flow without bubbles or overflow • filtration • fixing of films to minimise cell damage and the production of artefacts • labelling • mounting of stained films, sections and whole mounts to ensure long term preservation • permanent labels for smears, films and sections for presentation, storage and retrieval • physical or chemical separation

RANGE STATEMENT	
	• selection of diluent to preserve or enhance visibility of the cells to be counted • selection, filling and cover slipping of a clean, dry counting chamber to ensure even distribution of cells during filling • serial dilution to enable individual cells to be reliably counted • staining of fixed material to illustrate required characteristics • sub-sampling • thin film or smear on a slide
Checking sample condition	Checking sample condition may include: • labelling • spillage • spoilage due to incorrect storage and transport conditions • temperature control • suitability for the examination
Pre-use checks	Pre-use checks may include: • calibration • cleaning/checking use by dates of reagents • routine maintenance
Equipment	Equipment may include: • glass slides • counting chambers (e.g. haemocytometer) • optical graticules and stage micrometers • tissue culture flasks
Light microscopes	Light microscopes may include: • bright field illumination microscopic examination up to 1000x magnification • stereomicroscopes and dissection microscopes • compound microscopes • phase contrast microscopes • inverted microscopes
Biological samples	Biological samples may include: • smears, impression smears, sections, squashes, films and whole mounts • a monolayer of cells in smears and films

RANGE STATEMENT	
	• fixed smears for demonstration of bacteria by the methylene blue and Gram staining techniques • blood films stained by a Romanowsky technique to clearly show differentiation of granulocytes • stained sections of animal tissues using regressive haematoxylin and eosin to differentiate cytoplasmic and nuclear detail • differentially stained monocotyledon and dicotyledon stem sections to demonstrate the structure of vascular bundles (xylem, phloem and cambium) • stained whole mounts of helminths • whole mounts, such as liver flukes, planaria and samples of animal faeces to demonstrate ova, cysts and larvae • pond water organisms • onion root tip squash • midstream sample of urine
Physical samples	Physical samples may include: • sand • asbestos fibres • coal samples • construction testing materials • geological specimens
Checking prepared samples	Checking prepared samples may include looking for: • clean and scratch-free microscope slides to reduce artefacts • preparation according to SOPs • a homogeneous suspension of sample • films and smears that have been fixed rapidly • thin films with a monolayer of cells • appropriate whole mounts for intact organisms • correct sample identification during and after processing
Sample characteristics	Sample characteristics are restricted to what can be viewed by bright light microscopy and may include:

RANGE STATEMENT	
	• shape and size of particles • presence of contamination • colour • consistency and variability • number of cells (e.g. cells in blood or other particulate samples, such as a yeast suspension or pollen grains) • type of cells, percentage of atypical cells, presence/absence of cells, size of cells, viable and non-viable cells and trajectory • presence of stained material, such as starch • colour/staining and morphology • motility
Calculations	Calculations may include: • dilutions • percentage viability • number of cells in original sample after dilution • calculation of cells/ml in a number of squares of a counting chamber
Hazards	Hazards may include: • micro-organisms and agents associated with soil, air, water, blood and blood products and human or animal tissue and fluids • chemicals and stains • sharps and broken glassware • aerosols
Safety practices and personal protective equipment	Safety practices and personal protective equipment may include: • use of MSDS • use of personal protective equipment, such as safety glasses, gloves and coveralls • use of biohazard containers and laminar flow cabinet • correct labelling of reagents and hazardous materials • handling and storing hazardous materials and equipment in accordance with labels, MSDS and manufacturer's instructions • ergonomic layout, correct illumination and

RANGE STATEMENT	
	organisation of workbench • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973008A Perform histological procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform straightforward histological procedures involving processing and sectioning (by hand or rotary microtome) of plant and animal tissues in paraffin wax.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants working in biomedical, biotechnology, environmental and education sectors. Personnel will work under direct supervision and have ready access to enterprise procedures. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Assemble equipment and materials	1.1. Confirm the number and type of sections required 1.2. Collect equipment and arrange the workspace so that equipment can be used safely and efficiently 1.3. Perform pre-use and safety checks to ensure equipment is fit for purpose 1.4. Report faulty or unsafe equipment to appropriate personnel 1.5. Inspect processor reagents for deterioration and adequate volume and report any items requiring replacement
2. Process and embed plant and animal tissue	2.1. Select program and reagents for processing 2.2. Monitor processor regularly during processing sequence to ensure dehydration, clearing and infiltration are complete 2.3. Check that temperature of wax is suitable for embedding process 2.4. Check that volume of wax is sufficient for

ELEMENT	PERFORMANCE CRITERIA
	uninterrupted embedding of processor load 2.5. Embed tissue in correct orientation 2.6. Allow block to solidify evenly according to wax requirements
3. Cut sections of plant and animal tissue	3.1. Place and secure block and knife in microtome strictly in accordance with safety directions 3.2. Label required number of microscope slides in accordance with enterprise traceability requirements 3.3. Cut ribbons of representative sections at the required thickness observing prescribed safety measures 3.4. Float sections onto water bath to flatten tissues 3.5. Pick up sections onto microscope slides ensuring identification on slides matches that on block 3.6. Apply procedures to prevent cross-contamination between samples 3.7. Cut free hand sections of plant tissue as required 3.8. Inspect sections and reject items that do not meet specifications
4. Stain sections	4.1. Select reagents specified in the method 4.2. Stain sections according to the method 4.3. Examine sections microscopically to ensure expected staining outcomes have been achieved 4.4. Mount sections to ensure long term preservation 4.5. Attach permanent labels giving specimen details according to enterprise traceability requirements
5. Maintain a safe work environment	5.1. Ensure personal safety and minimise cross-contamination through the use of personal protective equipment 5.2. Handle all specimens and equipment in accordance with enterprise safety protocols/procedures 5.3. Clean up spills using appropriate techniques to protect personnel, work area and environment 5.4. Minimise generation of waste and environmental impacts 5.5. Collect and dispose of all wastes safely 5.6. Report hazards and incidents to designated personnel using enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- processing and embedding of plant and animal tissue
- cutting of sections free of wrinkles, scores and folds and at the specified thickness to demonstrate tissue and cellular structures, granules, inclusions and organelles
- regressive haematoxylin and eosin staining
- cover slipping slides, ensuring that no air bubbles are formed and material is preserved for the life of the slide
- labelling slides clearly with case number, specimen and stain details
- maintaining equipment and recording and reporting malfunctions appropriately
- maintaining traceability through all steps from receiving a specimen through to completion of a procedure

Required knowledge

Required knowledge includes:

- functions of the components of a rotary microtome
- safety precautions relevant to tissue processing, embedding and microtomy
- importance and appropriate use of certified reference materials
- relationship of the anatomy and morphology of tissue types and the macroscopic and microscopic appearance of stained sections
- correlation between poorly maintained processing reagents and resultant tissue blocks being difficult to cut or unsuitable for cutting
- relationship between correct orientation of the tissue during embedding and ability to cut sections from surface required for subsequent microscopic examination
- occupational health and safety (OHS) procedures related to micrometry and handling irritating, volatile, flammable and potentially carcinogenic substances, such as formaldehyde, xylene, histoclear, ethanol and chloroform
- safe and environmentally responsible disposal of wastes
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • process, embed and cut tissue safely to enterprise procedures • stain sections according to enterprise procedures • manage tasks and organise work to ensure the timely completion of tasks • use specimens, reagents and materials economically and dispose of wastes safely • maintain equipment, recording and reporting malfunctions appropriately • minimise cross-contamination between specimens • maintain traceability through all steps from receiving a specimen through to completion of a procedure • work safely.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL973007A Perform microscopic examination*. Resources may include: • standard laboratory equipped with appropriate equipment and materials, such as microtomes, stains, animal and plant tissues • processing system for paraffin blocks • associated OHS equipment, such as extractor systems • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • observation of the candidate performing tissue processing, embedding, cutting, pickup and mounting • inspection of sections and slides prepared by the candidate • review of quality control records for sections and slides prepared by the candidate • feedback from supervisors and peers on adherence to enterprise/technical procedures

EVIDENCE GUIDE	
	• questioning to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Biomedical** A laboratory assistant is asked to prepare a series of 5 (m or less, sections of rats' livers as part of a team's work to investigate a new treatment for Hepatitis C. She/he retrieves the liver samples from the cut-up bench for processing. The assistant checks that the processor is warmed up and that all the reagents are topped up. She/he chooses a program to suit the 1cm square liver samples and loads the cassettes into the processor. As processing continues, the assistant regularly checks that the system is working correctly. The next day, the assistant embeds the tissue into paraffin wax and cuts sections from each block using a rotary microtome. She/he checks that each section is smooth, flat and free of artefacts, taking care to ensure that there is no contamination between specimens and that traceability of all specimens and documentation is maintained. The assistant stains the tissue with a routine Haematoxylin and Eosin stain and passes the tray of prepared slides to the researcher for further analysis. **Education** A laboratory assistant in a high school was asked to prepare sections of plant tissue using a hand microtome

EVIDENCE GUIDE	
	in preparation for a practical class where the students will stain and examine the slides in order to consolidate their knowledge about plant tissue structure and function. He/she was also asked by the supervising teacher to prepare a brief written outline for the students of the procedures used to prepare the plant tissue sections and to demonstrate the procedures to the student group under the control of the teacher. The laboratory assistant emphasised the importance of setup, pre-use checks of the equipment and appropriate disposal of the sections at the end of the practical class.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• principles of good laboratory practice (GLP)
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• safety manuals

RANGE STATEMENT	
	• quality manuals and equipment and procedure manuals • material safety data sheets (MSDS) • enterprise recording and reporting procedures • production and laboratory schedules • material, production and product specifications • standard operating procedures (SOPs) describing personal protective equipment requirements, indications for use of biohazard and laminar flow cabinets, containment and cleanup of spillages and disposal of wastes • instructions to comply with legislation, standards, guidelines and codes • stock records and inventory • waste minimisation and disposal protocols
Equipment, **reagents**, **specimens and systems**	Equipment, reagents, specimens and systems may include: • tissue processors • microtomes and microtome knives (non-disposable or disposable) • embedding centres • flotation baths and drying ovens • microtome knife sharpeners • reagents, such as formaldehyde, ethanol, xylene, paraffin and stains • reference material for automated and manual quality control and quality assurance systems • fresh and fixed specimens • computer information systems, databases, record and filing systems, including specimen accessioning
Histological procedures	Histological procedures may include: • cutting paraffin sections of organs, such as kidney, liver, small intestine, stomach and tongue • cutting paraffin sections of dicotyledon and monocotyledon stems • staining tissue sections with Haematoxylin and Eosin (human and animal tissue) and Safranine and Fast Green (plant tissue)

RANGE STATEMENT	
Pre-use checks	Pre-use checks may include: • safety/serviceability • cleanliness • routine maintenance
Hazards	Hazards may include: • micro-organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • chemicals and stains • aerosols • sharps and broken glassware
Safety protocols/practices	Safety protocols/practices may include: • use of MSDS • use of personal protective equipment, such as gloves, safety glasses, goggles, faceguards, coveralls and gowns • use of biohazard containers and laminar flow cabinets • correct labelling of reagents and hazardous materials • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and

RANGE STATEMENT	
	Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973009A Conduct field-based acceptance tests for construction materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to conduct in situ tests to confirm the acceptability of raw or manufactured, construction materials prior to or after their use. Personnel are expected to be able to work independently and liaise with site personnel to ensure that testing is conducted safely and efficiently. They may transport samples and/or equipment to and from the site as necessary and prepare test pieces on-site for later laboratory testing.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the geotechnical and construction material testing industry sectors who conduct relatively quick and straightforward control and compliance tests at extractive, manufacturing or construction sites using established test methods. These tests could involve aggregates, concrete, soils, road pavement or other specialised construction materials. The unit could also be relevant to laboratory technicians working in the water/waste water and trade waste industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for field-based acceptance tests	1.1. Review job request to identify the test method and equipment involved, samples to be collected and/or test pieces to be prepared 1.2. Identify hazards and enterprise safe work procedures associated with the site, samples, test methods and equipment used 1.3. Confirm site location, access, timing and any special test requirements 1.4. Assemble all required equipment/materials and check that

ELEMENT	PERFORMANCE CRITERIA
	they are fit for purpose 1.5. Stow equipment/materials to ensure their safe transport, as necessary 1.6. Arrange transport to site, as necessary 1.7. Liaise with appropriate personnel on arrival at site to ensure safety and minimise disruption to other workers during testing/sampling
2. Perform field tests	2.1. Identify locations for in situ tests in accordance with test method or client instructions 2.2. Set up, check and operate test equipment safely and in accordance with enterprise procedures and test method 2.3. Perform tests as specified in test method or enterprise procedures 2.4. Take sufficient test measurements to ensure reliable data 2.5. Recognise obvious errors or atypical data and take appropriate corrective actions 2.6. Recognise and record details of site conditions that may impact on data quality 2.7. Seek advice to deal with any situation beyond own technical competence
3. Collect site samples and prepare test pieces	3.1. Identify locations for sample collection in accordance with test method or client instructions 3.2. Seek advice if samples cannot be collected or if sampling procedures require modification 3.3. Obtain required samples and maintain their integrity in accordance with sampling procedures or test method 3.4. Label all samples to ensure their traceability 3.5. Recognise and record any information about the sample appearance or site conditions that may impact on sample integrity 3.6. Prepare required test pieces and organise their safe curing, storage and/or transport in accordance with test method
4. Finalise field testing	4.1. Re-instate all disturbed surfaces in accordance with enterprise procedures 4.2. Clean all equipment (and vehicle as necessary) to avoid environmental damage including stormwater run-off and/or transfer of pests 4.3. Check that all equipment/materials are present and undamaged prior to re-stowing them for safe transport, as necessary 4.4. Notify appropriate site personnel on completion of tests

ELEMENT	PERFORMANCE CRITERIA
	and prior to leaving site 4.5. On return to base, check serviceability of test equipment before storage 4.6. Complete site safety plans, equipment logs and test reports in accordance with enterprise procedures
5. Maintain a safe work environment	5.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 5.2. Minimise environmental impacts of testing/sampling and generation of waste 5.3. Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- planning work sequences involving multiple/parallel tasks
- interpreting safety information (e.g. site safety plans) and working safely
- applying enterprise procedures and test methods
- checking and using test equipment in accordance with test methods and/or enterprise procedures
- cleaning and maintaining equipment
- estimating/calculating simple scientific quantities (e.g. density)
- recording and presenting results accurately and legibly
- maintaining security, integrity and traceability of all samples, data/results and documentation
- demonstrating a professional approach and positive company/organisation image

Required knowledge

Required knowledge includes:

- construction materials test methods routinely used in job role including:
  - purpose and principles of test
  - properties of materials under test

REQUIRED SKILLS AND KNOWLEDGE
• key preparation/measurement steps in test method • calculation steps to give results in appropriate units and precision • expected values for sample type • pre-use checks and operating procedures for test equipment routinely used in job role • expected values and sources of uncertainty (and methods for control) in construction materials tests routinely used in job role • procedures for recording and reporting test results, calculations, site observations and unexpected or atypical results and equipment problems • procedures for ensuring traceability of samples, test pieces, test data and results • health, site safety and environmental management requirements relevant to job role • confidentiality requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • liaise effectively with site personnel to arrange for testing to be performed safely and efficiently • conduct field-based acceptance tests and collect/prepare associated field samples or test pieces safely and accurately and within the required timeframe.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with other relevant units of competency such as: • *MSL922001A Record and present data* • *MSL943001A Work safely with instruments that emit ionising radiation* • *MSL943002A Participate in laboratory/field workplace safety*.

EVIDENCE GUIDE	
	Resources may include: • data sets and records • test methods and description of test setup • computer and relevant software or laboratory information system • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • review of test data, results and records generated by the candidate • feedback from supervisors and clients regarding the candidate's ability to work independently and conduct a range of field-based acceptance tests reliably, safely and efficiently • questions to assess understanding of enterprise procedures and test methods relevant to their job role. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing** A technician working for a consulting laboratory receives a telephone request from a client to conduct some concrete tests at their site at 10 am. They require a slump test and the preparation of three test cylinders and two flexural beam test pieces for later testing. The

EVIDENCE GUIDE	
	technician arrives at the site early and checks with the foreman about where the concrete truck will come in and positions his/her vehicle in a shady spot close by where the samples can cure without being disturbed. He/she prepares the slump plate, shovel, scoops, slump rod, cylinder moulds, bucket, steel ruler, spirit level, thermometer, brushes and worksheets. He/she checks the slump plate for level and damps down the moulds when the truck arrives. After waiting for the recommended volume of concrete to be discharged, he/she collects a sample and conducts the slump test. He/she pays particular attention to how each layer is added to the cone and 'rodded' and then carefully lifts off the cone in one easy motion. Using the slump rod on top of the cone as a benchmark, he/she measures the slump as 80+/-5 mm. This result is consistent with the results obtained from several repeat tests. He/she returns the slump material to the kibble and collects five buckets of concrete to make the cylinders and beams.The technician places a maximum/minimum thermometer alongside the prepared samples to monitor the curing process and the covers them with insulating material. He/she carefully cleans all the test equipment while the concrete is still wet and re-stows it in thevehicle. On returning to the laboratory, he/she ensures that all results and records are competed according to standard procedures. **Construction materials testing** A laboratory technician has been tasked with conducting a series of field density measurements using a nuclear gauge at a road construction site. Prior to leaving for the site, he/she locates the test method (AS 1289.5.8.1) and assembles all the materials and equipment needed for the job. The technician reviews the company's safe working rules for using the gauge, conducts the specified pre-use checks of the equipment, does a 'standard count' and enters all the required information in the relevant technical and administrative records. After safely stowing the equipment, he/she drives to the site. On arrival, the technician checks with the foreman about the size of the lot, test locations and datum point and the details about the other work currently going on at the site. The technician sets up the specified safety barriers and signs, ensures that the gauge is operating correctly and

EVIDENCE GUIDE	
	checks the radiation levels around the instrument. He/she drills the first of the ten required holes, carefully ensuring that it is the correct depth and is vertical, clear of obstructions and large enough to enable the gauge to be raised and lowered without jamming. He/she spreads sand near the hole to ensure that the instrument is flush with the ground and there is no air gap. With the source in position, he/she performs two measurements (@ 0º and 90º) to minimise the effect of any rocks or voids that may be close to the surface. He/she notes that the two results agree to within the accepted tolerance of 75kg/m^3. The technician then carefully retracts the rod and locks the source in its shielded position before moving the instrument to the next location. After successfully completing all the required measurements, the technician carefully cleans, checks and re-stows the equipment, fills in the holes, removes the barriers/signs and advises the foreman that he/she has finished the testing. On returning to base, he/she finalises the job in accordance with enterprise procedures.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1012 Methods of testing concrete
	  • AS 1141 Methods for sampling and testing

RANGE STATEMENT	
	aggregates • AS 1289 Methods of testing soils for engineering purposes • AS 2891 Methods of sampling and testing asphalt • AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS ISO 14000 Set:2005 Environmental management standards set • AS/NZS ISO 9000 Set:2008 Quality management systems set • AustRoads test methods • calibration and maintenance schedules • enterprise recording and reporting procedures • enterprise sampling procedures for specific samples, sites and clients • environmental legislation and regulations • equipment manuals and warranty, supplier catalogues and handbooks • equipment startup, operation and shutdown procedures • industry codes of practice • maps, site plans • material safety data sheets (MSDS) • material, production and product specifications • National Association of Testing Authorities (NATA) documents regarding construction materials testing (Field application document) • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • quality manuals • sampling and test procedures, enterprise or standard operating procedures (SOPs) • site safety plans • State/Territory Road Authority test methods
Hazards	Hazards may include: • sunlight, dust and noise and heat

RANGE STATEMENT	
	• manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery • vehicular traffic on roads and sites • injuries caused by falling objects and working conditions such as uneven surfaces, heights, slopes, wet surfaces, trenches and confined spaces • biohazards, such as microbiological organisms in soils • nuclear density/moisture gauges and industrial X-ray equipment
Enterprise safe work procedures	Enterprise safe work procedures may include: • use of site safety plans and MSDS • use personal protective equipment, such as hard hats, sunscreen lotion, hearing protection, gloves, goggles, coveralls, respirators and safety boots • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontaminating of equipment • signage, barriers, traffic control and flashing lights

Field-based acceptance tests	Field-based acceptance tests may include:
	• testing of concrete:
	  • consistency (e.g. slump)
	  • making and curing of concrete cylinders
	  • air content
	  • Schmidt hammer
	• testing of soils:
	  • field density (e.g. compaction control)
	  • coarse particle distribution (e.g. rock protection layers and embankments)
	  • dynamic cone penetration (DCP)
	  • infiltration
	  • Clegg hammer
	  • sample cores form stabilised pavements
	• testing of asphalt and bitumen seals:
	  • temperature of freshly laid asphalt

RANGE STATEMENT	
	• field density • texture depth • permeability • aggregate spread rate and binder spray rate
Site samples and test pieces	Site samples and test pieces may include: • site samples of aggregates, soil, concrete and road pavement • beams and cylinders for subsequent laboratory testing such as Brazil test and Marshall stability/flow test • asphalt cores and slabs for testing wheel tracking and fatigue
Test/sampling equipment and materials	Test/sampling equipment and materials may include: • survey equipment, steel ruler/tape and spirit level • shovel, scoops, plates, rods, cylinder and beam moulds • buckets, bags and sample containers • coring equipment • excavation equipment • slump cones, density cones and density sand • thermometer • air content meter • brushes • nuclear density/moisture gauge • worksheets, test methods • portable computers and personal digital assistants (PDAs)
Appropriate corrective actions	Appropriate corrective actions may include: • accuracy check of data entry and transcription • logical check of equipment setup • check of calibration, zero error and drift for measuring instrument • careful re-reading of procedures and checklists • repeat test measurements • seek advice
Minimising environmental impacts	Minimising environmental impacts may include: • disposal of surplus or spent or materials • containing run-off of water

RANGE STATEMENT	
	• recycling of wastes • compliance with quarantine requirements, including cleaning of vehicles to prevent transfer of pests (e.g. fire ants and seeds) and contaminants • compliance with environmental, cultural and heritage protection requirements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise occupational health safety and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

Co-requisite units		

MSL973010A Conduct laboratory-based acceptance tests for construction materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to conduct laboratory tests to confirm the acceptability of raw and/or manufactured construction materials. Personnel will have access to established test methods, enterprise procedures and readily available advice. They are expected to obtain reliable test results safely and efficiently. In general, these personnel do not calibrate equipment and make only limited adjustments to the controls. The unit of competency does not cover interpretation or analysis of results or troubleshooting equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the geotechnical and construction material testing industry sectors who conduct control and compliance tests in consulting laboratories or laboratories at extractive, manufacturing or construction sites using established test methods. These tests could involve aggregates, concrete, soils, road pavement or other specialised construction materials and products. The unit of competency could also be relevant to laboratory technicians working in the water/waste water and trade waste industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for laboratory-based acceptance tests	1.1. Access relevant job instructions from laboratory information management system (LIMS) 1.2. Interpret test request to confirm samples to be tested, the test method and equipment involved 1.3. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and/or equipment 1.4. Assemble all required equipment and materials

ELEMENT	PERFORMANCE CRITERIA
	1.5. Plan work sequences for optimum efficiency and/or throughput of multiple samples
2. Prepare samples or test pieces	2.1. Retrieve samples and/or test pieces from storage and record their general appearance 2.2. Check the accuracy and completeness of accompanying labels and documentation to ensure traceability 2.3. Check that the storage/curing conditions of samples and/or test pieces were appropriate 2.4. Compare samples and/or test pieces with test specifications, record observations and report discrepancies 2.5. Prepare samples and/or test pieces in accordance with appropriate test method
3. Check test equipment before use	3.1. Set up equipment in accordance with test method 3.2. Perform pre-use and safety checks in accordance with enterprise procedures 3.3. Identify faulty or unsafe equipment and report to appropriate personnel 3.4. Check calibration status of instruments and report any out of calibration items to appropriate personnel
4. Perform laboratory tests	4.1. Conduct tests in accordance with test method and enterprise procedures 4.2. Record data and observations in accordance with enterprise procedures 4.3. Recognise obvious errors or atypical data and take appropriate corrective actions 4.4. Perform calculations as set out in test method 4.5. Compare calculated results with expected values and report atypical results promptly to appropriate personnel 4.6. Complete technical/administrative records and test reports in accordance with enterprise procedures 4.7. Seek advice to deal with any situation beyond own technical competence
5. Maintain a safe work environment	5.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 5.2. Minimise generation of wastes and environmental impacts of testing 5.3. Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and enterprise procedures 5.4. Care for and store equipment, used test pieces and

ELEMENT	PERFORMANCE CRITERIA
	back-up samples in accordance with enterprise procedures

Required Skills and Knowledge

Required skills include:

- planning work sequences involving multiple/parallel tasks
- applying safety information, such as material safety data sheets (MSDS) and working safely
- applying enterprise procedures and test methods accurately
- checking and using test equipment in accordance with enterprise procedures
- estimating/calculating simple scientific quantities (e.g. density and moisture content)
- recording and presenting results accurately and legibly
- maintaining security, integrity and traceability of all samples and data/results
- cleaning and maintaining equipment
- demonstrating a professional approach and positive company/organisation image

Required knowledge

Required knowledge includes:

- construction materials and test methods routinely used in job role including:
  - purpose and principles of test
  - properties of materials under test
  - key preparation/measurement steps in test method
  - calculation steps to give results in appropriate units and precision
  - expected values for sample type
- pre-use checks and operating procedures for test equipment routinely used in job role
- expected values and sources of uncertainty (and methods for control) in construction materials tests routinely used in job role
- procedures for recording and reporting test results, calculations, test observations and unexpected or atypical results and equipment problems
- procedures for ensuring traceability of samples, test pieces, test data and results
- health, site safety and environmental management requirements relevant to job role
- confidentiality requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • plan efficient work sequences • prepare a range of laboratory samples and/or test pieces and conduct associated laboratory-based acceptance tests safely and accurately and within the required timeframe.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with other relevant units of competency such as: • *MSL922001A Record and present data* • *MSL943002A Participate in laboratory/field workplace safety* • *MSL953001A Receive and prepare samples for testing*. Resources may include: • data sets and records • test methods and description of test setup • computer and relevant software or laboratory information system • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • review of test data, results and records generated by the candidate • feedback from supervisors and clients regarding the candidate's ability to conduct a range of laboratory-based acceptance tests reliably, safely and efficiently • questions to assess understanding of enterprise procedures and test methods relevant to their job role. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and

EVIDENCE GUIDE	
	those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing (1)** A technician working at a consulting laboratory receives a job sheet that requires a particle size distribution (PSD) test to be performed on a soil sample. The sample weighs 20kg and is contained in a large bucket. All the required documentation is present and complete. The technician locates the documented method for the PSD test (AS 1289.3.6.1) and assembles the necessary equipment. He/she uses a riffle box to obtain the recommended minimum size of sample and places it in a 50°C oven overnight. He/she performs the sieving process in three stages - coarse (26.5, 19 mm), intermediate (9.5, 4.74, 2.36 mm) and fine (1.18 mm, 600, 300, 150 and 75 micron). The technician uses a stiff brush to carefully clean all the 'fines' off the larger particles and sieves and remembers to continue washing the sample until the wash water is clear. He/she determines the moisture content and mass of the dry fractions according to the test method, taking particular care to check that the sum of the masses on each sieve and in the pan equals the original mass of the sample. The technician then reports the percentage of material retained on each sieve to the nearest 1%. **Construction materials testing (2)** A technician carefully reads through a job sheet for a compactive test on an asphalt core sample. The

EVIDENCE GUIDE	
	specified test method is Q306C and the maximum density has already been determined as 2.505. The technician prepares the necessary test equipment and materials and then inspects the core closely. He/she looks for cracks, pits and voids and evidence of over compaction in the form of crushed particles - as these features will affect the reliability of the test result. The technician records the core's general appearance and notes that it meets the test specifications. After checking the accompanying paperwork, he/she logs the job into the laboratory information management system. He/she trims the core sample to obtain a suitable test piece (50-60 mm) and performs the test. The technician makes sure that the test piece is fully encapsulated in wax before weighing the suspended test piece in water. He/she watches for bubbles and any increase in mass that would indicate a leak. After he/she is satisfied that the recorded masses are reliable, the technician calculates the core density as 2.405 indicating a compaction of 96%. After rechecking the data entries and calculations, the technician completes the test report.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice and Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards, such as: • AS 1012 Methods of testing concrete

RANGE STATEMENT	
	• AS 1141 Methods for sampling and testing aggregates • AS 1289 Methods of testing soils for engineering purposes • AS 2891 Methods of sampling and testing asphalt • AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS ISO 14000 Set:2005 Environmental management standards set • AS/NZS ISO 9000 Set:2008 Quality management systems set • AustRoads test methods • calibration and maintenance schedules • enterprise recording and reporting procedures • enterprise sampling procedures for specific samples, sites and clients • environmental legislation and regulations • equipment manuals and warranties, supplier catalogues and handbooks • equipment startup, operation and shutdown procedures • industry codes of practice • maps, site plans • MSDS • material, production and product specifications • National Association of Testing Authorities (NATA) documents regarding construction materials testing(Field application document) • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • quality manuals • sampling and test procedures, enterprise or standard operating procedures (SOPs) • site safety plans

RANGE STATEMENT	
Hazards may	Hazards may include: • electric shock • light, dust, noise and heat • biohazards, such as microbiological organisms and agents associated with soil • chemicals such as acids, alkalis and hydrocarbons • flammable liquids and gases • burns from hot bitumen, hot plates, hot moulds or ovens • inhalation or burns from sulphur during preparation of concrete samples • fluids under pressure • hand tools • occupational overuse syndrome, slips, trips and falls • manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery
Enterprise safe work procedures	Enterprise safe work procedures may include: • use of MSDS • recognising and observing hazard warnings and safety signs/barriers • labelling of samples, reagents and hazardous materials • cleaning and decontaminating equipment and work areas regularly using recommended procedures • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • following established safe handling procedures for tasks involving manual handling • use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, coveralls, respirators and safety boots
Laboratory-based acceptance tests	Laboratory-based acceptance tests may include: • testing of concrete:

RANGE STATEMENT	
	• compressive and tensile tests • flexural tests • testing of soils: • laboratory density and moisture content • classification - consistency, particle distribution, dispersion and particle density • unconfined compressive strength • pH and conductivity • colour • testing of asphalt and bitumen seals: • density and compacted density • particle size distribution • stability/flow • stripping (core samples) • testing of aggregates: • particle size distribution and grading • particle shape • particle density, durability and absorption • contamination (silt and organics)
Samples and test pieces	Samples and test pieces may include: • samples of aggregates, soil, rock, concrete and road pavement • beams and cylinders for laboratory testing such as Brazil test • pats for Marshall stability/flow test
Test and sample preparation equipment/materials	Test and sample preparation equipment/materials may include: • crushers, mulchers, grinders, mills, riffles and sieves • moulds, bags and containers • ovens, microwaves and water baths • mass balances • microscopes • dimension apparatus (e.g. calipers and micrometers) • rammers, compression rigs and load cells • chemical reagents and volumetric glassware • temperature measuring devices such as

RANGE STATEMENT	
	thermometers and thermocouples • pH and conductivity meters • analogue and digital meters, charts/recorders, data loggers and computers
Appropriate corrective actions	Appropriate corrective actions may include: • accuracy check of data entry and transcription • logical check of equipment setup • check of calibration, zero error and drift for basic instruments • careful re-reading of procedures • repeat test measurements • seek advice
Technical/administrative records	Technical/administrative records may include: • test and calibration results • equipment use, maintenance and servicing history • faulty, unsafe or quarantined equipment
Minimising environmental impacts	Minimising environmental impacts may include: • collection of surplus or spent samples and test pieces for disposal • correct storage and handling of hazardous chemicals and samples • recycling of non-hazardous waste, such as chemicals, batteries, plastic, metals and glass • appropriate disposal of all waste • compliance with quarantine requirements to prevent transfer of pests (e.g. fire ants and seeds)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply

RANGE STATEMENT	
	current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973011A Perform fire pouring techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to follow standard procedures for extracting precious metals from their host matrices in readiness for analysis. Fire pourers are expected to handle routine samples, recognise common sample preparation and cupellation problems and make standard adjustments to fluxes and firings. They are expected to seek advice from their supervisor when non-routine problems arise.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the mineral assay industry sector. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan work for shift	1.1. Review job requests to identify the samples, preparation methods required for each and shift priorities 1.2. Identify hazards, safety equipment/procedures associated with samples, preparation methods, reagents and equipment 1.3. Plan parallel work sequences to optimise the throughput of multiple sets of samples during shift 1.4. Assemble all required equipment, materials, reagents and check they are fit for purpose 1.5. Check pots/cupels and discard those with faults and/or a record of high gold values 1.6. Check that fusion and muffle furnaces are operating at the specified temperatures
2. Prepare sample racks for fusion	2.1. Check samples against accompanying documentation and record/report any discrepancies 2.2. Conduct simple visual/chemical tests for each

ELEMENT	PERFORMANCE CRITERIA
	sample to assess the adequacy of prior sample preparation and possible presence of sulphides or other mineralogy 2.3. Weigh out the recommended amount of sample and add specified identifier to maintain orientation, as necessary 2.4. Weigh out flux components, mix thoroughly with the sample charge and transfer to recommended type/size of pot without loss of material 2.5. Place pots in racks 2.6. Record all required details of sample preparation to ensure traceability of samples 2.7. Seek advice to deal with any situation beyond scope of responsibility or knowledge
3. Obtain acceptable buttons and prills	3.1. Maintain sequencing in order to track samples, buttons and prills throughout the recovery process 3.2. Monitor furnace temperature/time to ensure complete sample fusion 3.3. Remove fused samples from furnace and pour into moulds with minimal loss of material 3.4. Recognise the need for repeat firings due to lead shotting and/or poor fusions 3.5. Separate slag and button with minimal loss of collector 3.6. Inspect buttons for matte, brittleness, size and malformed shape 3.7. Place acceptable buttons in muffle furnace using cupels that have been previously loaded and preheated 3.8. Regularly monitor furnace temperature/time/air flow to ensure efficient cupellation 3.9. Recover prills, check identifiers and inspect for contamination, losses and evidence of other precious metals 3.10. Complete and collate sample records before presenting prills for analysis
4. Troubleshoot and correct common recovery failures	4.1. Monitor all stages of recovery for indicators of potential loss 4.2. Recognise undesirable recovery conditions and decide whether the process requires correction 4.3. Apply an established corrective action and restart

ELEMENT	PERFORMANCE CRITERIA
	the process 4.4. Document any adjustments made to standard methods and re-sequencing of samples 4.5. Seek advice when problems are beyond scope of responsibility or knowledge
5. Perform daily maintenance of assay equipment	5.1. Grade and inspect pots using established criteria prior to storage for re-use 5.2. Report defective equipment and consumable requirements to appropriate personnel
6. Maintain a safe work environment	6.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 6.2. Minimise the release of collectors to the work environment 6.3. Segregate and dispose of wastes in accordance with enterprise requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- accurately weighing samples and flux components
- manual handling of heavy/hot items of equipment
- hand-eye coordination during pouring and knocking up buttons
- recognising non-acceptable characteristics of received and fused samples, buttons and prills
- applying standard methods and procedures and approved variations

Required knowledge

Required knowledge includes:

- procedures for:
  - fusion of common mineral oresamples
  - cupellation of buttons
  - digestion/partingof prills
- function, operation and maintenance of assay equipment

REQUIRED SKILLS AND KNOWLEDGE
• hazards, control measures, operation and maintenance of safety equipment • enterprise and/or legal traceability requirementsrelevant to job role • health, safety and environment requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • recognise hazards and work safely at all times • interpret and follow standard recovery methods • maintain close attention to technical and safety requirements in a physically demanding/hazardous environment • maintain sequential control of samples through all recovery stages • plan work flow to ensure efficient sample throughput • recognise indicators of poor recovery and apply established corrective actions • minimise rework, waste and environmental impacts • dispose of all waste responsibly.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL953001A Receive and prepare samples for testing* • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • a variety of precious metal ore samples • fire assay methods • fire assay equipment, materials and reagents • safety equipment.

EVIDENCE GUIDE	
Method of assessment	The following assessment methods are suggested: • review of quality control performance and analytical results traceable to assay samples prepared by the candidate • review of sample records prepared by the candidate • feedback from peers, clients and supervisors • written/oral questioning about fire pouring techniques, typical problems and corrective actions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Mineral processing** A laboratory routinely determines the 'total' gold concentration of its clients' samples. A technician is preparing a rack of samples for the day's first pour. He/she monitors the furnace temperature and assembles the necessary pots, cupels and other equipment. He/she checks the client's specifications for the first sample and notices that it is dark grey. The technician recognises that this colour often indicates a high sulphide content and follows the established procedure for adjusting the flux recipe and sample charge weight to compensate. He/she carefully mixes the sample and flux and places the pot in the rack, carefully noting its position. The technician prepares the remaining samples, blanks, and check samples according to requirements. A satisfactory fusion

EVIDENCE GUIDE	
	and pour is obtained for all samples except for one that shows some 'lead shotting'. The technician adjusts the flux and sample charge weight and repeats the process. The repeat sample provides an acceptable button. He/she cupels the button to separate the precious metal from the first collector (lead). The prill is placed in a numbered container for subsequent digestion and analysis by atomic absorption spectroscopy (AAS).

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 3895.1-1991 Methods for the analysis of copper, lead, zinc, gold and silver ores - Determination of gold (Fire assay-Flame AAS method)
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures

RANGE STATEMENT	
	• enterprise sampling procedures for specific samples, sites and clients • environmental legislation and regulations • equipment manuals and warranty, supplier catalogues and handbooks • equipment startup, operation and shutdown procedures • industry codes of practice • material safety data sheets (MSDS) • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, training manuals, induction manuals • standard operating procedures (SOPs) and published preparation methods
Samples	Samples may include: • solids, such as rocks, minerals, soils, sands and stream sediments • core and other drill samples (e.g. rotary air blast (RAB), reverse circulation (RC) and aircore) • slurries, powder concentrates and metallurgical solutions • dump samples and grab samples
Client requests/documentation	Client requests/documentation may include: • client profile, sample identification, sample receipt, storage and analyses • required preparation method/and service charges
Consideration of mineralogy	Consideration of mineralogy may include: • recognising presence of highly oxidised ores, such as haematite or magnetite • adjusting charge weight and flux components to suit
Assay equipment	Assay equipment may include: • mixing equipment and balances • fusion and muffle furnaces and associated

RANGE STATEMENT	
	spares • temperature sensors and hotplates • compressed air service, extraction systems and fuel supply lines • pots, cupels, pouring equipment, pot loader, trolleys, moulds, tongs and hammers
Hazards	Hazards may include: • dust, silica, slag, glass shards and molten flux • chemicals, such as hydrofluoric acid, bromine, perchloric acid, aqua regia, cyanide, lead-based compounds, free-mercury and nickel compounds • noise and vibration • crushing, entanglement and cuts associated with moving machinery • manual handling of heavy loads, such as pots, racks and trolleys • heat exhaustion/stress and fatigue
Safety equipment and procedures	Safety equipment and procedures may include: • ensuring access to service shut-off points, fire extinguishers/fire hose, safety shower/eye wash stations and first aid station • recognising and observing hazard warnings and safety signs • labelling of samples, reagents and hazardous materials • direct extraction and fume hoods • guards for moving machinery parts • noise insulation • using personal protective equipment, such as dust masks, heat resistant mittens, safety face shields with tinted visor, coats, ear muffs, safety boots, heat reflective clothing and latex gloves for flux handling • following established manual handling procedures • regular cleaning of equipment and work areas using enterprise procedures • reporting of abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gasses, smoke, vapour, fumes, odour and

RANGE STATEMENT	
	particulates to appropriate personnel

Fluxes	Fluxes may include:
	• bulk fluxes containing lead (II) oxide (PbO), borax, soda ash, silica, silver nitrate and flour
	• non-standard flux additives, such as:
	  • flour (oxidising samples)
	  • potassium nitrate (reducing samples and sulphides)
	  • silica (basic ores)
	  • lead as PbO (siliceous ores)

Pots	Pots may include: • ceramic, acidic/basic, alumina, zirconia and graphite
Sequencing of pots in a rack	Sequencing of pots in a rack may include • addition of silver wire or silver nitrate ($AGNO_3$) mix • addition of coloured salts (e.g. copper sulphate $CuSO_4$)
Collectors	Collectors may include: • litharge or lead (II) oxide (PbO) for pot fusion • silver ($AGNO_3$) for the cupellation
Criteria for an 'acceptable' button	Criteria for an 'acceptable' button could include: • one piece, mass >20 g and <50 g • malleable • separates cleanly from slag • free of undecomposed ore, matte and speiss
Other precious metals	Other precious metals may include: • high gold, Platinum and Palladium
Separation of collectors	Separation of collectors may include: • cupellation • digestion • parting, annealing and weighing for a gravimetric finish
Contamination and losses	Contamination and losses may be caused by:

RANGE STATEMENT	
	• poorly made cupels • base metals - copper (Cu), nickel (Ni), zinc (Zn) and bismuth (Bi) • arsenic (As), sulphur (S), antimony (Sb), selenium Se), tellurium (Te) and chromium (Cr) • scoria • sprouting
Records	Records may include: • pour sheets - date, time, client, pour number and preparation method • number of pots, positions of sample, blank and check in rack • visual appearance of samples, buttons and prills • corrective actions for specific samples
Indicators of potential loss and the corrective action	Indicators of potential loss and the corrective action may include: • viscous slag - check furnace temperature, adjust flux and lower charge weight • lead shotting - adjust flux, lower charge weight to compensate for high oxides, silicates and chromites • sulphides - adjust fusion time, adjust sample weight and/or flux • matte, speiss - adjust sample weight and flux • incomplete fusion - adjust sample weight and/or flux • unacceptable button - adjust sample weight and/or flux • inquartation - add 3 parts silver (Ag) to prill, wrap in lead foil and re-cupel
Waste	Waste may include: • rejected pots and cupels • slag, furnace material • disposable personal protective equipment
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management

RANGE STATEMENT	
	requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL973012A Assist with geotechnical site investigations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare for and assist with site activities such as excavations, sampling and testing as part of a geotechnical investigation team. Personnel are expected to identify common site problems and seek advice to deal with situations beyond their own technical competence.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants working under the close supervision of a senior technician in the construction, mining and drilling industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for on-site operations	1.1. Confirm details of the job, location, work instructions, appropriate sampling/test procedures and safety requirements with supervisor 1.2. Identify likely site hazards, personal protective equipment and safety procedures that are specified for the job and materials used 1.3. Collect, check, and stow all tools, equipment and materials required at the site 1.4. Confirm site access requirements such as entry permits and participate in safety induction as required
2. Assist with excavation of boreholes, test pits and/or trenches	2.1. Confirm specified sampling/testing locations with supervisor 2.2. Excavate to the specified sampling/testing depth, minimising disturbance and potential contamination of the site 2.3. Ensure materials from different strata are kept separate

ELEMENT	PERFORMANCE CRITERIA
	2.4. Recognise materials and record changes of strata, test results
3. Assist with site sampling	3.1. Prepare and check sampling equipment and materials 3.2. Take disturbed and undisturbed samples as directed and in accordance with enterprise methods/procedures 3.3. Label samples and record samples/site conditions in accordance with enterprise methods/procedures
4. Assist with site testing	4.1. Conduct pre-use checks of test equipment 4.2. Perform basic tests as directed and in accordance with test methods or enterprise procedures 4.3. Record data in accordance with test methods or enterprise procedures 4.4. Recognise obvious errors or atypical data and seek advice
5. Assist with finalising site operations	5.1. Reinstate the site in accordance with instructions 5.2. Clean all equipment (and vehicle as necessary) avoiding environmental damage, stormwater contamination or spread of pests 5.3. Check all equipment/materials prior to re-stowing them for safe transport 5.4. Handle and transport samples in accordance with enterprise procedures 5.5. Notify appropriate site personnel on completion of tasks and prior to leaving site (if unsupervised) 5.6. On return to base, check serviceability of test equipment before storage
6. Assist with maintaining records	6.1. Complete relevant parts of site safety plans, equipment logs and test reports in accordance with enterprise procedures 6.2. Maintain confidentiality of enterprise information
7. Maintain a safe work environment	7.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 7.2. Minimise environmental impacts of testing/sampling and generation of waste 7.3. Collect and/or dispose of all waste in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting maps, site plans and drawings
- recognising site services, sampling and testing sites
- setting up, checking, using and cleaning/maintaining tools and equipment
- taking representative samples, handling and transporting samples
- recognising soil, rock and fill materials
- recognising site features and geotechnical conditions
- performing basic insitu tests and site measurements (e.g. location and depth)
- maintaining accurate and compete records
- communicating problems to appropriate personnel
- driving safely on and off-road
- working safely on construction sites around heavy equipment and earthmoving plant

Required knowledge

Required knowledge includes:

- the basic concepts, purposes and principles of geotechnical site investigation
- site safety and management rules (safety induction, risk assessments, controlledentry/exit to site and required protective equipment and clothing)
- simple methods for identifying and classifying materials
- basic engineering properties of soil and rock materials and their use in engineering and construction
- basic principles of representative sampling and testing
- basic insitu testing methods
- relevant occupational health, safety (OHS) and environment requirements

Evidence Guide

EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

EVIDENCE GUIDE	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • prepare for site operations and perform geotechnical sampling, testing and site reinstatement under direction • work safely at geotechnical investigation sites • follow instructions and work as part of a small team.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical, additional assessment techniques must be used. This unit of competency may be assessed with: • *MSL952002A Handle and transport samples or equipment* • *MSL952001A Collectroutine site samples* • *MSL973001A Perform basic tests*. Resources may include: • access to geotechnical sites, tools, equipment • enterprise procedures, sampling plans, test methods and equipment manuals.
Method of assessment	The following assessment methods are suggested: • review of work outputs over a period of time to ensure accurate and consistent work is obtained within required timelines • examples of completed workplace documentation • feedback from peers and supervisors • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or

EVIDENCE GUIDE	
	assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials** A geotechnical consultancy company is carrying out the investigation for the construction of an industrial complex involving building pads and roadways. A contract drilling company has been hired to carry out auger drilling for the building pad foundations. The drill rig will be used to perform standard penetration tests in some boreholes to determine bearing capacities. Undisturbed sample tubes will be pushed to obtain samples for consolidation testing in the laboratory. A senior technician is in charge of site activities and arranges for the drill rig to be on-site. She/he plans a program of drilling, sampling and testing and a laboratory assistant is assigned to assist with drilling, testing and sampling operations at the site. The senior technician has a marked-up plan of the site showing borehole locations to help him/her direct where to drill. The drilling contractor operates the drill rig, takes tube samples, performs the standard penetration tests and cases the hole if required, as directed by the senior technician. The assistant assists with recording and sampling the soil profile, sealing the sample tubes with wax and labeling them. He/she also records the SPT readings and bags and labels the material from the split-spoon sampler. Each borehole is capped to prevent access by unauthorised persons so that the assistant can record the standing water level 24 hours after the hole has been drilled. The assistant wears a helmet, work boots and earmuffs while working near the rig. He/she covers up and wears sunscreen while working in the sun and drinks large quantities of water. The assistant also excavates hand auger holes to a depth of 1 m at regular intervals in the proposed roadways to obtain samples for California Bearing Ratio (CBR) tests.

EVIDENCE GUIDE	
	Adjacent to each, he/she performs a dynamic cone penetrometer test to 2 m to assess the insitu material. He/she records the logs of the auger holes and the test results on the company's standard data sheets and backfills each auger hole immediately after sampling.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• environmental legislation and regulations
	• equipment manuals
	• equipment startup, operation and shutdown procedures
	• industry codes of practice
	• material, production and product specifications

RANGE STATEMENT	
	• National Association of Testing Authorities (NATA) documents regarding construction materials testing • OHS national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Site hazards	Site hazards may include: • solar radiation, dust and noise • manual handling of heavy materials and equipment • working in/on trenches, confined spaces, wet and uneven surfaces, heights and slopes • vehicular and pedestrian traffic • underground services such as gas and electricity
Safety procedures	Safety procedures may include: • location of site services before investigations commence • use of material safety data sheets (MSDS) • use of personal protective equipment, such as hard hats, hearing protection, sunscreen, gloves, masks, goggles, coveralls and safety boots • handling and storage of (hazardous) materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning of equipment and vehicles • machinery guards • signage, barriers, flashing lights and traffic control
Tools and equipment	Tools and equipment may include: • hand tools, including shovels, crowbars, scoops, spanners, wrenches and tape measure • consumables, including sample bags, labels, sample tubes and wax • documentation, including maps, plans and worksheets • field test equipment, including dynamic cone

RANGE STATEMENT	
	penetration (DCP) testing, standard penetration testing (SPT), shear vane, pocket penetrometers and water level indicator • safety clothing and equipment, including helmets, boots, gloves, earmuffs and glasses • excavation equipment, including hand and power augers, powered excavators, generators and jack hammers
Common site problems	Common site problems may include: • caving in of excavation walls • drilling difficulties • sample loss during retrieval • knowing when to stop a hole, or what and when to test and sample • misidentification of samples and sampling locations • equipment breakdown and breakage • environmental impacts of construction activities on wildlife, vegetation, waterways and inclement weather • working close to earth moving equipment, trucks and overhead loads
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974001A Prepare, standardise and use solutions

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare, standardise and monitor the quality of solutions.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians working in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare solutions	1.1. Select appropriate procedure for solution preparation 1.2. Select equipment, materials and solvent of specified purity 1.3. Measure appropriate quantities of reagents for solution preparation and record data. 1.4. Select and assemble specified laboratory equipment and appropriate grade of glassware 1.5. Perform specified dilutions 1.6. Prepare solutions to achieve homogeneous mix of the specified concentration 1.7. Label and store solutions to maintain identity and stability
2. Standardise and use volumetric solutions	2.1. Assemble appropriate laboratory equipment 2.2. Perform serial dilutions as required 2.3. Standardise the solution to the required specified range and precision 2.4. Label and store solutions to maintain identity and stability 2.5. Use standard volumetric solutions to determine concentration of unknown solutions
3. Calculate and record data	3.1. Calculate specified concentrations 3.2. Use authorised procedure if data is to be modified

ELEMENT	PERFORMANCE CRITERIA
	3.3. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 3.4. Record all relevant details according to laboratory procedures and report results 3.5. Report concentration with appropriate units
4. Monitor the quality of laboratory solutions	4.1. Check solutions for visual deterioration and expiry date 4.2. Restandardise or dispose of dated or deteriorated solutions 4.3. Record details and label solutions according to laboratory procedures
5. Maintain a safe work environment	5.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 5.2. Clean up spills using appropriate techniques to protect personnel, work area and environment 5.3. Minimise generation of waste and environmental impacts 5.4. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 5.5. Store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting and following enterprise standard operating procedures (SOPs)
- determining equivalence points using indicators and graphical methods
- using calculation methods, including appropriate units, uncertainties, balancing equations, the concentration of the solution given the chemical reaction for the titration
- using apparatus and reagents to prepare standard solutions such as balances and volumetric glassware
- selecting and using primary and secondary standards and indicators
- performingquality assurance checks for solution performance

REQUIRED SKILLS AND KNOWLEDGE
• performing titrations • recognising control results that are not within acceptable range • interpreting and using safety information, such as that provided by material safety data sheets (MSDS) and follow relevant safety procedures
Required knowledge
Required knowledge includes: • solution terminology, chemistry of acids, bases, buffers, redox reactions and complexiometric reactions • concepts of metrology • grades of glassware, reagents and their use • reactions used for standardisation and desirable characteristics • enterprise communication and reporting procedures • occupational health and safety (OHS) procedures, including those for using corrosive materials • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • use balances and volumetric glassware • select and use primary and secondary standards • select and use indicators • perform quality assurance checks for solution performance • perform titrations using laboratory procedures with required accuracy and precision and within required timelines • calculate the concentration of the solution given the chemical reaction for the titration • recognise control results that are not within acceptable range

EVIDENCE GUIDE	
	• record results to enterprise standards • label and store solutions in accordance with enterprise procedures • interpret and follow enterprise SOPs • interpret and use safety information, such as that provided by MSDS and follow relevant safety procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *relevant MSAL974000 series units of competency, and* • *relevant MSAL975000 series units of competency dealing with sampling, tests and measurements*. Resources may include: • standard laboratory equipped with appropriate volumetric equipment • laboratory reagents and equipment • SOPs and testing methods.
Method of assessment	The following assessment methods are suggested: • inspection and/or testing of solutions prepared by the candidate • review of records and workplace documentation completed by candidate • review of work outputs by the candidate over time to ensure accuracy, consistency and timeliness • feedback from peers and supervisors • observation of the candidate preparing, standardising and using a range of solutions • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or

EVIDENCE GUIDE	
	assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A standard solution is used to determine the concentration of unknown solutions. The quality of these analyses is critically related to the accuracy with which the concentration of the standard solution is known. Therefore, laboratory technicians spend considerable effort to ensure that the materials and methods used for the preparation and standardisation will lead to a solution of accurately known concentration. For example, anhydrous sodium carbonate is often used to prepare solutions to determine the concentrations of acids. The sodium carbonate is heated at a suitable temperature to remove any trace of moisture and cooled in a dessicator. An appropriate quantity is dissolved in distilled water and made up to volume in a volumetric flask. This solution of known concentration is then titrated with acids of unknown concentration and the concentration of the acids determined. **Environmental** A laboratory technician was required to determine the total acidity of a water sample as part of a quality control program. The total acidity was measured by titrating the water sample with sodium hydroxide of known concentration using an appropriate indicator. The concentration of the sodium hydroxide was determined via a volumetric titration against a primary standard of potassium hydrogen phthalate. The value of the total acidity was determined by multiplying the volume of sodium hydroxide used with a numerical 'factor' which had been determined by the laboratory supervisor in order to save time. The value of the 'factor' was displayed on the titration equipment. However, a new technical assistant did the full calculation and found that his/her result differed slightly

EVIDENCE GUIDE	
	from that obtained using the 'factor'. After discussion with the laboratory supervisor it was agreed that the error was in the 'factor' and the assumption that each new batch of sodium hydroxide prepared was exactly the same concentration as all previous batches. This was incorrect as the concentration of each batch differed slightly and its actual concentration was determined accurate, using the primary standard. The procedure was changed so that the full calculation was required for all tests.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2163-2000 Laboratory glassware - Measuring cylinders
	  • AS 2165-1996 Laboratory glassware - Burettes AS 2162.1-1996 Verification and use of volumetric apparatus - General - Volumetric glassware
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories

RANGE STATEMENT	
	• AS/NZS 2243 Set:2006 Safety in laboratories set • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • MSDS and safety procedures • material, production and product specifications • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals • SOPs • waste minimisation and safe disposal procedures
Solutions	Solutions may include but are not limited to: • solutions of strong/weak acids and bases • oxidising/reducing agents • solutions used for complexometric or precipitation titrations • stains for cells and tissues, enzymes, buffers and antibodies • diluents for maintaining isotonicity • organic solutions and histological fixatives
Apparatus and reagents to prepare standard solutions	Apparatus and reagents to prepare standard solutions may include: • balances • pipettes, burettes, volumetric glassware and weighing bottles • dessicators and filtering media • ovens and muffle furnaces • solutions, indicators and primary and secondary standards • auto titrators, pH meters and other related meters and electrodes for determining equivalence points, top pan and analytical

RANGE STATEMENT	
	balances • magnetic stirrers and heaters, and water baths
Checking useability of solutions	Checking useability of solutions may include: • examining stained samples for correct staining reactions • performing pH checks • confirming enzyme activity • checking red cell suspensions for haemolysis • ferric chloride for phenolic solutions • isotonicity for saline
Hazards	Hazards may include: • chemicals, such as strong acids and bases, and stains • sharps and broken glassware • burners, hot plates, ovens and furnaces
Safe work practices	Safe work practices may include: • use of MSDS • use of personal protective equipment, such as gloves, safety glasses, goggles, faceguards, coveralls and gowns • use of biohazard containers, laminar flow cabinets and fume hoods • correct labelling of reagents and hazardous materials • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontaminating of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard

RANGE STATEMENT	
	precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974002A Conduct geotechnical site investigations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare for and conduct and conclude site activities such as excavations, sampling and testing as part of a geotechnical investigation team. Personnel are expected to solve common site problems and seek advice to deal with situations beyond their own technical competence. This competency is typically performed by laboratory technicians working under the guidance of a geotechnical paraprofessional or engineer.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians working in the construction, mining and drilling industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973012A	*Assist with geotechnical site investigations*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for on-site operations	1.1. Identify the job, location, work instructions, appropriate sampling/test procedures and safety requirements 1.2. Identify site hazards and identify appropriate personal protective equipment and safety procedures that are specified for the job and materials used 1.3. Record description of the job to be undertaken, compare with specification and report any variations 1.4. Arrange for the collection, checking, stowing and transport of all tools, equipment and materials required at the site 1.5. Ensure site access requirements, such as entry permits and safety inductions have been organised

ELEMENT	PERFORMANCE CRITERIA
2. Arrange excavation of boreholes, test pits and/or trenches	2.1. Identify the sampling/testing location 2.2. Excavate or oversee excavation to the sampling/testing depth, minimising disturbance and potential contamination of the site 2.3. Identify materials and record changes of strata, test results and other relevant information 2.4. Ensure materials from different strata are kept separate 2.5. Terminate the excavation at the appropriate depth and record the reason for termination
3. Conduct site sampling	3.1. Prepare and check sampling equipment and materials 3.2. Take disturbed and undisturbed samples in accordance with enterprise methods/procedures 3.3. Label and record samples in accordance with enterprise methods/procedures 3.4. Recognise and record details of site conditions that may impact on sample integrity or site interpretation
4. Conduct testing	4.1. Prepare and conduct pre-use checks of test equipment 4.2. Perform, or assist with performing, tests in accordance with test methods or enterprise procedures 4.3. Record test data in accordance with test methods or enterprise procedures 4.4. Recognise obvious errors or atypical data and take appropriate corrective actins
5. Finalise site operations	5.1. Backfill or seal any excavation and ensure that it is left in a safe and uncontaminated condition 5.2. Reinstate surfaces disturbed by sampling or testing 5.3. Clean all equipment (and vehicle, as necessary) avoiding environmental damage, stormwater contamination or spread of pests 5.4. Check all equipment/materials prior to re-stowing them for safe transport 5.5. Handle and transport samples in accordance with established practices 5.6. Notify appropriate site personnel on completion of investigations and prior to leaving site 5.7. On return to base, check serviceability of test equipment before storage

ELEMENT	PERFORMANCE CRITERIA
6. Maintain records	6.1. Maintain equipment records in accordance with established practices 6.2. Complete site safety plans, equipment logs and test reports in accordance with enterprise procedures 6.3. Maintain confidentiality of enterprise information
7. Maintain a safe work environment	7.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 7.2. Minimise environmental impacts of testing/sampling and generation of waste 7.3. Collect and/or dispose of all waste in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting maps, site plans and drawings
- identifying and locating site services, sampling and testing sites (e.g. global positioning system (GPS))
- setting up, checking, using and cleaning/maintaining tools and equipment
- taking representative samples, handling and transporting samples
- identifying soil, rock and fill materials
- observing, interpreting and reportingsite features and geotechnical conditions
- performing basic in situ tests and site measurements (e.g. location and depth)
- maintaining accurate and complete records
- communicating problems to appropriate personnel
- driving safely on and off-road
- working safely on construction sites aroundheavy equipment and earthmoving plant

Required knowledge

Required knowledge includes:

- the basic concepts, purposes and principles of geotechnical site investigation
- identification and classification of materials

REQUIRED SKILLS AND KNOWLEDGE
• engineering properties of soil and rock materials • representative sampling and testing • uses of soil and rock materials in engineering and construction • insitu testing methods • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • identify and locate site services, sampling and testing sites and recognise site problems • use tools and equipment effectively and efficiently • collect representative samples and handle and transportthem correctly • record sampling and testing information • identify and describe materials accurately • observe, interpret and report geotechnical conditions • communicate problems to appropriate personnel and seek advice • record and communicate work results • work safely.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical, additional assessment techniques must be used. This unit of competency may be assessed with: • *MSL952002A Handle and transport samples or equipment* • *MSL954001A Obtain representative samples in accordance with sampling plan*

EVIDENCE GUIDE	
	• *MSL973001A Perform basic tests*. Resources may include: • access to sites, tools and equipment • enterprise procedures, sampling plans, test methods and equipment manuals.
Method of assessment	The following assessment methods are suggested: • review of work outputs over a period of time to ensure accurate and consistent work is obtained within required timelines • examples of completed workplace documentation • feedback from peers and supervisors • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials** A geotechnical consultancy company is carrying out the investigation for the construction of an industrial complex involving building pads and roadways. A contract drilling company has been hired to carry out auger drilling for the building pad foundations. The drill rig will be used to perform standard penetration tests in some boreholes to determine bearing capacities. Undisturbed sample tubes will be pushed to obtain samples for consolidation testing in the laboratory.

EVIDENCE GUIDE	
	A senior technician is in charge of site activities, and arranges for a drill rig. She/he plans a program of drilling, sampling and testing. A laboratory assistant is allocated to carry out the majority of site activities. These include overseeing drilling, testing and sampling operations. He/she is provided with a marked-up plan of the site showing borehole locations so that he/she can direct where to drill. The senior technician makes site visits every second day to oversee the work. The drilling contractor operates the drill rig, takes tube samples, performs the standard penetration tests and cases the hole if required, as directed by the senior technician. The assistant records and samples the soil profile, seals the sample tubes with wax and labels them. He/she also records the SPT readings and bags and labels the material from the split-spoon sampler. Each borehole is capped to prevent access by unauthorised persons so that the assistant can record standing water level 24 hours after the hole has been drilled. He/she wears a helmet, safety boots and earmuffs while working near the rig. He/she covers up and wears sunscreen while working in the sun and drinks large quantities of water. The assistant also excavates hand auger holes to a depth of one metre at regular intervals in the proposed roadways to obtain samples for California Bearing Ratio (CBR) tests. Adjacent to each, he/she performs a dynamic cone penetrometer test to two metres to assess the insitu material. He/she records the logs of the auger holes and the test results on the company's standard data sheets and backfills each auger hole immediately after sampling. He/she reports each day's activities to the senior technician using the company's standard summary form. He/she is confident to identify soil types thus minimising the need for laboratory testing of the samples taken. Based on the field logs, cross-sections of the site can be drawn so that the designer can assess its geotechnical characteristics and determine the extent of any further investigations.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • industry codes of practice • environmental legislation and regulations • standard operating procedures (SOPs) • equipment manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • quality manuals • enterprise recording and reporting procedures • production and laboratory schedules • material, production and product specifications
Site hazards	Site hazards may include: • solar radiation, dust and noise • manual handling of heavy materials and equipment • working in/on trenches, confined spaces, wet and uneven surfaces, heights and slopes • vehicular and pedestrian traffic
Safety procedures	Safety procedures may include: • location of site services before investigations commence • use of material safety data sheets (MSDS) • use of personal protective equipment, such as hard hats, hearing protection, sunscreen, gloves, masks, goggles, coveralls and safety boots • handling and storage of (hazardous) materials

RANGE STATEMENT	
	and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning of equipment and vehicles • machinery guards • signage, barriers, flashing lights, traffic control
Tools and equipment	Tools and equipment may include: • hand tools, including shovels, crowbars, scoops, spanners, wrenches and tape measures • consumables, including sample bags, labels, sample tubes and wax • documentation, including maps, plans and worksheets • field test equipment, including dynamic cone penetration (DCP) testing, standard penetration testing (SPT), shear vane, pocket penetrometers and water level indicator • safety clothing and equipment, including helmet, boots, gloves, earmuffs and glasses • excavation equipment, including hand and power augers
Common site problems	Common site problems may include: • caving of the excavation • drilling difficulties • not knowing the requirements of the design engineer • not understanding the nature of the item being designed (e.g. retaining wall, piled structure and earthworks) • sample loss during retrieval • knowing when to stop a hole, or what and when to test and sample • misidentification of samples and sampling locations • equipment breakdown and breakage • environmental problems and issues, including site access, inclement weather, traffic, wildlife, vegetation and construction activities
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise

RANGE STATEMENT	
	OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974003A Perform chemical tests and procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to interpret chemical test requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine chemical tests/procedures. These tests will involve several measurement steps. The unit includes data processing and interpretation of results and tracking of obvious test malfunctions where the procedure is standardised. However, personnel are not required to analyse data, optimise tests/procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory or technical assistants and instrument operators in all industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Review test request to identify samples to be tested, test method and equipment/instruments involved 1.2. Identify hazards and enterprise control measures associated with the sample, preparation/test methods, reagents and/or equipment 1.3. Plan work sequences to optimise throughput of multiple samples, if appropriate
2. Receive and prepare samples	2.1. Log samples using standard operating procedures (SOPs) 2.2. Record sample description, compare with specification and note and report discrepancies 2.3. Prepare samples and standards in accordance with chemical testing requirements 2.4. Ensure traceability of samples from receipt to

ELEMENT	PERFORMANCE CRITERIA
	reporting of results
3. Check equipment before use	3.1. Set up equipment/instruments in accordance with test method requirements 3.2. Perform pre-use and safety checks in accordance with relevant enterprise and operating procedures 3.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4. Check equipment calibration using specified standards and procedures, if applicable 3.5. Quarantine out of calibration equipment/instruments 3.6. Ensure reagents required for the test are available and meet quality requirements
4. Test samples to determine chemical species or properties	4.1. Operate equipment/instruments in accordance with test method requirements 4.2. Perform tests/procedures on all samples and standards, if appropriate, in accordance with specified methods 4.3. Shut down equipment/instruments in accordance with operating procedures
5. Process and interpret data	5.1. Record test data noting atypical observations 5.2. Construct calibration graphs, if appropriate, and compute results for all samples from these graphs 5.3. Ensure calculated values are consistent with expectations 5.4. Record and report results in accordance with enterprise procedures 5.5. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 5.6. Interpret trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.7. Determine if obvious procedure or equipment problems have led to atypical data or results
6. Maintain a safe work environment	6.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes and environmental impacts 6.3. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 6.4. Care for and store equipment and reagents as

ELEMENT	PERFORMANCE CRITERIA
	required
7. Maintain laboratory records	7.1. Enter approved data into laboratory information management system 7.2. Maintain confidentiality and security of enterprise information and laboratory data 7.3. Maintain equipment and calibration logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting test methods and procedures
- sample preparation procedures
- performing calibration checks
- using instruments for qualitative and/or quantitative analysis
- maintaining and evaluating reagents
- troubleshooting basic equipment/method
- using calculation methods, including appropriate units, uncertainties, balancing equations, and the concentration of the solution given the chemical reaction for the titration
- preparing calibration graphs and calculating results using appropriate units and precision
- applying theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact
- tracing and sourcing obvious causes of an artefact
- recording and communicating results in accordance with enterprise procedures
- maintaining security, integrity, traceability of samples, sub-samples, test data, results and documentation

Required knowledge

Required knowledge includes:

- chemical principles and concepts underpinning test/procedure
- purpose of the tests

REQUIRED SKILLS AND KNOWLEDGE
• concepts of metrology • principles and concepts related to equipment/instrument operation and testing • function of key components of the equipment/instrument and/or reagents • effects of modifying equipment/instrument variables • use of calibration procedures • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret test methods/procedures accurately • prepare and test samples using procedures appropriate to the nature of sample • perform calibration checks (if required) • safely operate test equipment/instruments to enterprise standards and/or manufacturer's specification • prepare calibration graphs and calculate results using appropriate units and precision • apply basic theoretical knowledge to interpret gross features of data and make relevant conclusions • identify atypical results as out of normal range or an artefact • traces and source obvious causes of an artefact • communicate problems to a supervisor or outside service technician • record and communicate results in accordance with enterprise procedures • maintain security, integrity, traceability of samples, sub-samples, test data and results and documentation.
Context of and specific resources for	This unit of competency is to be assessed in the

EVIDENCE GUIDE	
assessment	workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Process and interpret data* • *MSL974001A Prepare, standardise and use solutions*. Resources may include: • standard laboratory equipped with appropriate test equipment/instruments, standards and reagents • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over a period of time to check accuracy, consistency and timeliness of results • review of test records and workplace documentation completed by the candidate • observation of candidate conducting a range of chemical tests and procedures and sample preparation • feedback from peers and supervisors • oral or written questioning of chemical principles and concepts, test methods and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing**

EVIDENCE GUIDE	
	Ultraviolet spectroscopy is a suitable method for determining the concentration of sulphanilamide in pharmaceutical preparations. The ultraviolet absorption spectrum is pH dependent, with the wavelength maximum different in acid and alkaline solutions. Example: a technician was conducting an analysis and noted that the wavelength maxima had moved from approximately 250nm to below 230nm. After reviewing the procedure being used and checking for possible errors, the technician found that an incorrect solvent had been used for the analysis. The hydrochloric acid solvent was replaced with sodium hydroxide, as per the standard method, and the correct absorption spectrum was obtained. **Environmental** A technician was asked to test water samples from a local lake over several days to determine the lake's nutrient levels following reports of algal blooms in the lake over the preceding weeks. He/she used a field colorimeter kit to determine both nitrates and orthophosphates using SOPs. Because the same colorimetric cells were used for the nitrate and orthophosphate tests, they were carefully washed and rinsed with distilled water between all tests (as specified in the SOP). After reviewing the results from the first three days, the technician noted that the first orthophosphate result, which was done immediately after all the nitrate tests, was much higher than subsequent orthophosphate tests which were all consistently low. The technician argued that the 'high' results for the first orthophosphate test may be due to cross-contamination from trace amounts of reagents used in previous nitrate tests despite having closely followed the cleaning/rinsing SOPs. After discussion with his/her supervisor, the technician modified the field procedures by using totally different colorimetric cells for the nitrate and orthophosphate tests. For all subsequent tests no 'high' orthophosphate results were obtained for the first sample. As a result, the laboratory supervisor amended the SOPs to incorporate this new requirement. **Food processing** Regular checks are conducted on the percentage of salt in cheese at a dairy company's laboratory. A technician checks the results from the airomatic salt-titration

EVIDENCE GUIDE	
	equipment and, if the results are abnormal, notifies the supervisor before taking appropriate action. After obtaining a high result, for example, the assistant notified the supervisor and then began checking the machine to identify a possible reason for the high reading. He/she found that the supply bottle of silver nitrate used in the test was almost empty. This had resulted in less solution being pumped through the equipment than required, leading to graph readings that indicated a high percentage of salt. After replacing the silver nitrate bottle and recalibrating the equipment, the assistant retested the cheese samples and found that they contained the expected 1-2% salt.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2134.1-1999 Recommended practice for chemical analysis by atomic absorption spectrometry - Flame atomic absorption spectrometry
	  • AS 2162.1-1996 Verification and use of volumetric apparatus - General - Volumetric glassware
	  • AS 3753-2001 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry

RANGE STATEMENT	
	• AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS 2243 Set:2006 Safety in laboratories set • AS/NZS ISO 9000 Set:2008 Quality management systems set • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry methods, such as Royal Australian Chemical Institute (RACI) and/or American Association of Cereal Chemists (AACC) methods for inorganic constituents • material safety data sheets (MSDS) and safety procedures • material, production and product specifications • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals and equipment and procedure manuals • SOPs • waste minimisation and safe disposal procedures
Sample preparation processes	Sample preparation processes may include: • grinding • mulling • preparation of discs • digestion • dissolving • ashing • refluxing • tracting

RANGE STATEMENT	
	• filtration • evaporation • flocculation • precipitation • washing • drying • centrifugation

Non-instrumental test/procedures	Non-instrumental test/procedures may include:
	• gravimetric analysis:
	  • loss on drying
	  • suspended solids
	  • ashes, such as sulphated and gravimetric assays (e.g. sulphates and nitrogen in fertilisers)
	  • Ni by dimethylglyoxime
	  • bitumen content of asphaltic concrete
	• titrimetric analysis:
	  • acid/base determinations
	  • complexiometric, such as water hardness, Fe by dichromate and binder content analysis
	  • redox, such as precipitation of chlorides in water
	  • dissolved oxygen (DO), chemical oxygen demand (COD) and biochemical oxygen demand (BOD)
	• filtration, separation and solvent extraction techniques
	• corrosion testing, cement content and accelerated weathering

Instrumental tests	Instrumental tests may include: • spectrometry • chromatography • electrochemistry
Types of instrumentation and instrumental techniques	Types of instrumentation and instrumental techniques may include: • colorimetric techniques, such as enzyme activity, chlorine in water, specific cations and anions

RANGE STATEMENT	

	• infrared, ultraviolet-visible (UV-VIS) spectrophotometry
	• other spectrometric techniques:
	  • fluorimetric analysis, flame atomic emission and flame atomic absorption spectrometry
	  • fourier transform infrared
	• chromatographic techniques:
	  • column and thin layer analytical and preparative chromatography
	  • gas or liquid chromatography for purity, raw material and formulation checks
	  • ion chromatography for detection of nitrates, phosphates, sulphates, chlorides and bromides
	  • gel filtration chromatography for purification of proteins
	• electrochemical techniques, such as pH, eH, conductivity and ion-selective electrodes
	• electrophoretic techniques for DNA patterns and determination of protein purity
	• soil testing:
	  • moisture content
	  • organic matter content
	  • specific anions and cations
	• auto-analysers for determination of total P, total Kjeldahl N, orthophosphate, nitrite/nitrate and ammonia

Chemical principles and concepts	Chemical principles and concepts may include: • ions, atoms, molecules, bonding and links to chemical properties • chemical reactions involving acid/base, redox, complex ion formation, solubility and equilibrium • energy levels and absorption/emission spectra
Chemical tests methods	Chemical tests methods may include: • control of starting materials, in-process materials and finished products • environmental monitoring • basic troubleshooting and/or problem solving

RANGE STATEMENT	
	within the scope of SOPs and enterprise processes

Hazards	Hazards may include:
	• chemicals:
	  • acids (e.g. sulphuric, perchloric and hydrofluoric)
	  • heavy metals and pesticides
	  • anions (e.g. fluoride)
	  • hydrocarbons (e.g. mono-aromatics)
	• aerosols from broken centrifuge tubes, pipetting
	• sharps and broken glassware
	• flammable liquids and gases
	• cryogenics, such as dry ice and liquid nitrogen
	• fluids under pressure, such as hydrogen in gas liquid chromatography, acetylene in atomic absorption spectrometry
	• sources of ignition
	• high-temperature ashing processes
	• disturbance or interruption of services

Hazard control measures:	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses and coveralls • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III

RANGE STATEMENT	
	biohazard cabinets) and containment procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Records	Records may include: • test and calibration results • equipment use, maintenance and servicing history • faulty or unsafe equipment
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974004A Perform food tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to interpret food test requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine testing of raw food materials, in-process materials and final products. These tests will involve several measurement steps. The unit includes data processing and some interpretation of results and tracking of obvious test malfunctions where the procedure is standardised. However, personnel are not required to analyse data, optimise tests/procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory or technical assistants and instrument operators working in the food and beverage processing industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Review test request to identify samples to be tested, test method and equipment/instruments involved 1.2. Identify hazards and enterprise controls associated with the sample, preparation/test methods, reagents and/or equipment 1.3. Plan parallel work sequences to optimise throughput of multiple sets of samples, if appropriate
2. Receive and prepare food samples	2.1. Log samples using standard operating procedures (SOPs) 2.2. Record sample description, compare with specification and note and report discrepancies 2.3. Prepare samples and standards in accordance with food testing requirements 2.4. Ensure traceability of samples from receipt to

ELEMENT	PERFORMANCE CRITERIA
	reporting of results
3. Check equipment before use	3.1. Set up equipment/instruments in accordance with test method requirements 3.2. Perform pre-use and safety checks in accordance with relevant enterprise and operating procedures 3.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4. Check equipment calibration using specified standards and procedures, if applicable 3.5. Quarantine out of calibration equipment/instruments 3.6. Ensure reagents required for the test are available and meet quality requirements
4. Test samples to determine food components and characteristics	4.1. Operate equipment/instruments in accordance with test method requirements 4.2. Perform tests/procedures on all samples and standards, if appropriate, in accordance with specified methods 4.3. Shut down equipment/instruments in accordance with operating procedures
5. Process data	5.1. Record test data noting atypical observations 5.2. Construct calibration graphs, if appropriate and compute results for all samples from these graphs 5.3. Ensure calculated values are consistent with reference standards and expectations 5.4. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 5.5. Record and report results in accordance with enterprise procedures 5.6. Interpret trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.7. Determine if basic procedure or equipment problems have led to atypical data or results
6. Maintain a safe work environment	6.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes and environmental impacts 6.3. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 6.4. Care for and store equipment and reagents as

ELEMENT	PERFORMANCE CRITERIA
	required
7. Maintain laboratory records	7.1. Enter approved data into laboratory information management system (LIMS) 7.2. Maintain confidentiality and security of enterprise information and laboratory data 7.3. Maintain equipment and calibration logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- using instruments for qualitative and/or quantitative analysis
- interpreting test methods and procedures
- sample preparation procedures
- performing calibration checks
- using instruments for qualitative and/or quantitative analysis
- maintaining and evaluating reagents
- troubleshooting basic equipment/method
- calculations to estimate uncertainty and produce results
- preparing calibration graphs and calculating results using appropriate units and precision
- applying theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact
- tracing and sourcing obvious causes of an artefact
- recording and communicating results in accordance with enterprise procedures
- maintaining security, integrity, traceability of samples, sub-samples, test data, results and documentation

Required knowledge

Required knowledge includes:

- principles and concepts underpinning the test/procedure
- purpose of tests

REQUIRED SKILLS AND KNOWLEDGE
• metrology techniques underpinning test/procedure including uncertainty • principles and concepts related to equipment/instrument operation and testing • function of key components of the equipment/instrument • effects on the test of modifying equipment/instrument variables • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret test methods/procedures accurately • prepare and test samples using procedures appropriate to the nature of sample • perform calibration checks (if required) • safely operate test equipment/instruments to enterprise standards and/or manufacturer's specification • prepare calibration graphs and calculate results using appropriate units and precision • apply basic theoretical knowledge to interpret gross features of data and make relevant conclusions • identify atypical results as out of normal range or an artefact • trace and source obvious causes of an artefact • communicate problems to a supervisor or outside service technician • record and communicate results in accordance with enterprise procedures • maintain security, integrity, traceability of samples, sub-samples, test data/results and documentation.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment.

EVIDENCE GUIDE	
	This unit of competency may be assessed with: • *MSL924001AProcess and interpret data*. Resources may include: • standard laboratory equipped with test equipment, instruments, standards and materials • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over a period of time to check accuracy, consistency and timeliness of results • review of test records and workplace documentation completed by the candidate • observation of candidate conducting a range of food tests and procedures and sample preparation • feedback from peers and supervisors • oral or written questioning of food technology concepts and principles, test methods and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food processing** A technician was required to conduct an analysis of the level of sorbic acid in samples of processed cheese.

EVIDENCE GUIDE	
	She/he set up and calibrated the distillation unit while the samples were prepared. The controls and samples were distilled and placed in the spectrometer at 260 nm. Readings were carefully recorded for each sample and control flask. The control sample readings at the beginning and end of the testing period were compared for any variance. The technician worked quickly and excluded light from the reactants as they were light sensitive. Analytical data was presented to the supervisor for checking and signing-off for release of the product batch prior to the results being recorded on a daily run chart for viewing by production personnel.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1766.0-1995 Food microbiology - General introduction and list of methods
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set

RANGE STATEMENT	
	• ISO/TS 19036 Set:2006 Microbiology of food and animal feeding stuffs - Guidelines for the estimation of measurement uncertainty for quantitative determinations • Australia New Zealand Food Standards (ANZFS) Code • Australian code of good manufacturing practice for medicinal products (GMP) • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 • Australian Quarantine and Inspection Service (AQIS) Import Guidelines • calibration and maintenance schedules • data quality procedures • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • gene technology regulations • industry standards, such as Royal Australian Chemical Institute (RACI) or American Association of Cereal Chemists (AACI) methods for colour, moisture, total ash, fats and proteins, nitrogen, fibre, micro-organisms and viscosity • material safety data sheets (MSDS) • material, production and product specifications (including maximum residue levels) • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • SOPs and in-house methods • Therapeutic Goods Regulations 1009
Sample preparation processes	Sample preparation processes may include: • grinding • milling • preparation of discs • dissolving • ashing

RANGE STATEMENT	
	• refluxing • extracting • filtration • evaporation • flocculation • precipitation and centrifugation • culturing of selected micro-organisms • digestion • degassing • temperature equilibration
Principles and concepts underpinning the test/procedure	Principles and concepts underpinning the test/procedure may include: • ions, atoms, molecules, bonding, affinities and related properties • chemical reactions (acid/base and complexiometric) • structure and properties of proteins, lipids, carbohydrates, vitamins and minerals • food additives, flavourings and essences • nutrient value of major food groups • interaction of water with food components • microbiology, including incubation characteristics, selective media, growth stages of bacterial cultures and reference organisms • microbiology of organisms with public health significance • chemical and microbial changes in food • food preservation techniques • fermentation process • packaging and controlled atmosphere • elastic properties of materials and hardness • cohesive/adhesive forces, fluid flow and viscosity • changes of state, energy content and enthalpy change • electromagnetic spectrum and absorption, emission and refraction of light • quality control program for raw materials, process control and finished product inspection • genetically modified foods

RANGE STATEMENT	

Food tests and procedures	Food tests and procedures may include:
	• visual and sensory tests:
	  • appearance, taste, texture, colour and odour of foods
	  • melting point, boiling point and freezing point
	  • sediments and scorched particles
	  • foreign matter
	  • damage to packaging and compatibility of packaging
	  • dispersability
	• chemical analysis:
	  • pH, conductivity and moisture content
	  • solids, fats, proteins and carbohydrates
	  • ash analysis and salt analysis
	  • titratable acids, iodine values and peroxide values
	  • enzyme activity
	  • specific ions and active ingredients
	• microbiological tests and procedures:
	  • isolation, detection, classification to genera and some species or micro-organisms
	  • enumeration and nomenclature of desirable/ non-desirable micro-organisms
	  • propagation and maintenance of yeast, bacteria and cultures used in food processing
	  • measurement of spoilage and contamination
	  • sterility, hygiene and sanitation checks
	• optical/spectrometric tests:
	  • ultraviolet-visible (UV-VIS) spectrophotometry
	  • refractive index
	  • optical rotation
	• physical/mechanical tests:
	  • mass, volume, density, specific gravity and particle size
	  • foreign matter
	  • rheology, viscosity and gel strength

RANGE STATEMENT	
	• 'wetability' and 'whipability' • homogenisation • browning (sugar content) • elasticity, hardness, compressibility and strength • starch quality • thermal tests: • calorific values • stability of products • effectiveness of heat treatments
Tests	Tests may include methods for: • control of starting materials, in-process materials and finished products • health monitoring • basic troubleshooting of production processes
Hazards	Hazards may include: • microbiological organisms and agents associated with soil, air, water, plants, animal tissue and fluids • chemicals, such as acids, heavy metals, pesticides and hydrocarbons • aerosols from broken centrifuge tubes and pipetting • sharps and broken glassware • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam and industrial gases • sources of ignition • high temperature ashing processes • disturbance or interruption of services
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling,

RANGE STATEMENT	
	MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses, coveralls, gown, body suits and respirators • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Records	Records may include: • test and calibration results • equipment use, maintenance and servicing history • faulty or unsafe equipment
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and

RANGE STATEMENT	
	State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974005A Perform physical tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to interpret physical test requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine physical tests. These tests will involve several measurement steps. The unit includes data processing and interpretation of results and tracking of obvious test malfunctions where the procedure is standardised. However, personnel are not required to analyse data, optimise tests/procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory or technical assistants and instrument operators working in the manufacturing, environment, food and construction materials testing industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Review test request to identify samples to be tested, test method and equipment/instruments involved 1.2. Identify hazards and enterprise control measures associated with the sample, preparation/test methods and/or equipment 1.3. Plan work sequences to optimise throughput of multiple samples, if appropriate
2. Receive and prepare samples	2.1. Log samples using standard operating procedures (SOPs) 2.2. Record sample description, compare with specification and note and report discrepancies 2.3. Prepare samples and standards in accordance with physical testing requirements 2.4. Ensure traceability of samples from receipt to

ELEMENT	PERFORMANCE CRITERIA
	reporting of results
3. Check equipment before use	3.1. Set up equipment/instruments in accordance with test method requirements 3.2. Perform pre-use and safety checks in accordance with relevant enterprise and operating procedures 3.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4. Check equipment calibration using specified procedures, if applicable 3.5. Quarantine out of calibration equipment/instruments
4. Test samples to determine physical properties	4.1. Operate equipment/instruments in accordance with test method requirements 4.2. Perform tests/procedures on all samples and standards, if appropriate, in accordance with specified methods 4.3. Shut down equipment/instruments in accordance with operating procedures
5. Process and interpret data	5.1. Record test data noting atypical observations 5.2. Ensure calculated values are consistent with expectations 5.3. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 5.4. Record and report results in accordance with enterprise procedures 5.5. Interpret trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Determine if obvious procedure or equipment problems have led to atypical data or results
6. Maintain a safe work environment	6.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes and environmental impacts 6.3. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 6.4. Care for and store equipment and materials as required
7. Maintain laboratory records	7.1. Enter approved data into laboratory information management system

ELEMENT	PERFORMANCE CRITERIA
	7.2. Maintain confidentiality and security of enterprise information and laboratory data 7.3. Maintain equipment and calibration logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- using instruments for qualitative and/or quantitative analysis
- interpreting test methods and procedures
- sample preparation procedures
- performing calibration checks
- metrology techniques underpinning test/procedure including estimating uncertainty
- using instruments for qualitative and/or quantitative analysis
- maintaining and evaluating reagents
- troubleshooting basic equipment/method
- preparing calibration graphs and calculating results using appropriate units and precision
- applying theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact
- tracing and sourcing obvious causes of an artefact
- recording and communicating results in accordance with enterprise procedures
- maintaining security, integrity, traceability of samples, sub-samples, test data, results and documentation

Required knowledge

Required knowledge includes:

- physical principles and concepts underpinning the test/procedure
- purpose of tests
- function of key components of the equipment/instrument
- effects on test of modifying equipment/instrument variables
- sample preparation procedures
- concepts of metrology

REQUIRED SKILLS AND KNOWLEDGE
• basic equipment/method troubleshooting procedures • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret test methods/procedures accurately • prepare and test samples in accordance with specified methods • perform calibration checks (if required) • safely operate test equipment/instruments to enterprise standards and/or manufacturer's specifications • apply basic knowledge of physical properties of materials to interpret gross features of data and make relevant conclusions • identify atypical results, such as out of normal range or an artefact • trace and source obvious causes of an artefact • communicate problems to a supervisor or outside service technician • calculate, record and communicate results in accordance with enterprise procedures • maintain security, integrity and traceability of samples, sub-samples, test data/results and documentation.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Process and interpret data*.

EVIDENCE GUIDE	
	Resources may include: • standard laboratory equipped with appropriate test equipment/instruments, standards and materials • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over a period of time to check accuracy, consistency and timeliness of results • review of test records and workplace documentation completed by the candidate • observation of candidate conducting a range of physical tests and procedures and sample preparation • feedback from peers and supervisors • oral or written questioning of physical principles and concepts, test methods and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A technical assistant was measuring the specific density of a shipment of glycerol using a standard laboratory procedure. The result did not agree with the manufacturer's certificate of analysis. The assistant notified the manufacturer who came to the plant and checked the delivered material. It had been raining while

EVIDENCE GUIDE	
	the glycerol was in transit and rain water had entered the drum, diluting the glycerol. The drum was returned to the manufacturer and a new drum was supplied to the manufacturing plant. The manufacturer investigated the seals on the glycerol drums and took action to ensure that new seals would protect the product in transit. **Food processing** A technician was testing the melt flow index of a new type of polymer that was to be used as a sealant for packages of freeze dried coffee. The technician measured the melt flow rate and found it was much too high. The technician then checked the melt flow equipment as per the manufacturer's directions and found the machine was out of calibration. After recalibration using recommended standards, another sample was obtained and retested. This time, the polymer was within specification and was released for use in production.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in

RANGE STATEMENT	
	laboratories set • AS/NZS ISO 9000 Set:2008 Quality management systems set • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • data quality procedures • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • SOPs
Physical principles and concepts underpinning the test/procedure	Physical principles and concepts underpinning the test/procedure may include: • matter, interatomic and intermolecular forces and states of matter • mass, weight, forces, pressure, energy, friction and slip resistance • properties of gases, pressure/volume/temperature, density, diffusion and compressibility • cohesive/adhesive forces, hydrostatic pressure, fluid flow, viscosity and friction • thermal expansion, thermal conductivity and coefficients of expansion • changes of state, energy content, enthalpy change and endothermic and exothermic processes • electromagnetic spectrum, primary/secondary colours, reflection, refraction diffraction and interference of light • electrical concepts, including electric field, voltage, current, resistance and AC/DC • electromagnetic concepts, including magnetic field and flux, and electromagnetic induction

RANGE STATEMENT	
	• sound concepts, including wave properties, amplitude, frequency and loudness (dB) • elasticity, hardness, strength of materials, plasticity, permeability and dispersion • electrical safety concepts including voltage, current, resistance, conductors/insulators and AC/DC
Preparation of samples	Preparation of samples may include processes, such as: • drying, washing, grinding, sieving, melting and moisture conditioning • cutting, trimming or machining of test specimens, etching

Physical tests and procedures	Physical tests and procedures may include:
	• precise measurement of position, orientation and dimensions:
	  • three-dimensional setup of manufacturing tools using inclinometers, verniers and laser
	  • thickness using vernier, X-ray and gamma ray
	  • particle size using sieving and laser
	  • dimensional stability involving expansion, contraction and weathering
	  • movement using strain gauge and accelerometer
	• mass, density and specific gravity:
	  • moisture/density relationship
	  • compaction
	  • loose and compacted density
	• thermal tests:
	  • thermal conductivity
	  • coefficients of expansion (e.g. linear and volume)
	  • melt flow index
	  • calorimetry, (e.g. specific heat and latent heat)
	  • combustion properties (e.g. enthalpy and energy content)
	  • drying times
	  • thermal stability of products

RANGE STATEMENT	

	• optical tests:
	  • flatness and surface finish
	  • refractive index
	  • optical rotation
	  • transmission/absorption of filters
	  • colour matching of products
	• acoustic tests:
	  • absorption, reflection and transmission
	  • intensity, attenuation and loudness (dB)
	  • amplitude and frequency
	• electrical tests:
	  • conductance, resistance and insulation
	  • temperature dependence of dielectrics
	• magnetic tests:
	  • permeability
	  • retentivity, hysteresis loss and coercivity
	  • intrinsic induction

Test and sample preparation equipment/materials	Test and sample preparation equipment/materials may include: • crushers, mulchers, grinders, mills, riffles and sieves • moulds, bags and containers • ovens, microwaves and water baths • mass balances • microscopes • dimension apparatus (e.g. calipers and micrometer) • rammers, compression rigs and load cells • chemical reagents and volumetric glassware • temperature measuring devices, such as thermometers and thermocouples • pH and conductivity meters • analogue and digital meters, charts/recorders, data loggers and computers
Tests	Tests may include methods for: • control of starting materials, in-process materials and finished products • investigation of sources of construction materials

RANGE STATEMENT	
	• basic troubleshooting of enterprise processes
Hazards	Hazards may include: • microbiological organisms and agents, associated with soil, air and water • chemicals, such as acids and solvents • radiation, such as alpha, beta, gamma, X-ray and neutron • sharps, broken glassware and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam and industrial gases • sources of ignition • burners and ovens • disturbance or interruption of services • crushing, entanglement and cuts associated with moving machinery (grinders)
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses, coveralls and safety boots • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Records	Records may include:

RANGE STATEMENT	
	• test and calibration results • equipment use, maintenance and servicing history • faulty or unsafe equipment
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

Co-requisite units		

MSL974006A Perform biological procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to interpret work requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine biological procedures, including sample preparation. These procedures may involve several steps and are used to classify cell types, species and biologically active compounds by analysing their biological and chemical characteristics. This unit includes data processing, interpretation of results and troubleshooting obvious departures from standard procedures.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants working in the biomedical, environmental, biotechnology and education industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973004A	*Perform aseptic techniques*
	MSL973007A	*Perform microscopic examination*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule work requirements	1.1. Review work request to identify samples, required procedures and materials/equipment/instruments involved 1.2. Identify hazards and enterprise control measures associated with the sample, preparation methods, reagents and/or equipment 1.3. Plan parallel work sequences to optimise throughput of multiple sets of samples, if appropriate
2. Receive and prepare biological samples	2.1. Log samples using standard operating procedures (SOPs) 2.2. Record sample description, compare with specification and note and report discrepancies 2.3. Prepare samples in accordance with testing

ELEMENT	PERFORMANCE CRITERIA
	requirements 2.4. Ensure traceability of sample from receipt to reporting of results
3. Perform techniques that assist in the classification of a cell or species	3.1. Select suitable techniques in accordance with enterprise requirements and methods 3.2. Set up and use equipment and reagents in accordance with the method 3.3. Perform techniques in accordance with the method
4. Perform techniques that analyse biological activity	4.1. Select suitable techniques in accordance with enterprise requirements and methods 4.2. Set up and use equipment and reagents in accordance with the method 4.3. Perform techniques in accordance with the method
5. Process and interpret data	5.1. Record test data noting atypical observations 5.2. Construct calibration graphs, if appropriate, and compute results for all samples from these graphs 5.3. Ensure calculated values are consistent with expectations 5.4. Record and report results in accordance with enterprise procedures 5.5. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 5.6. Interpret trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.7. Determine if obvious procedure or equipment problems have led to atypical data or results
6. Maintain a safe work environment	6.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes 6.3. Ensure the safe disposal of biohazardous wastes 6.4. Clean, care for and store equipment and reagents as required
7. Maintain laboratory records	7.1. Record approved data into enterprise system 7.2. Maintain confidentiality and security of enterprise information and laboratory data 7.3. Maintain equipment and calibration logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- using instruments for qualitative and/or quantitative analysis
- sample preparation and separation techniques
- performing calibration checks
- metrology techniques underpinning test/procedure including estimating uncertainty
- maintaining and evaluating reagents
- troubleshooting basic equipment/method
- preparingand using calibration graphs and calculating results using appropriate units and precision
- applying theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact
- tracing and sourcing obvious causes of an artefact
- recording and communicating results in accordance with enterprise procedures
- maintaining security, integrity, traceability of samples, sub-samples, test data, results and documentation

Required knowledge

Required knowledge includes:

- hazards and risks in biological laboratories
- principles and concepts related to equipment/instrument operation and testing
- function of key components of the equipment/instrument and/or reagents
- effects of modifying equipment/instrument variables
- basic equipment/method troubleshooting procedures
- calculation steps to give results in appropriate units and precision
- sources of uncertainty in measurement and methods for control
- importance and appropriate use of controls and certified reference materials
- enterprise and/or legal requirements for traceability
- relevant health, safety and environmental requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret test procedures accurately • prepare and test samples using procedures appropriate to the nature of sample • perform calibration checks (if required) • safely operate test equipment to enterprise standards and/or manufacturer's specification • prepare calibration graphs and calculate results in appropriate units and precision • apply basic theoretical knowledge to interpret gross features of data and make relevant conclusions • identify atypical results as out of normal range or an artefact using reference material or quality control sera • trace and source obvious causes of an artefact • communicate problems to a supervisor or outside service technician • record and communicate results according to enterprise procedures • maintain security, integrity, traceability and identity of samples, sub-samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Process and interpret data* • *MSL974003A Perform chemical tests and procedures*. Resources may include: • standard laboratory equipped with appropriate test equipment and instruments, reagents and materials • SOPs and testing methods.
Method of assessment	The following assessment methods are suggested:

EVIDENCE GUIDE	
	• review of results obtained by the candidate over a period of time to ensure accuracy, consistency and timeliness • review of testing records and workplace documentation completed by the candidate • observation of candidate conducting a range of biological procedures • feedback from peers and supervisors • oral or written questioning of biological concepts, principles and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** (**1**) A laboratory technician conducts a screening test for parasites in stool samples. She/he checks the sample identification details, cross-checks the sample barcode with the request slip and the data entry in the laboratory information management system (LIMS). The technician locates the test method and then examines the sample container to ensure that it has not leaked and that there is sufficient volume for the test. She/he prepares the sample by adding solvent to a portion and shaking it before placing it in a centrifuge. After satisfactory separation, she/he pipettes a small quantity of the top layer of solvent onto a glass slide and adds iodine as a stain. The technician carefully views the slide using x40

EVIDENCE GUIDE	
	magnification and searches for eggs. She/he enters a nil result in the LIMS and disposes of the sample in accordance with enterprise procedures. **Biomedical** (**2**) A technical officer is requested to determine the total protein concentration of a blood sample using colorimetry. After checking the condition of the sample, she/he collects the Biuret reagent from the refrigerator, the required number of tubes and protein control samples and standards specified in the method. The officer labels the tubes and then accurately dispenses the correct volumes of reagent, standards, controls and samples into them. The solutions are thoroughly mixed using a vortex mixer and allowed to stand for five minutes for the reaction to occur. She/he records absorbance readings for each tube and prepares a calibration curve. The officer reads the concentration values from the graph for the control and test samples and checks the control data against the expected values. As these fall within the accepted range, she/he enters the test results into the LIMS.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards, such as: • AS 2134.1-1999 Recommended practice for chemical analysis by atomic absorption

RANGE STATEMENT	
	spectrometry - Flame atomic absorption spectrometry • AS 2162.1-1996 Verification and use of volumetric apparatus - General - Volumetric glassware • AS 3753-2001 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry • AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS 2243 Set:2006 Safety in laboratories set • AS/NZS ISO 9000 Set:2008 Quality management systems set • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry methods, such as Royal Australian Chemical Institute (RACI) and/or American Association of Cereal Chemists (AACC) methods for inorganic constituents • material safety data sheets (MSDS) and safety procedures • material, production and product specifications • national measurement regulations and guidelines • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals and equipment and procedure manuals • SOPs • waste minimisation and safe disposal procedures
Biological principles and concepts underpinning tests and	Biological principles and concepts underpinning tests and procedures may include:

RANGE STATEMENT	
procedures	• molecular interactions within the compounds of nucleic acids and nucleotides, proteins and amino acids, carbohydrates, lipids and vitamins, influencing structure, activity, chemical reactivity and physical properties, including solubility, energy levels and emission/absorption spectra • chemical and biochemical characteristics of lipids, carbohydrates, nucleic acids and proteins influencing structure, function and reactivity both in vitro and in vivo • chemical significance of biologically significant ions, such as calcium, zinc, iron, magnesium, sodium, potassium, chloride and phosphate • key metabolic pathways and the significance of initial nutrients, products and wastes on those pathways • structure and function of organelles, cells, plant and animal tissue and organs • interrelationships of biological systems (carbon cycle, energy cycle and the web of life) • classifications, such as bacteria, viruses, yeasts, single cell, multi-cellular, plants, animals, prions, helminths, prokaryotes and eukaryotes • phases of the cell cycle • Mendelian genetics, such as inheritance, meiosis, karyotypes, dominant and recessive traits, genotypes and phenotypes, and pedigrees • significance of the genetic code and transcription and translation • cell membrane activity, including diffusion (passive, facilitated and active), osmosis, tonicity and plasmolysis • staining reactions involving acid/base, redox, complex ion formation, solubility and equilibrium
Techniques for preparation of samples	Techniques for preparation of samples may include: • dissection, such as preparation of thymus extracts from mice • extraction (e.g. solvent extraction) • filtration (e.g. filter water samples and plate the

RANGE STATEMENT	

	sediment onto agar plates for incubation and growth of E. coli)
	• separation (e.g. dialysis)
	• precipitation and flocculation
	• centrifugation (excluding ultra centrifugation)
	• chromatography:
	  • gel filtration chromatography (e.g. crude purification of proteins)
	  • affinity chromatography (e.g. purification of immunoglobulins)
	• electrophoresis:
	  • polyacrylamide gel electrophoresis for separation of DNA segments
	  • agarose gel electrophoresis
	  • capillary electrophoresis
	  • gradient gel electrophoresis

Techniques to classify cells or species	Techniques to classify cells or species may include:
	• classification of species according to taxa
	• classification of cells according to microscopic or staining characteristics
	• characteristics of bacterial colonies:
	  • growth on differential media
	  • colony morphology (size and shape)
	  • biochemical reactions, such as miniaturised test strips, redox reactions and sugar tests

Techniques to analyse chemical and biological characteristics	Techniques to analyse chemical and biological characteristics may include:
	• staining:
	  • Gram stain for gram negative and positive bacteria
	  • Romanowsky stain for blood films
	  • Haematoxylin and Eosin for tissue sections
	  • Oil red O for fatty cellular inclusions
	  • spore staining
	  • flagella staining
	• microscopic examination:
	  • light
	  • phase contrast

RANGE STATEMENT	
	• bright field • dark ground • enumeration • colorimetry and spectrophotometry: • ultraviolet/visible • fluorimetric • infrared • flame emission • atomic absorption spectrometry • electrochemistry: • pH • ion selective electrodes and polarography (e.g. concentration of chloride ions) • chromatography: • column and thin layer analytical and preparative chromatography • gas and liquid chromatography for purity, raw material and formulation checks
Hazards	Hazards may include: • microbiological organisms and agents, associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • chemicals, such as acids, solvents and stains • aerosols from broken centrifuge tubes and pipetting • sharps and broken glassware • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam, hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry • sources of ignition • disturbance or interruption of services
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted

RANGE STATEMENT	
	samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses, coveralls and gowns • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Disposal of biohazardous wastes	Disposal of biohazardous wastes may include: • collection for sterilisation by autoclaving (e.g. autoclaving of microbiological plates) • appropriate storage (e.g. of waste containing radioactive isotopes) • use of biohazard waste containers
Records	Records may include: • test calibration results • equipment use, maintenance and servicing history • faulty or unsafe equipment • batch number, catalogue number and use by date for analytical kits
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise

RANGE STATEMENT	
	OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974007A Undertake environmental field-based monitoring

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to organise and undertake field monitoring programs that are primarily focused on the determination of physical and chemical parameters and/or observation and documentation of biological/ecological systems. It covers confirming the requirements of the monitoring activities, sampling, sample handling, physical and chemical monitoring and simple field-based analysis, data collection and recording. It also covers field camp maintenance and field safety. The unit of competency covers gaining clearance for animal trapping, tagging, keeping or experimentation, but does not cover specific animal handling techniques. These tasks would only be performed under the guidance and supervision of a scientific officer.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical, field and environmental officers working in the construction materials, mining and environmental services industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Confirm requirements for field monitoring activities with supervising staff	1.1. Clarify the purpose, objectives and the defined site for the field monitoring activities 1.2. Review all emergency plans, risk assessments, and safety and environmental requirements associated with the field activities 1.3. Review and discuss the detailed work program with supervising staff 1.4. Clarify the need for permits and any access restrictions or local concerns at field site 1.5. Clarify details of all samples to be collected and

ELEMENT	PERFORMANCE CRITERIA
	field parameters to be measured 1.6. Confirm final data formats will suit stakeholders who receive or use the data 1.7. Review existing in-house protocols and/or associated in-house requirements that relate to field sampling, monitoring and data quality procedures
2. Prepare for field monitoring activities	2.1. Develop checklists, based on work program, to facilitate correct preparation of field activities 2.2. Identify and implement all actions required under enterprise emergency plan, risk assessment, and environment, safety and data quality procedures 2.3. Complete all administrative requirements and obtain appropriate approvals/permits 2.4. Prepare and check all instruments, equipment, materials and supplies required to implement field program 2.5. Confirm, correct and safe use of equipment and details of field activities with supervisor 2.6. Arrange and check correct operation, packaging and transportation of all supplies and equipment 2.7. Arrange all additional pre- and post-monitoring activities
3. Perform field activities	3.1. Establish and maintain field camp in accordance with enterprise procedures, as necessary 3.2. Perform field sampling, monitoring, data collection and recording as per the agreed work program 3.3. Label all samples and complete data sheets and field log book in accordance with enterprise procedures 3.4. Store samples/specimens in accordance with any special requirements for continued wellbeing, viability or integrity 3.5. Perform all tests and operate all equipment according to enterprise instructions 3.6. Store and maintain equipment and, where appropriate, calibrate instruments during field activities 3.7. Perform all activities safely with minimal impact on the environment
4. Close down field monitoring activities	4.1. Arrange and check final packaging and transportation of all samples, equipment and supplies back to home base

ELEMENT	PERFORMANCE CRITERIA
	4.2. Ensure that monitoring/camp site is left in accordance with enterprise and environmental requirements 4.3. Ensure all samples and data are stored safely 4.4. Ensure dispatch of collected samples for subsequent analysis 4.5. Test and, if required, decontaminate equipment before storage 4.6. Report results/noting any anomalies with users, data analysers and/or supervisor

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- field sampling and monitoring procedures, including labelling and traceability
- demonstrating correct and safe use, under laboratory and field conditions, of field instruments and/or equipment (including field calibration)
- identifying and rectifyingbasic instrument faults
- collecting and preserving plants and animals to enable subsequent identification
- operating communication systems
- operating transportation systems
- applying data quality procedures under field conditions
- locating and managing of monitoring sites
- communicating effectively and efficiently
- reviewingand documenting emergency, safety or environmental field plans
- developing checklists covering instruments, equipment and associated supplies
- maintaining, storing and transporting samples/specimens to ensure their wellbeing, viability and integrity
- working safely for the protection of self and others
- negotiating with staff and stakeholders and reaching satisfactory agreements, where possible
- responding effectively to changed or unforeseen circumstances

Required knowledge

REQUIRED SKILLS AND KNOWLEDGE

Required knowledge includes:
• purpose and the objectives of a field activity, including:
  • information and analysis required
  • end users of information
  • significance of outcomes for broader programs
• risk assessment principles
• technical capabilities and limitations of common equipment and instruments
• specific legislation and codes of practice related to sample and animal collection
• a range of chemical and physical field monitoring procedures
• enterprise procedures for the recording of field data
• relevant health, safety and environment requirements, including field safety/survival principles

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can:
	• demonstrate understanding of the purpose and objectives of a field activity, including:
	  • information and analysis required
	  • end users of information
	  • significance of outcomes for broader programs
	• communicate effectively and efficiently with staff and other relevant parties
	• review a written work program and define the major field activities
	• review emergency, safety or environmental field plans and document the key aspects which relate to a defined field activity
	• develop accurate and complete checklists covering instruments, equipment and associated supplies necessary for a defined field activity
	• apply sampling, testing and data quality procedures

EVIDENCE GUIDE	
	accurately under field conditions • prepare, check and calibrate field instruments • demonstrate correct and safe use, under laboratory and field conditions, of field instruments and/or equipment (including field calibration) • define and correctly prepare sample containers for different field samples • take samples, under field conditions, according to defined procedures • maintain, store and transport samples/specimens to ensure their wellbeing, viability and integrity • pack and transport supplies, equipment and instruments to and/or from a field site • accurately perform field tests according to written instructions • record data and information, conduct quality checks and field analysis • work safely for the protection of self and others • negotiate with staff and stakeholders and reach satisfactory agreements, where possible • respond effectively to changed or unforseen circumstances.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL945001A Maintain laboratory/field workplace safety* • *MSL954001A Obtain representative samples in accordance with sampling plan*. Resources may include: • vehicles, survey equipment, sampling/monitoring equipment, consumables and manuals • work program, enterprise procedures, codes of practice and field protocols.
Method of assessment	The following assessment methods are suggested: • review of field data and results obtained by the candidate • feedback from supervisors and peers • demonstration of understanding of existing work program requirements by:

EVIDENCE GUIDE	
	• developing a checklist of the resources required to carry out a defined work program • developing a list of all pre-and post-monitoring requirements • observation of fieldwork performed by candidate with a focus on: • sample collection, preservation, storage and transportation • field sampling and monitoring procedures • accurate data recording • safety, emergency and environmental aspects of monitoring activity • communication techniques • general site reconnaissance • response to simulation exercises with a focus on: • accident and emergency situations • basic environmental impact assessment of a field site • loss of communication system and implementation of alternative procedures • demonstration of calibration, use and general maintenance of field instruments and equipment • oral and/or written questions to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of

EVIDENCE GUIDE	
	competency and to show its relevance in a workplace setting. **Environmental** (**1**) A technical officer in an environmental protection authority is required to undertake an emergency monitoring program in a small catchment following a public complaint that a small industrial site has illegally discharged a concentrated sodium chloride/acid mixture into a nearby creek system. The monitoring program requires three samples to be taken above and three samples below the industrial site over a distance of two kilometres. Additional tests covering electrical conductivity, pH, temperature and turbidity are to be done in situ at the same time as when the samples are taken. All samples and monitoring procedures are to be clearly documented and undertaken according to statutory and enterprise requirements, as the results may potentially be required to be presented and cross-examined in court. All of the above planning, implementation and reporting must be completed within 24 hours. **Environmental** (**2**) A technical officer is involved in a four day lake survey 100 km from the laboratory. The survey is designed to collect many water samples and undertake netting activity to determine the variety and food requirements of fish in the lake. The technical officer is responsible for collecting the water samples, in accordance with the predetermined sampling plan and enterprise sampling procedures, and disposing of the fish samples after they have undergone field-based gut analysis. Given the large number of water samples and the duration of the field trip, the technical officer arranges for the hire of several 3-way camping refrigerators (gas/12V/240V) to store and transport the water samples at 4°C and for appropriate supervised burial of the fish samples at a local council landfill. In addition, he/she prepares, checks and packs all the supplies and equipment. **Environmental** (**3**) In preparation for a major field trip to collect soil samples in a remote location, a technical officer spent several weeks ensuring that all arrangements were in place. The officer confirmed access to the site and located suitable maps, aerial photos and reconnaissance

EVIDENCE GUIDE	
	data. The logistics of food, water, hygiene, fuel, transport, communications and safety were planned with senior staff to suit the fieldwork location, duration and personnel involved. The vehicles were serviced in preparation for remote off-road work and a full complement of spares was assembled. All supplies and field equipment were purchased or assembled, checked against an inventory and securely stowed in the vehicles.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 3780-2008 The storage and handling of corrosive substances
	  • AS 4332-2004 The storage and handling of gases in cylinders
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	• AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2865 Set:2005 Safe working in a

RANGE STATEMENT	
	confined space set • AS/NZS 4452:1997 The storage and handling of toxic substances • AS/NZS 4501 Set:2008 Occupational clothing set • AS/NZS ISO 14000 Set:2005 Environmental management standards set • HB 9-1994 Occupational personal protection • animal welfare legislation and codes of practice • Australian code of good manufacturing practice for medicinal products (GMP) • Australian Dangerous Goods Code • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 • Australian Quarantine and Inspection Service (AQIS) Import Guidelines • Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice • data quality procedures • enterprise sampling and monitoring protocols • equipment manuals and warranties, supplier catalogue and handbooks • gene technology regulations • government policy (e.g. sustainable development and impact assessment) • Guide to physical containment levels and facility types • material safety data sheets (MSDS) • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety national standards and codes of practice • principles of good laboratory practice (GLP) • site specific requirements • specific environmental standards • Therapeutic Goods Regulations 1009

RANGE STATEMENT	
Communications	Communications may include: • face-to-face • telephone • written documents • meetings
Purpose of field monitoring activities	Purpose of field monitoring activities may include: • single or multiple site sampling and monitoring • routine monitoring of physical/chemical parameters • biological/ecological surveys • requirement to comply with legislation, regulations or standards • requirement to comply with industry sampling or monitoring protocols or codes of practice
Related plans and procedures	Related plans and procedures may include: • risk assessments • safety and accident/injury plans • emergency plans and procedures, access to nearest medical services • environmental impact assessment procedures • pollution prevention procedures • first aid and survival procedures
Hazards	Hazards may include: • solar radiation, dust and noise • personnel getting lost • accidents, emergencies and incidents, such as snake, insect or animal bites • exposure to severe weather conditions • manual handling of heavy objects • power tools, generators, moving machinery • vehicle and boat handling in rough/remote conditions
Safety procedures and control measures	Safety procedures and control measures may include: • use of personal protective equipment, such as sunscreen, hats, safety glasses, gloves, coveralls and safety boots

RANGE STATEMENT	
	• 'stay with vehicle' and other survival techniques • regular communication schedule • global positioning system (GPS), maps and aerial photos • handling, storage and disposal of all hazardous materials/waste in accordance with MSDS, labels, enterprise procedures, codes and regulations
Enterprise procedures for field activities	Enterprise procedures for field activities may include: • field note books or log books • standard operating procedures (SOPs) covering fieldwork, sampling and testing • equipment operating manuals, calibration procedures, instrument fault finding procedures and general maintenance and repair procedures • emergency, first aid and survival procedures • field camp procedures for cleaning, cooking, safety, security, hygiene, work management and set up/take down • requirements related to protection of the environment • incident/accident/injury report forms
Administrative requirements and appropriate approvals	Administrative requirements and appropriate approvals may include: • travel requisitions • authority for use of vehicles and equipment • insurance • permits
Equipment	Equipment may include: • navigation and communication equipment (e.g. compass, maps, GPS, two-way radio and mobile phone) • survey equipment • sampling equipment and containers, and animal cages • parameter specific meter or multi-probes (e.g. dissolved oxygen, electrical conductivity, pH, turbidity, nitrates, phosphates and temperature)

RANGE STATEMENT	
	• field test kits to determine such parameters as dissolved gases, chemical anions and cations, heavy metals, E. coli and biological oxygen demand • portable colourimeters, field microscopes • filters, sieves • soil monitoring kits • data loggers • tools, spares and vehicle recovery equipment • first aid equipment
Pre- and post-field activities	Pre- and post-field activities may include: • review of emergency and safety plans, risk assessment and environmental assessment requirements • confirming information regarding location and contact numbers of nearest emergency services • arranging site access (e.g. maps, permission, keys and condition of tracks) • arranging and checking all transportation systems (e.g. vehicles, boats and aircraft) • checking that communication systems are available and operational • confirming correct and safe use of instruments, equipment and field procedures with supervisor • confirming location and details of sampling sites (e.g. maps, photographs and descriptions) • preparing sample containers (e.g. container type and preparation, preservation techniques and labelling) • arranging correct transport, storage and laboratory testing of samples collected during field activities • arranging additional laboratory testing
Field monitoring activities and skills	Field monitoring activities and skills may include: • sample collection, preservation, labelling, storage, and transportation according to written procedures • correct use and calibration of field instruments according to written instructions • correct and accurate performance of field tests

RANGE STATEMENT	
	for specific parameters • clear and accurate recording of data • safe operation of motor vehicles and boats
Management of field camp activities	Management of field camp activities may include: • purchase of supplies • booking of accommodation • assembly, checking and transport of equipment/consumables, such as tents, cooking, bedding, communication system, food, water • mechanical checks of all transport vehicles • rostering and supervision of staff • location, establishment, and maintenance of site, including hygiene and waste • removal of waste and site remediation
Site and field issues and problems	Site and field issues and problems may include: • loss or failure of equipment • failure to bring critical equipment • communication failure/difficulties • unexpected restriction access to site • unforseen environmental impacts • contact with hazardous wastes
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974008A Capture and manage scientific images

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to capture accurate and reproducible images of scientific (environmental, medical and technical) subjects using a scientific approach and enterprise procedures/protocols to ensure the integrity of the image. It also includes the ability to generate and maintain pre- and post-image capture records to ensure that images can be reproduced.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians in all industry sectors. Personnel who capture images as a substantial part of their job role, should consider accessing the following units of competency from the *CUV40403 Certificate IV in Photoimaging* from CUV03 *Visual Arts, Crafts and Design Training Package*: • *CUVPHI04B Apply photoimaging lighting techniques* • *CUVPHI05B Use a 35mm SLR camera or digital equivalent* • *CUVPHI06B Plan and carry out image capture in response to a brief* • *CUVPHI07B Process photoimages to work print/file stage* • *CUVPHI511A Produce technical photoimages*. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Establish requirements for image capture	1.1. Define requirements and purpose of the work and create a brief 1.2. Choose an imaging technique that maintains the integrity and veracity of the subject and fulfils the work requirements 1.3. Plan the work using technical knowledge to ensure an effective and efficient result
2. Plan and set up the	2.1. Select and assemble the required equipment

ELEMENT	PERFORMANCE CRITERIA
shoot	2.2. Follow ethical and legal work practices at all times 2.3. Assess risks or hazards and implement safety procedures 2.4. Prepare the subject to achieve the brief
3. Capture and reproduce the required image	3.1. Expose media or film and accurately document the work in progress 3.2. Review the image against the work requirements and repeat if necessary 3.3. Reproduce the image to specification
4. Keep records and deliver images	4.1. Accurately and retrievably record the request, technical specifications and images so that they are retrievable 4.2. Store records safely and securely to archival standards 4.3. Follow copyright and crediting policies and procedures 4.4. Make the images available to the client, discuss the results and ensure that requirements have been met

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- creating and interpreting a brief
- applying an imaging technique that best meets the specifications and purpose of the job
- using a back-up system of image capture when shooting images
- producing consistent high quality, cost effective outcomes for clients
- keeping accurate records that allow future replication of images
- working safely and in an ethical manner

Required knowledge

Required knowledge includes:

- repercussions of manipulation of images and differences between adjustment and

REQUIRED SKILLS AND KNOWLEDGE
manipulation • scientific approach and protocols to ensure integrity of images • veracity of different types of storage media • relevant copyright, moral rights and intellectual property issues and legislation • relevant health, safety and environment requirements • enterprise policies and procedures for capturing and managing scientific images

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • create and interpret a brief • apply an imaging technique that best meets the specifications and purpose of the job, consistent with enterprise procedures • provide a back-up system of image capture when shooting images • produce consistent high quality, cost effective outcomes for clients • keep accurate records that allow future replication of images • work safely and in an ethical manner consistent with legislation, regulations and codes of practice.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL975015A Prepare animal and plant material for display*. Resources may include: • appropriate facilities, equipment and materials for image capture • enterprise procedures, equipment manuals, industry

EVIDENCE GUIDE	
	catalogues and journals.
Method of assessment	The following assessment methods are suggested: • review of portfolio of work completed by the candidate • feedback from clients and supervisor • oral or written questions to assess underpinning knowledge • case studies to assess the candidate's approach to different subjects and use of a variety of imaging techniques. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical**, **biotechnology**, **environmental** It's Friday afternoon and a technical officer in a university biology faculty is asked, at short notice, to assist a postgraduate student to obtain images to support a presentation of her work at an international conference. She's flying out of the country to the conference on Sunday. The officer discusses the requirements with the student and determines that the images are needed for a poster presentation to show the differences between sizes of fungal spores. It is agreed that colour prints of four different sized spores are to be produced using a camera coupled to a stereomicroscope. Given the time constraints, a decision is made to use a digital image that

EVIDENCE GUIDE	
	can be reproduced on-site. The images are produced on Friday evening and the student produces her poster on Saturday. The details of the subject, conditions and the images themselves are carefully stored for later use in the student's thesis.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Scientific images	Scientific images may include the following types of imaging techniques: • photographic • digital • X-ray • video • prints • transparencies • direct transformation from images to data, such as reading of DNA sequencing gels • auto-radiations • micrographs • other non-visible light sources, such as ultraviolet (UV) light, fluorescence and phosphorescence • electron micrographs
Scientific subjects	Scientific subjects may include: • building sites, environmental survey and monitoring sites

RANGE STATEMENT	
	• accident or incident sites, and injuries • forensic evidence • biological specimens • histological sections • live animals • chromatography gels
Job requirements and brief	Job requirements and brief may include: • description and specification of work, including constraints and due date • purpose of the image • specifications, such as size, purpose, audience, medium and style • interviewing and collecting information from the client • keeping records, request forms and notes
Purposes of the image	Purposes of the image may include: • publication as a thesis, presentation or on the web • temporal serial recording of changes over time • display as a poster, diorama, print or projection • preview, snapshot or proof of an image for production at a later stage • records of data for inclusion in databases • use in forensic investigation or court proceedings
Planning of the job	Planning of the job may include: • choice of type of image, media, site and conditions • preparation of the subject, such as make-up, choice of whole or part, staining, dissection, mounting, animal handling, setting up a light path for a microscope and appropriate magnification • technical requirements, such as resolution, film type, tripods, shutter speed, lens type and colour differential • back-up method and equipment for image capture • specification of final product, size, delivery, number and cost

RANGE STATEMENT	
	• position of subject
Equipment	Equipment may include: • lighting • backdrops • camera systems and accessories
Hazards	Hazards may include: • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • solar radiation, dust and noise • chemicals and radioisotopes • X-rays and other sources of electromagnetic radiation (laser and UV) • manual handling of heavy objects • slips, trips and falls, falling objects and moving machinery (e.g. on building sites) • pedestrian and vehicular traffic
Safety procedures	Safety procedures may include: • recognising and observing hazard warnings and safety signs • use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators and safety boots • following required containment procedures through the use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets and Class PCII, PCIII, and PCIV physical containment facilities • use of material safety data sheets (MSDS) • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • following established manual handling procedures
Ethical and legal work practices	Ethical and legal work practices may include consideration of: • industry codes of practice, contracts, permits,

RANGE STATEMENT	
	intellectual property, crediting, plagiarism and copyright • moral rights, model release, etiquette, decorum and sensitivity towards the subject, use of a chaperone and confidentiality
Production of images	Production of images may include: • sending images for processing • processing the images • use of commercial software
Storage of records	Storage of records may include: • the brief, technical specifications and images • file management (back-ups, data retrieval and storage) • paper-based, electronic or digital
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974009A Undertake field-based, remote-sensing monitoring

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to organise and undertake a defined field-based, remote-sensing monitoring activity. This may include assembling, setting up and checking appropriate monitoring equipment on-site, sampling, data collection and storage, equipment and system maintenance, and associated field testing and laboratory analysis. This unit of competency does not cover developing specific monitoring protocols or detailed design and/or construction of instruments, buildings, structures associated with the remote-sensing monitoring activities.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical, field and environmental officers working in the environmental services, geotechnical, construction materials testing and mining industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Confirm monitoring requirements with supervising staff	1.1. Clarify the purpose, objectives and the preferred site for the remote-sensing activities 1.2. Review all emergency and risk assessments, safety and environmental requirements and data quality procedures for the field activities 1.3. Clarify details of all field parameters to be monitored and the preferred monitoring and data quality procedures 1.4. Confirm final data formats will suit stakeholders who receive or use the data 1.5. Clarify details of any statutory requirements that apply to the site and associated field activities 1.6. Review existing remote-sensing monitoring protocols, and siting standards or associated in-house

ELEMENT	PERFORMANCE CRITERIA
	requirements which relate to the field activities
2. Assemble remote-sensing field monitoring system	2.1. Identify required instruments, equipment and consumables and associated maintenance and replacement procedures 2.2. Identify site access, services and security requirements and any site constraints 2.3. Complete all administrative requirements and obtain appropriate approvals 2.4. Confirm required instrument calibration and data storage, handling and transfer systems 2.5. Field-check site suitability for monitoring activities and define alternative sites as necessary 2.6. Assemble remote-sensing monitoring system and check all components under laboratory conditions
3. Organise and establish the remote-sensing monitoring site	3.1. Identify, and confirm with senior staff, all resources required for operation of monitoring system in the field 3.2. Confirm that all safety, emergency and risk assessment requirements and data quality procedures have been correctly applied to the field activities 3.3. Ensure correct packaging and transportation of equipment and instruments to defined field site 3.4. Establish remote monitoring station 3.5. Test operation of total system under field conditions
4. Operate and maintain monitoring site	4.1. Undertake regular or emergency inspections of the site according to set procedures 4.2. Undertake calibration checks according to written instructions 4.3. Inspect and maintain all instruments, equipment and data systems and organise replacement of defective items 4.4. Perform all field and laboratory activities safely and with minimal impact on the environment 4.5. Document all site visits and associated actions 4.6. Review the total monitoring activity on a regular basis and implement any required modifications or improvements
5. Close down field monitoring activities	5.1. Confirm decision to close down site and finalise all data requirements with supervising staff 5.2. Dismantle monitoring system and arrange checking, packaging and transportation of all equipment and

ELEMENT	PERFORMANCE CRITERIA
	instruments back to base 5.3. Close down site in accordance with enterprise and environmental requirements 5.4. Hand back site and inform all relevant authorities 5.5. Test, decontaminate, if required and store all equipment appropriately 5.6. Document all close-down actions

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- assembling, testing, operating and closing down a field-based, remote-sensing monitoring system under laboratory/field conditions
- automatic and manual sampling and calibration procedures
- communicatingand negotiating effectively and efficiently with staff and other relevant parties
- identifying and interpreting statutory requirements accurately
- confirming type, quantity and quality of data needed for defined monitoring activity
- undertaking reconnaissance and evaluating monitoring sites
- identifying and establishing a secure field monitoring site according to defined criteria
- packaging and transporting supplies, equipment and instruments into the field
- responding effectively to changed or unforeseen circumstances

Required knowledge

Required knowledge includes:

- purpose and objectives of the monitoring, including:
  - information and analysis required
  - end users of information
  - significance of outcomes for broader programs
- terminology relevant to field monitoring activities
- field monitoring aims and objectives

REQUIRED SKILLS AND KNOWLEDGE
• remote-sensing monitoring protocols • statutory requirements regarding monitoring activities • technical capabilities and limitations of remote-sensing equipment and instruments • fundamentals of field-based, remote-sensing monitoring systems • fundamentals of field instrument fault identification and rectification procedures • data storage, analysis and presentation procedures • data quality procedures • field safety requirements and emergency plans • environmental requirements regarding field activities • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can:
	• demonstrate understanding of purpose and objectives of the monitoring, including:
	  • information and analysis required
	  • end users of information
	  • significance of outcomes for broader programs
	• communicate effectively and efficiently with staff and other relevant parties
	• identify and interpret statutory requirements accurately
	• confirm type, quantity and quality of data needed for defined monitoring activity
	• demonstrate ability to assemble test, operate and close down a field-based, remote-sensing monitoring system under laboratory/field conditions
	• undertake reconnaissance and evaluate monitoring sites
	• identify and establish a secure field monitoring site

EVIDENCE GUIDE	
	according to defined criteria • demonstrate ability to appropriately package and transport supplies, equipment and instruments into the field • negotiate with staff and stakeholders and reach satisfactory agreements, where possible • respond effectively to changed or unforeseen circumstances.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL935004A Maintain instruments and equipment*. Resources may include: • vehicles, monitoring and communication equipment, consumables and manuals • work program, enterprise procedures, codes of practice and field protocols.

Method of assessment	The following assessment methods are suggested:
	• review of data and results obtained by the candidate
	• feedback from supervisors and peers
	• observation of work carried out under laboratory conditions with a focus on:
	  • automatic and manual sampling and instrument calibration procedures
	  • assembling, checking and operation remote-sensing monitoring systems
	  • recording, storing, analysing and presenting basic monitoring data
	• observation of work carried out in the field with a focus on:
	  • identification of monitoring site according to defined criteria
	  • identification and recording of required services and security requirements for the site
	  • identification and recording of potential environmental impacts associated with operation of a defined monitoring site
	• simulation exercises with a focus on:
	  • accident and emergency situations
	  • basic environmental impact assessment of a field

EVIDENCE GUIDE	
	site • loss of communication system and implementation of alternative procedures • demonstration of calibration, use, and general maintenance of monitoring equipment • oral and/or written questions to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental** A report by an environmental consultant indicates that a major regional city requires two remote-sensing air quality monitoring stations to adequately meet its air quality monitoring objectives. In conjunction with senior staff, a senior technical officer is instructed to relocate the existing monitoring station in the central business district, as it does not meet the new Australian standard for locationing and siting of such a monitoring station and to develop a new station in an outer suburban area. The two remote-sensing monitoring stations must meet all siting and location standards, operate unsupervised for up to seven days, produce data in a form suitable for direct inclusion into the Territory's State of Environment Report, and meet all statutory and enterprise requirements. The technical officer is required to clearly identify and document the above requirements, negotiate

EVIDENCE GUIDE	
	with all relevant authorities regarding siting, supply of services, access and security, as well as design, assemble and establish the remote-sensing monitoring system. Ongoing operation, maintenance and annual evaluation are also the responsibility of the senior technical officer in conjunction with senior staff.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1678 Emergency procedure guide - Transport
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 4501 Set:2008 Occupational clothing set
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Codes of Practice
	• calibration procedures
	• data quality procedures

RANGE STATEMENT	
	• enterprise sampling and monitoring protocols • equipment manuals and warranties, supplier catalogues and handbooks • equipment operating manuals • field protocols, procedures, note books and log books • general maintenance and repair procedures • government policy (e.g. sustainable development and impact assessment) • incident/accident/injury report forms • instrument fault finding procedures • material safety data sheets (MSDS) • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • remote-sensing monitoring protocols • requirements related to protection of the environment • site-specific requirements • specific environmental standards • standard operating procedures (SOPs) • Therapeutic Goods Regulations 1009
Remote-sensing monitoring activities	Remote-sensing monitoring activities may include: • meteorology (e.g. temperature, humidity and wind) • geology/mining (e.g. movement of structures, vibration and blast shock waves) • hydrology (water flow and water depth in catchment) • environmental (e.g. air quality, water quality and noise) • civil engineering (e.g. temperature, displacement and/or hydrostatic pressure on structures and movement of ions in structures)
Communication and/or consultation strategies	Communication and/or consultation strategies may include:

RANGE STATEMENT	
	• face-to-face • telephone • written documents • meetings
Purpose of field monitoring activities	Purpose of field monitoring activities may include: • single or multiple site monitoring • component of enterprise environmental management plan • remote-sensing monitoring of physical/chemical and mechanical/geotechnical parameters • monitoring of consolidation of soils, foundations • monitoring the durability of structures (e.g. roads) • requirement to comply with statutory requirements • requirement to comply with industry sampling/monitoring protocols/codes of practice
Related plans and procedures	Related plans and procedures may include: • risk assessments • safety and accident/injury plans • emergency plans and procedures, and access to nearest medical services • environmental impact assessment procedures • pollution prevention procedures • first aid and survival procedures
Hazards	Hazards may include: • solar radiation, dust and noise • personnel getting lost • accidents, emergencies and incidents, such as snake, insect or animal bites • exposure to severe weather conditions • manual handling of heavy objects • power tools, generators and moving machinery • vehicle and boat handling in rough/remote conditions
Safety procedures and control	Safety procedures and control measures may

RANGE STATEMENT	
measures	include: • use of personal protective equipment, such as sunscreen, hats, safety glasses, gloves, coveralls and safety boots • 'stay with vehicle' and other survival techniques • regular communication schedule • global positioning system (GPS), maps and aerial photos • handling, storage and disposal of all hazardous materials/waste in accordance with MSDS, labels, enterprise procedures, codes and regulations
Administrative requirements and appropriate approvals	Administrative requirements and appropriate approvals may include: • travel requisitions • authority for use of vehicles and equipment • permits • insurance
Instruments and equipment	Instruments and equipment may include: • navigation and communication equipment (e.g. compass, maps, GPS, two-way radio and mobile phone) • sampling and autosampling equipment for air, water, storm water, waste water and sewage • instruments that measure air pollutants (e.g. oxides of carbon, oxides of sulphur, oxides of nitrogen, hydrocarbons and particulates (PM10, PM2.5 total suspended, ozone)) • instruments that measure water quantity and/or hydrological parameters (e.g. flow, dissolved oxygen, electrical conductivity, pH, turbidity, nitrates, phosphates and temperature) • instruments that measure meteorological parameters (e.g. pressure, minimum and maximum temperature, wet and dry bulb temperatures, humidity, rainfall, and wind speed and direction) • instruments that measure sound pressure levels (e.g. noise or sound pressure meter) • instruments that measure displacement or durability of civil engineering structures,

RANGE STATEMENT	
	consolidation (e.g. load cells, inclinometers, piezometers, strain gauges and accelerometers)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974010A Perform mechanical tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to interpret mechanical test requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine mechanical tests. These tests will involve several measurement steps. The unit includes data processing and interpretation of results and tracking of obvious test malfunctions where the procedure is standardised. However, personnel are not required to analyse data, optimise tests/procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory or technical assistants and instrument operators working in the manufacturing, food and construction materials testing industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Review test request to identify samples to be tested, test method and equipment/instruments involved 1.2. Identify hazards and enterprise control measures associated with the sample, preparation/test methods and/or equipment 1.3. Plan work sequences to optimise throughput of multiple samples, if appropriate
2. Receive samples and prepare test pieces	2.1. Log samples using standard operating procedures (SOPs) 2.2. Record sample description, compare with specification and note and report discrepancies 2.3. Prepare test pieces, and standards if appropriate, in accordance with mechanical testing requirements 2.4. Ensure traceability of samples from receipt to

ELEMENT	PERFORMANCE CRITERIA
	reporting of results
3. Check equipment before use	3.1. Set up equipment/instruments in accordance with test method requirements 3.2. Perform pre-use and safety checks in accordance with relevant enterprise and operating procedures 3.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4. Check equipment calibration using specified procedures, if applicable 3.5. Quarantine out-of-calibration equipment/instruments
4. Test samples to determine mechanical properties	4.1. Operate equipment/instruments in accordance with test method requirements 4.2. Perform tests/procedures on all test pieces and standards, if appropriate in accordance with specified methods 4.3. Shut down equipment/instruments in accordance with operating procedures
5. Process and interpret data	5.1. Record test data noting atypical observations 5.2. Ensure calculated values are consistent with expectations 5.3. Record and report results in accordance with enterprise procedures 5.4. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 5.5. Interpret trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Determine if obvious procedure or equipment problems have led to atypical data or results
6. Maintain a safe work environment	6.1. Use established work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes and environmental impacts 6.3. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 6.4. Care for and store equipment, used test pieces and back-up samples as required
7. Maintain laboratory records	7.1. Enter approved data into laboratory information management system (LIMS)

ELEMENT	PERFORMANCE CRITERIA
	7.2. Maintain confidentiality and security of enterprise information and laboratory data 7.3. Maintain equipment and calibration logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • using instruments for qualitative and/or quantitative analysis • interpreting test methods and procedures • sample preparation procedures • performing calibration checks • metrology techniques underpinning test/procedure including estimating uncertainty • using instruments for qualitative and/or quantitative analysis • maintaining and evaluating reagents • troubleshooting basic equipment/method • preparing calibration graphs and calculating results using appropriate units and precision • applying theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact • tracing and sourcing obvious causes of an artefact • recording and communicating results in accordance with enterprise procedures • maintaining security, integrity, traceability of samples, sub-samples, test data, results and documentation
Required knowledge
Required knowledge includes: • mechanical principles and concepts underpinning the test/procedure • purpose of tests • metrology techniques underpinning test/procedure • principles and concepts related to equipment/instrument operation and testing • function of key components of the equipment/instrument • effects on test of modifying equipment/instrument variables

REQUIRED SKILLS AND KNOWLEDGE
• sample preparation procedures • basic equipment/method troubleshooting procedures • calibration procedures • calculation steps to give results in appropriate units and precision • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret test methods/procedures accurately • prepare and test samples in accordance with specified methods • perform calibration checks (if required) • safely operate test equipment/instruments to enterprise standards and/or manufacturer's specifications • apply basic knowledge of physical properties of materials to interpret gross features of data and make relevant conclusions • identify atypical results, such as out of normal range or an artefact • trace and source obvious causes of an artefact • communicate problems to a supervisor or outside service technician • record and communicate results in accordance with enterprise procedures • maintain security, integrity and traceability of samples, sub-samples, test data/results and documentation.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment.

EVIDENCE GUIDE	
	This unit of competency may be assessed with: • *MSL924001A Process and interpret data*. Resources may include: • standard laboratory equipped with appropriate test equipment/instruments, standards and materials • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over a period of time to check accuracy, consistency and timeliness of results • review of test records and workplace documentation completed by the candidate • observation of candidate conducting a range of mechanical tests and sample preparation procedures • feedback from peers and supervisors • oral or written questioning of mechanical principles and concepts, test methods and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials** A technical assistant is responsible for compressive strength testing of concrete cylinders. Typically, there are 20 to 30 to be tested each day. On arrival in the morning

EVIDENCE GUIDE	
	the assistant records the maximum and minimum temperatures of the curing tanks, locates the particular cylinders to be tested and removes them from the tanks. She/he dries each cylinder, weighs it and measures its diameter and length using a comparator gauge. The ends are checked for excessive roughness and non-parallelism. She/he then starts the compression test machine and checks that the load pacer is set to the correct loading rate. She/he places a rubber cap on the finished end of each cylinder in turn and places it centrally on the platen of the load frame. The assistant closes the protective screen, applies load at the specified rate until failure occurs, and records the maximum load. After the cylinder has failed, the assistant removes it from the platen and checks for invalid failure modes. When this occurs (e.g. a shear failure) she/he puts the cylinder aside for further investigation. Any debris is removed from the platen and the next cylinder is tested. When all cylinders have been tested, the assistant cleans away any material left on the compression machine and switches it off. She/he enters all the data in into the laboratory information management system (LIMS) which calculates the unit mass and ultimate compressive strength of each cylinder. Finally, the assistant reviews the data for unusual or unexpected results that may indicate an error. **Manufacturing** A technician is asked to test a new polymeric material that is to be used to manufacture children's toys. The technician makes several representative test pieces and measures the elastic properties of the polymer as well as the durability of the polymer to flex many times without cracking. Because the polymer is to be used in a toy, the technician also dispatches samples of the polymer for chemical testing by a consulting laboratory to determine whether any toxic monomer could leach out if a child sucked the toy.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different

RANGE STATEMENT	
work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1012 Methods of testing concrete
	  • AS 1289 Methods for testing soils for engineering purposes
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • ISO 5269 Pulps - Preparation of laboratory sheets for physical testing
	  • ISO 9142:2003 Adhesives - Guide to the selection of standard laboratory ageing conditions for testing bonded joints
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• calibration and maintenance schedules
	• data quality procedures
	• enterprise recording and reporting procedures
	• equipment startup, operation and shutdown procedures
	• material safety data sheets (MSDS)
	• material, production and product specifications
	• national measurement regulations and guidelines
	• principles of good laboratory practice (GLP)

RANGE STATEMENT	
	• production and laboratory schedules • quality manuals, equipment and procedures manuals • SOPs
Mechanical principles and concepts underpinning the test/procedure	Mechanical principles and concepts underpinning the test/procedure may include: • matter, interatomic and intermolecular forces and states of matter • mass, weight, forces, pressure and energy • cohesive/adhesive forces, friction and slip resistance • elasticity, hardness, ductility, malleability, strength of materials, elastic limit, elastic moduli and ultimate stress • electrical concepts, including electric field, voltage, current, resistance and AC/DC • elasticity, hardness, strength of materials, plasticity, permeability and dispersion
Preparation of samples and test pieces	Preparation of samples and test pieces may include processes such as: • cutting • trimming • machining • etching
Mechanical tests and procedures	Mechanical tests and procedures may include: • adhesive strength • elastic properties and strength of materials • slip resistance and friction • viscosity and torque • creep and endurance • abrasion, hardness, impact, indent and penetration resistance • pressure and/or vacuum testing using manometers and load cells
Tests	Tests may include methods for: • control of starting materials, in-process materials and finished products • investigation of sources of construction materials

RANGE STATEMENT	
	• basic troubleshooting of enterprise processes
Hazards	Hazards may include: • microbiological organisms and agents associated with soil • chemicals, such as acids and solvents • sharps and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam and industrial gases • sources of ignition • disturbance or interruption of services • crushing, entanglement and cuts associated with moving machinery or falling objects
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples and hazardous materials • handling and storage for hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as hard hats, hearing protection, gloves, safety glasses, coveralls and safety boots • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Records	Records may include: • test and calibration results • equipment use, maintenance and servicing

RANGE STATEMENT	
	history • faulty or unsafe equipment
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974011A Prepare tissue and cell cultures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare primary tissue cultures for applications, such as maintenance of animal cell lines and propagation of plants by tissue culture and basic subculture procedures. Personnel are required to manipulate equipment and materials and samples to prevent contamination at all preparation stages. They will have ready access to enterprise procedures and will work under direct supervision.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants working in laboratories in the biomedical, environmental, biotechnology and education industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Work safely according to the legal and regulatory framework	1.1. Ensure work practices and personal actions conform to regulations, codes, guidelines and enterprise quality assurance procedures 1.2. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and equipment 1.3. Select, fit and use personal protective clothing and safety equipment 1.4. Address hazards and incidents as they arise 1.5. Maintain a chain of custody, traceable to the worker, for all cells and tissues
2. Prepare and test cell and tissue culture media	2.1. Select and confirm media specifications and processes/methods

ELEMENT	PERFORMANCE CRITERIA
	2.2. Prepare culture media to suit the application 2.3. Sterilise culture media and check for sterility 2.4. Perform quality control checks to ensure that culture media is fit for purpose 2.5. Store culture media in accordance with specifications
3. Prepare tissue or cell cultures	3.1. Select tissue/cell sample to optimise growth and prepare it for culture 3.2. Add specified growth agents and/or nutrients 3.3. Inoculate culture medium using aseptic techniques
4. Monitor tissue or cell culture	4.1. Incubate culture in specified conditions 4.2. Monitor growth of culture and record appearance and characteristics 4.3. Report presence or absence of contamination 4.4. Subculture the culture to continue the cell line 4.5. Dispose of biohazardous and other laboratory waste safely
5. Maintain records	5.1. Maintain records of batches of media and test data 5.2. Ensure records of tissue cultures are retrievable, legible and accurate 5.3. Ensure records conform to information management, records, quality system and legal requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • working safely • satisfying all legal and regulatory requirements, including the use and care of biohazard cabinets • preparing, diluting and sterilising reagents and culture media that are fit for purpose • growing cell lines and tissue to specifications without contaminating the original sample and the environment

REQUIRED SKILLS AND KNOWLEDGE
• identifying expected cell types and recognising normal and abnormal cells using an inverted microscope • counting cells (total and viable) • monitoring cell growth and recognising problems such as contamination • maintaining chain of custody, traceable to the worker, of all cell lines, tissues, logs of work completed and procedures/methods used
Required knowledge
Required knowledge includes: • basic structure and function of cells and organelles • basic classes and classification of culturable material, such as organisms, plants, animals, bacteria, viruses, tissues, cells and prions • cell physiology and processes, such as simple and facilitated diffusion, plasmolysis, osmosis, tonicity, active transport, energy production, mitosis, motility, phagocytosis and pinocystosis • concepts and principles of cell growth, such as need for nutrients, role of growth regulators and removal of wastes • types and sources of contamination • purposes and mechanisms of staining • importance of strict aseptic techniques and cleaning procedures • hazards and risks in biological laboratories • relevant health, safety and environment requirements • enterprise and/or legal traceability requirements • relevant quality control checks and quality assurance procedures

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • work safely and satisfy all legal and regulatory requirements, including the use and care of biohazard cabinets • prepare, dilute and sterilise reagents and culture

EVIDENCE GUIDE	
	media that are fit for purpose • grow cell lines and tissue to specifications without contaminating the original sample and the environment • identify expected cell types and recognise normal and abnormal cells using an inverted microscope • count cells (total and viable) • monitor cell growth and recognises problems, such as contamination • maintain chain of custody, traceable to the worker, of all cell lines, tissues, logs of work completed and procedures/methods used.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL933001A Maintain the laboratory/field workplace fit for purpose* • *MSL973003A Prepare culture media* • *MSL973007A Perform microscopic examination*. Resources may include: • laboratory equipped with appropriate equipment, samples, cell lines and reagents • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • examination of tissue and cell cultures prepared by the candidate • observation of the candidate preparing a range of tissue and cell cultures • review of work records and results obtained by candidate • feedback from supervisors and peers on adherence to enterprise/technical procedures • questioning to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and

EVIDENCE GUIDE	
	disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biotechnology** A laboratory assistant maintains a leucocyte cell line which is used to routinely produce monoclonal antibodies which have been ordered by researchers. The assistant's job is to ensure that the cell line's growth is optimised to ensure a regular supply of high quality product. Every day, she/he checks for growth and contamination by aseptically removing a sample for microscopic examination. She/he also checks the colour of the pH indicator in the media and records cell line characteristics, such as its appearance, number of cells and any evidence of contamination in her/his laboratory notebook. She/he also checks the incubator temperature and atmosphere together with the labelling and possible leakage of flasks. **Education** A laboratory assistant at a regional university is instructed to prepare 95 flasks of Vero (African green monkey kidney) cells for a practical class in three weeks time. She/he routinely passages the cells once per week and usually splits the flasks into six. She/he has three flasks routinely subcultured from last week and calculates that these can be subcultured to produce the required number of flasks while holding back some flasks from each subculture as a back up in case of contamination and for routine passaging after the practical class. She/he prepares the 95 flasks in the third week and checks them for obvious bacterial or fungal contamination and for Mycoplasma contamination. She/he labels all the flasks with the required information, records all the steps in the laboratory cell culture log and puts the flasks out in the teaching laboratory just prior to

EVIDENCE GUIDE	
	the class.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1678 Emergency procedure guide -Transport
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4187:2003 Cleaning, disinfecting and sterilizing reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • HB 9-1994 Occupational personal protection

RANGE STATEMENT	
	• Australian code of good manufacturing practice for medicinal products (GMP) • Australian Dangerous Goods Code • client and product specifications • enterprise procedures, standard operating procedures (SOPs) and quality assurance procedures • gene technology regulations • Guide to physical containment levels and facility types • manufacturer's instructions or verbal direction from laboratory manager, supervisor or senior technician • material safety data sheets (MSDS) • National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)] • occupational health and safety (OHS) national standards and codes of practice • operation and maintenance manuals for automated media preparation equipment • principles of good laboratory practice (GLP) • production schedules and instructions • Therapeutic Goods Regulations 1009 • verified test methods
Applications of plant tissue/cell culture	Applications of plant tissue/cell culture may include: • mass propagation of commercial species • production of disease free plants by meristem tip culture • conservation of rare plants • haploid plant production by anther/pollen culture • 'sports' produced by somaclonal variation • development of resistant plants by directed cell selection • protoplast fusion to produce novel plant hybrids
Applications of animal tissue/cell culture	Applications of animal tissue/cell culture may include: • establishment and maintenance of animal cell lines, such as liver, epidermal and fibroblastic

RANGE STATEMENT	
	• maintenance of continuous cell lines • preparation of cell cultures for commercial sale • growth and enumeration of viruses • extraction of DNA • extraction of antigens for use in diagnostic tests • research of cell structure and function, cancer and tumour biology • immunofluorescent techniques • testing of media efficacy • production of monoclonal antibodies • production of genetically modified cell cultures • secondary metabolite production
Hazards	Hazards may include: • biohazards, such as infectious agents and oncogenic DNA • chemical and radiation hazards • allergenic factors • cryogenic liquids, such as nitrogen • heat from burners and molten agar • ultraviolet (UV) light • sharps, broken glassware • contaminated clothing
Hazard control measures and safety procedures	Hazard control measures and safety procedures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses,

RANGE STATEMENT	
	coveralls and gowns • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Tissue culture equipment and facilities	Tissue culture equipment and facilities may include: • growth cabinets • culture vessels, growth chambers, sterile containers, culture plates, flasks and bottles • autoclaves • positive filtration apparatus • auto pipettes and pipette pumps • cell counting chambers and haemocytometer • incubators, including specialised atmosphere carbon dioxide • light and binocular inverted microscopes • centrifuges
Pre-use checks	Pre-use checks include: • performing routine maintenance • checks on raw materials and consumables, including use by date, possible contamination and storage conditions
Sterilisation and disposal of biohazardous wastes	Sterilisation and disposal of biohazardous wastes may include: • steam and high pressure air or steam • boiling, microwaving and autoclaving • filtration • gas, chemical and radiation
Plant tissues and cells	Plant tissues and cells may include: • plant tissue, such as petioles, leaves, stems and

RANGE STATEMENT	
	petals • meristem tissue • special tissue, such as fern stolon, seed embryos and somatic embryoids • tissue for callus development to initiate cell suspension cultures
Animal tissues and cells	Animal tissues and cells may include: • primary cells from animal tissue, such as heart, liver, kidney and epidermal • secondary cells, such as epithelial, endothelial and fibroblast • continuous cell lines, such as tumour lines, hybidomers and transformed lines (Epstein-Barr virus)
Preparing a primary culture	Preparing a primary culture may involve: • thawing of cryopreserved cells and monitoring of cell recovery • enzymatic disaggregation from tissue • mechanical disaggregation from tissue • primary explant technique • pre-treatment • disinfestation of explants using hypochlorite and water
Suitable culture conditions	Suitable culture conditions may include: • specified temperature and light intensity • appropriate atmosphere, such as carbon dioxide • shaking of cell suspensions or roller bottles • conditions for establishment, multiplication or planting out • special conditions for protoplast culture
Monitoring growth of tissue and cell lines	Monitoring growth of tissue and cell lines may include: • identification of normal and abnormal cells viewed by an inverted stereo microscope • recognition of contamination, such as bacteria (e.g. Mycoplasma), fungi and other plant or animal tissue in the media • checking growth rates

RANGE STATEMENT	
	• performing viable cell counts
Subculture	Subculture may include: • treatment of callus to multiply or regenerate shoots • treatment to encourage adventitious bud • treatment to encourage rooting • subculture of embryoids • cell suspensions • preparation of protoplasts
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL974012A Perform tests to determine the properties of construction materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to conduct multi-stage tests to determine the properties of raw and/or manufactured construction materials. These test results are typically used by clients to prove raw material deposits, tender for supply of construction materials, classify soils, determine the suitability of construction materials for specialised uses and inform the design of civil engineering works. The unit includes data processing and interpretation of results to identify obvious errors or unexpected results and take corrective action. However, personnel are not required to analyse data, optimise test methods or enterprise procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the geotechnical and construction material testing industry sectors who conduct tests in consulting laboratories or laboratories at extractive, manufacturing or construction sites using established test methods. These tests (such as load bearing ability, creep, shrinkage, durability, plasticity, permeability, chloride diffusion and reactivity) are used to determine the properties of aggregates, concrete, soils, road pavement or other specialised construction materials and products. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in

	practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973001A	*Perform basic tests*
	OR	
	MSL973010A	*Conduct laboratory-based acceptance tests for construction materials*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Access relevant job instructions from laboratory information management system (LIMS) 1.2. Interpret test request to confirm samples to be tested, the

ELEMENT	PERFORMANCE CRITERIA
	test method and equipment involved 1.3. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and/or equipment 1.4. Assemble all required equipment and materials 1.5. Plan work sequences for optimum efficiency and/or throughput of multiple samples
2. Prepare samples or test pieces	2.1. Retrieve samples and/or test pieces from storage and record their general appearance 2.2. Check the accuracy and completeness of accompanying labels and documentation to ensure traceability 2.3. Check that the storage/curing conditions of samples and/or test pieces were appropriate 2.4. Compare samples and/or test pieces with test specifications, record observations and report discrepancies 2.5. Prepare samples and/or test pieces in accordance with appropriate test method 2.6. Conduct preliminary measurements to establish initial dimensions and test conditions as necessary
3. Check test equipment before use	3.1. Set up test equipment/instruments in accordance with test method 3.2. Perform pre-use and safety checks in accordance with enterprise procedures 3.3. Identify faulty or unsafe equipment/instruments and report to appropriate personnel 3.4. Check calibration status of instruments and report any out of calibration items to appropriate personnel
4. Conduct test to determine sample properties	4.1. Perform each treatment/measurement stage of the test method precisely and in the correct sequence 4.2. Record all data, observations and any factors that may impact on the quality of results 4.3. Recognise obvious errors or atypical data and take appropriate corrective actions 4.4. Seek advice to deal with any situation beyond own technical competence 4.5. Shut down test equipment/instruments in accordance with enterprise procedures
5. Process and interpret data	5.1. Check data for accuracy and completeness 5.2. Perform required calculations and ensure results are

ELEMENT	PERFORMANCE CRITERIA
	consistent with expected values for the sample type 5.3. Record and report results with the appropriate accuracy, precision and units 5.4. Interpret trends in data and/or results and report out of specification or unexpected results promptly to appropriate personnel 5.5. Determine if obvious procedure or equipment problems have led to unexpected data or results
6. Maintain laboratory records	6.1. Enter approved data and test results into LIMS 6.2. Maintain confidentiality and security of enterprise information and test results 6.3. Maintain technical/administrative records and test reports in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Use safe work procedures and protective equipment to ensure personal safety and that of others 7.2. Minimise generation of wastes and environmental impacts of testing 7.3. Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and enterprise procedures 7.4. Care for and store equipment, used test pieces and back-up samples in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting client's test requests, test methods and procedures accurately
- planning work sequences involving multiple/parallel tasks
- interpreting safety information, such as material safety data sheets (MSDS), and working safely
- checking and using test equipment in accordance with enterprise procedures
- maintaining concentration and applying multi-stage test methods accurately
- estimating/calculating scientific quantities (e.g. stress, strain and stiffness)
- interpreting gross features of data and graphs (e.g. Mohr circles) and making

REQUIRED SKILLS AND KNOWLEDGE
logical conclusions • identifying atypical data, errors and unexpected results and tracing any obvious causes • recording and presenting results accurately and legibly • maintaining security, integrity and traceability of all samples/testpieces, data/results and technical records • cleaning and maintaining equipment • seeking advice from a supervisor • communicating with clients or outside service technician • demonstrating a professional approach and positive company/organisation image
Required knowledge

Required knowledge includes:
• relationship between properties and uses of construction materials
• construction materials test methods routinely used in job role including:
  • purpose and principles of test
  • relationship between the properties and uses of construction materials
  • sample preparation procedures
  • key treatment/measurement stages
  • calculation steps to give results in appropriate units and precision
  • expected values for sample type
  • sources of uncertainty and methods for their control
• principles and concepts underpinning the test method such as:
  • mass, weight, forces, pressure, energy, density, friction and slip resistance
  • elasticity, hardness, strength of materials, plasticity, permeability and dispersion
  • electrical safety concepts including voltage, current, resistance, conductors/insulators andAC/DC
  • chemical ions, pH and solubility
• principles and concepts related to equipment/instrument operation and testing including the function of key components of the equipment/instrument and effects on test of modifying equipment/instrument variables
• pre-use checks and operating procedures for test equipment/instruments routinely used in job role
• basic equipment/method troubleshooting procedures
• procedures for ensuring traceability of samples, test pieces, test data and results
• procedures for recording and reporting test results, calculations, test observations and unexpected or atypical results and equipment problems
• health, site safety and environmental management requirements relevant to job role
• confidentiality requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • plan efficient work sequences • prepare a range of laboratory samples or test pieces and conduct tests to determine their properties safely and accurately and within required timeframe • interpret trends in data and results to identify obvious errors or unexpected results and take corrective action.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with other relevant units of competency such as: • *MSL924001A Process and interpret data* • *MSL943002A Participate in laboratory/field workplace safety* • *MSL953001A Receive and prepare samples for testing*. Resources may include: • data sets and records • test methods and description of test setup • computer and relevant software or laboratory information system • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • review of test data, results and records generated by the candidate • feedback from supervisors and clients regarding the candidate's ability to conduct a range of multi-stage tests to determine the properties of samples

EVIDENCE GUIDE	
	reliably, safely and efficiently • questions to assess understanding of enterprise procedures and multi-stage test methodsrelevant to their job role (including key treatment and measurement steps, expected values, sources of uncertainty and corrective actions). In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing** A materials technician employed at a consulting laboratory reviews the ten job sheetsassigned to him/her at the start of the day. The first client is a road construction company and requires a soaked California Bearing Ratio (CBR) test on a sandy gravel sample (@98% density ratio using modified compactive effort and 105%OMC). The technician locates and reads through the appropriate test methods (AS 1289.6.1.1 and AS1289.5.2.1) and assembles the necessary equipment.He/she uses a 19mm sieve to obtain suitable material for the test and prepares representative sub-samples to determine the dry density and optimum moisture content and CBR. To determine theCBR, he/she adds the required amount of water to the test portion to achieve the required laboratory density ratio and sets it aside to cure for the recommended time. Using the modified

EVIDENCE GUIDE	
	compactive effort procedure, he/she fills the mould in five layers taking care that each layer thickness meets specification. He/she then positions the required surcharges on top of the specimen and places it in a water bath to soak for four days. After retrieving the specimen, the technician checks the swell and performs the penetration test before the specimen dries out.After positioning the specimen, zeroing the measuring instruments, he/she applies the load with a constant penetration of 1+/- 0.2mm/min and records the load (kN) at penetrations of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 7.5, 10.0 and 12.5mm. Afterwards,the technician removes the sample carefully and determines the moisture content for both the top 30mm layer and the rest of the specimen. He/she plots the load vs penetration data and applies corrections at 2.5mm and 5.0mm to compensate for its initial upward concave shape. He/she reads off force values of 9.2kN (at 2.5 mm) and 13.9kN (at 5.0mm) respectively and calculates CBR values of 69.7% and 70.2%. After checking all measurements, data plots and calculated values the technician decides that the results are consistent with expected values. He/she reports each of the required results to the precision specified in the test method (e.g. CBR=70% @ 2.5 and 5.0mm penetration) and other test details such as the surcharges used and the period of soaking. After completing the test report, he/she forwards it to the laboratory manager for review prior to its release to the client. **Construction materials testing** A laboratory receives a job request from a building developer to determine the shrink/swell index for soil samples collected from a proposed housing estate. A technician logs the job and locates the appropriate test method (AS 1289.7.1.1). Given the commercial importance of establishing whether or not there are any significant cut/fill variations across the development site, he/she reviews the method carefully. The technician notes that they need to be careful when removing the sample from the U50 tube to preserve its undisturbed state and to also check for stones and inert materials. He/she works through the steps required for separately conditioning and measuring the two specimens required for determining the index and notes that if the shrink specimen cracks while drying to

EVIDENCE GUIDE	
	constant length, the results will be invalid. After assembling and checking the required equipment, he/she performs the test successfully.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS 1012 Methods of testing concrete
	  • AS 1289 Methods for testing soils for engineering purposes
	  • AS 2981 Methods of sampling and testing asphalt
	  • AS 1141 Series - Methods for sampling and testing aggregates
	• AustRoads test methods
	• conservation requirements
	• enterprise quality manual, customer quality plan
	• equipment manuals and warranties, supplier catalogues and handbooks
	• MSDS

RANGE STATEMENT	
	• National Association of Testing Authorities (NATA) documents regarding construction materials testing • sampling and test methods, enterprise or standard operating procedures (SOPs) • site safety plans • State/Territory Road Authority test methods
Hazards	Hazards may include: • electric shock • light, dust, noise and heat • biohazards, such as microbiological organisms and agents associated with soil • chemicals such as acids, alkalis and hydrocarbons • flammable liquids and gases • burns from hot bitumen, hot plates, hot moulds or ovens • inhalation or burns from sulphur during preparation of concrete samples • fluids under pressure • hand tools • occupational overuse syndrome, slips, trips and falls • manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery
Enterprise safe work procedures	Enterprise safe work procedures may include: • use of MSDS • barriers recognising and observing hazard warnings and safety signs/barriers • labelling of samples, reagents and hazardous materials • cleaning and decontaminating equipment and work areas regularly using recommended procedures • handling and storing hazardous material and equipment in accordance with labels, manufacturer's instructions, enterprise procedures and regulations • following established manual handling

RANGE STATEMENT	
	procedures for tasks involving manual handling • use of personal protective equipment, such as hard hats, hearing protection, gloves, goggles, safety glasses, coveralls, respirators and safety boots

Tests	Tests may include:
	• testing of concrete:
	  • drying shrinkage
	  • chlorides and sulphates
	  • chloride ion penetration
	  • stiffness
	• testing of cement:
	  • air permeability
	  • setting times
	  • normal consistency
	• testing of soils:
	  • moisture-density relationships
	  • California Bearing Ratio (CBR) (1 point)
	  • unconfined compressive strength
	  • quick tri-axial stress (total stress parameters)
	  • permeability (e.g. drainage material)
	  • hydrometer analysis
	  • shrink/swell tests (site classification)
	• testing of asphalt:
	  • Marshall stability/flow
	  • skid tests
	• testing of bitumen seals:
	  • viscosity
	  • penetration
	  • softening point
	  • flash point
	• testing of aggregates:
	  • 10% fines, wet-dry strength variation
	  • <2 micron test
	  • sodium sulphate soundness
	  • Los Angeles Abrasion

RANGE STATEMENT	
	• Washington degradation • polished aggregate friction value
Samples and test pieces	Samples and test pieces may include: • samples of aggregates, soil, rock, concrete, road pavement and binders • disturbed and undisturbed samples
Test and sample preparation equipment/materials	Test and sample preparation equipment/materials may include: • crushers, mulchers, grinders, mills, riffles and sieves • moulds, bags and containers • ovens, microwaves and water baths • mass balances • microscopes • dimension apparatus (e.g. calipers and micrometer) • rammers, compression rigs and load cells • chemical reagents and volumetric glassware • temperature measuring devices, such as thermometers and thermocouples • pH and conductivity meters • analogue and digital meters, charts/recorders, data loggers and computers
Appropriate corrective actions	Appropriate corrective actions may include: • accuracy check of data entry and transcription • logical check of equipment setup • check of calibration, zero error and drift for basic instruments • careful re-reading of procedures • repeat test measurements • seek advice
Technical/administrative records	Technical/administrative records may include: • test and calibration results • equipment use, maintenance and servicing history • faulty, unsafe or quarantined equipment
Minimising environmental impacts	Minimising environmental impacts may include: • collection of surplus or spent samples and test

RANGE STATEMENT	
	pieces for disposal • recycling of non-hazardous waste, such as chemicals, batteries, plastic, metals and glass • appropriate disposal of all waste • correct storage and handling of hazardous chemicals and samples
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units	

Co-requisite units		

MSL974013A Monitor performance of structures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to monitor civil engineering structures (such as roads, dams, embankments, open cut faces, bridges, tunnels, towers and other concrete/steel erections) to measure their performance, confirm design parameters or measure the effects of improvements or rehabilitation. The unit involves confirming the requirements of the monitoring activities, liaising with site personnel, performing monitoring activities, setting up monitoring equipment, collecting reliable data and reporting results. Personnel are also expected to interpret results in the field, recognise/rectify obvious errors or unexpected results and troubleshoot common problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the geotechnical, construction material testing, civil engineering and mining industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973009A	*Conduct field-based acceptance tests for construction materials*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Confirm requirements for monitoring activities with supervising staff	1.1. Review job request to confirm the purpose and objectives of monitoring activities 1.2. Review emergency plans, risk assessments, safe work procedures, environmental requirements associated with the monitoring activities and site requirements 1.3. Review any available data from previous monitoring at the site to identify expected values and any trends in results 1.4. Liaise with client to arrange site access, confirm timing and clarify the need for permits, induction training or any other special requirements

ELEMENT	PERFORMANCE CRITERIA
	1.5. Confirm details of monitoring instruments to be used, parameters to be measured and the data formats required by users
2. Prepare for monitoring activities	2.1. Complete all administrative requirements and obtain appropriate approvals/permits 2.2. Arrange appropriate transport to and from site and accommodation as necessary 2.3. Assemble all required instruments, equipment and supplies and check that they are fit for purpose 2.4. Stow monitoring instruments, equipment and supplies to ensure their safe transport 2.5. Liaise with appropriate personnel on arrival at site to ensure safety and minimise disruption to other workers during monitoring 2.6. Complete site induction as necessary
3. Collect and verify monitoring data	3.1. Use barriers and signage to control access to work area in accordance with enterprise safety procedures 3.2. Perform pre-use checks of instruments and trial measurements to ensure they are operating within specifications 3.3. Identify location for monitoring in accordance with work instructions and/or test method 3.4. Operate instruments safely and in accordance with work instructions, test method, and/or manufacturer's specifications 3.5. Take sufficient measurements to ensure that data meets quality requirements 3.6. Recognise obvious errors or atypical data and take appropriate corrective actions 3.7. Recognise and record/photograph details of site conditions that may impact on data quality 3.8. Seek advice to deal with any situation beyond own technical competence
4. Finalise monitoring activities	4.1. Remove signage and barriers and reinstate all disturbed surfaces in accordance with enterprise procedures 4.2. Ensure all data are stored safely before shutdown of instrument/equipment 4.3. Clean all instruments and equipment (and vehicle as necessary) to avoid environmental damage including stormwater run-off and/or transfer of pests

ELEMENT	PERFORMANCE CRITERIA
	4.4. Check that all instruments, equipment and supplies are present and undamaged before re-stowing them for safe transport 4.5. Notify appropriate site personnel on completion of monitoring activities and prior to leaving site 4.6. On return to base, check serviceability of instruments and equipment before storage 4.7. Download data into laboratory/enterprise information management system in accordance with enterprise procedures 4.8. Complete site safety plans, instrument/equipment logs and test reports in accordance with enterprise procedures 4.9. Notify supervising staff upon completion of activities 4.10. Report any significant issues arising from monitoring activities to appropriate personnel
5. Maintain a safe work environment	5.1. Use safe work procedures and personal protective equipment to ensure personal safety and that of others 5.2. Minimise environmental impacts of monitoring activities and generation of waste 5.3. Collect and/or dispose of all waste in accordance with environmental/quarantine requirements and enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • identifying resource requirements for field monitoring activities • liaising with clients and site personnel about monitoring activities • interpreting safety information (e.g. site safety plans) and working safely • applying work instructions, test methods and enterprise procedures with close attention to detail • checking and using monitoring instruments and equipment in accordance with test

REQUIRED SKILLS AND KNOWLEDGE
methods and/or enterprise procedures • cleaning and troubleshooting/maintaining instruments and equipment in the field • operating communication systems • estimating/calculating simple scientific quantities (e.g. stress, strain and pressure) • recording and presenting results accurately and legibly • using laboratory software (e.g. spreadsheets, file management and data logger control) • maintaining security, integrity and traceability of all samples, data/results and documentation • demonstrating a professional approach and positive company/organisation image
Required knowledge

Required knowledge includes:
• monitoring activities routinely performed in job role, including:
  • purpose and principles of monitoring
  • properties of materials and/or structures being monitored
  • key steps in setup, operation and shutdown of monitoring instruments
  • calculation steps to give results in appropriate units and precision
  • expected measurement values for materials or structures
• monitoring instruments and equipment routinely used in job role, including the function of key components, effects of varying key controls, connections, data acquisition fundamentals and common problems
• basic instrument fault identification and rectification procedures pre-use checks and operating procedures for monitoring instruments and equipment routinely used in job role
• expected values and sources of uncertainty (and methods for control) in monitoring activities routinely performed in job role
• procedures for verifying and recording data, reporting results, calculations, site observations and unexpected or atypical results, and equipment problems
• procedures for ensuring traceability of data and results
• health, site safety and environmental management requirements relevant to job role
• confidentiality requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • liaise effectively with site personnel to arrange for monitoring to be performed safely and efficiently • set up, operate and troubleshoot monitoring equipment in the field • conduct monitoring activities safely and produce reliable data within the required timeframe • work semi-autonomously.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with other relevant units of competency such as: • *MSL924001A Process and interpret data* • *MSL924002A Use laboratory application software* • *MSL943002A Participate in laboratory/field workplace safety*. Resources may include: • data sets and records • test methods and description of monitoring activities • monitoring instruments and equipment • data logger, computer and relevant software or laboratory information system • relevant enterprise procedures.
Method of assessment	The following assessment methods are suggested: • review of monitoringdata, results and records generated by the candidate • feedback from supervisors and clients regarding the candidate's ability to work independently and conduct a range of monitoring activities reliably, safely and efficiently • questions to assess understanding of enterprise procedures, monitoring activitiesand test methods relevant to their job role. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess

EVIDENCE GUIDE	
	directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing (1)** A contracting engineer has requested daily monitoring of a large cutting on a major new highway for at least several months. The new cutting has exposed a major geological fault that may result in significant slippage or total failure of the slope. A technician is assigned the task of monitoring the site which is approximately 10 km from the laboratory. He/she confirms the site location, specified monitoring points and the data required by the engineer. He/she then contacts the site manager to arrange access and schedule the monitoring times. The technician confirms that he/she has a currentfirst aid certificate and has previously completed the construction company's site induction program. Because there is only 4WD access to the cutting, the technician arranges to use an appropriate vehicle. On arrival at the site, the technician meets key company staff. He/she locates the boreholes and identifies each monitoring point on the site plan. He/she then assembles the laboratory's inclinometer taking care to check the torpedo probe, data logger, graduated support cable, electrical cables and connectors. He/she carefully checks the first borehole and uses a dummy probe to clean the keyways and ensure that it is free of obstructions. He/she records a trial set of orthogonal readings @ 0.5 m intervals over the 10 m depth. The technician then obtains a complete set of baseline data being careful to conduct repeat measurements and record each depth precisely so that subsequent measurements can be recorded at the same point and small changes in inclination can be detected. On

EVIDENCE GUIDE	
	return to base, he/she verifies the data and discusses the results with the laboratory manager before issuing them to the client. He/she then documents the site details and work instructions for the team to ensure rapid turnaround of data for the client. **Construction materials testing (2)** Two technicians have been assigned the task of surveying the condition of a stretch of highway to determine the extent of deterioration and whether it needs to be re-sealed. They locate the test method (Q702) and conduct a routine pre-use check of the laboratory's dedicated vehicle and confirm that all monitoring systems are functioning correctly. They examine the previous road roughness data and schedule the test for 8 pm in order to minimise interferences. On reaching the site, they drive the specified route to check for hazards such as cross roads, wildlife and other traffic. After commencing the test, the driver maintains constant speed while the operator records 'chainage' data and key road features on a laptop computer to reference the data set. After one pass, the technician reviews the data file to identify problem spikes, gaps or anomalies in the data. Then they perform repeat runs for both lanes in both directions, being careful to use the same wheel path in each case. On return to base, they download the data files, run data quality checks and use laboratory software to smooth the data. They then store the data files in accordance with enterprise procedures and complete the test report.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards,

RANGE STATEMENT	
	it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• AustRoads test methods
	• enterprise quality manual, customer quality plan
	• enterprise recording and reporting procedures
	• enterprise sampling procedures for specific samples, sites and clients
	• environmental legislation and regulations
	• equipment manuals and warranty, supplier catalogues and handbooks
	• equipment startup, operation and shutdown procedures
	• industry codes of practice
	• maps and site plans
	• material safety data sheets (MSDS)
	• material, production and product specifications
	• National Association of Testing Authorities (NATA) documents regarding construction materials testing (Field application document)
	• national measurement regulations and guidelines
	• occupational health and safety (OHS) national standards and codes of practice
	• quality manuals
	• sampling and test procedures, enterprise or standard operating procedures (SOPs)
	• site safety plans
	• State/Territory Road Authority test methods
	• test methods

Hazards	Hazards may include:

RANGE STATEMENT	
	• dust and noise • extreme weather (e.g. sunlight, wind, hail, rain and heat) • manual/handling of heavy equipment or materials • crushing, entanglement and cuts associated with moving machinery • vehicular traffic on roads and sites • injuries caused by falling objects and working conditions such as uneven surfaces, heights, slopes, wet surfaces, trenches and confined spaces • nuclear density/moisture gauges and industrial X-ray equipment • driving vehicles over long distances, in rural or remote areas and over difficult terrain • fatigue
Enterprise safe work procedures	Enterprise safe work procedures may include: • use of site safety plans and MSDS • use of personal protective equipment, such as hard hats, sunscreen lotion, hearing protection, gloves, goggles, coveralls, respirators and safety boots • handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations • regular cleaning and/or decontaminating of equipment • signage, barriers, traffic control and flashing lights
Monitoring activities	Monitoring activities may include measuring: • displacement and vibration • pressure and force • temperature • setting time • strain • cracking (visual assessment of road condition) • defect mapping • moisture • water levels

RANGE STATEMENT	
	• movement of chemical ions through structures
Monitoring instruments and equipment	Monitoring instruments and equipment may include: • transducers, such as accelerometers, load cells, pieziometers, strain gauges and thermocouples • signal conditioning and data storage devices such as amplifiers, data loggers and portable computers • global position system (GPS) • digital camera • survey equipment, steel ruler/tape and verniers • signage, warning lights and boundary tape/cones • worksheets and test methods • umbrellas and shade structures • communication equipment (e.g. radio)
Administrative requirements and appropriate approvals	Administrative requirements and appropriate approvals may include: • travel requisitions, insurance • authority for procurement of supplies, use of vehicles and equipment • access permits
Appropriate corrective actions	Appropriate corrective actions may include: • logical check of equipment setup • check of calibration, zero error, drift for measuring instrument, data entry/storage and transfer • replacement of batteries, instrument boards/cards and leads and connectors • careful re-reading of procedures and checklists • repeat measurements • seek advice
Minimising environmental impacts	Minimising environmental impacts may include: • damage from movement of vehicles • disposal of surplus or spent or materials • containing run-off of water • recycling of wastes • compliance with quarantine requirements, including cleaning of vehicles to prevent

RANGE STATEMENT	
	transfer of pests (e.g. fire ants and seeds) and contaminants • compliance with environmental, cultural and heritage protection requirements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

Co-requisite units		

MSL975001A Perform microbiological tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to contribute to the culture, isolation and identification of micro-organisms, such as bacteria, fungi, viruses, protozoans, algae and parasites in order to investigate the physiology and pathology of plants and animals, monitor the natural environment, and to assist in the production of foods, pharmaceutical goods and other manufactured materials.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in the biomedical, biotechnology, environmental, manufacturing and food processing industry sectors. The results of work performed by technical personnel would normally be integrated, interpreted and reported on by scientists, medical, veterinary or plant pathologists or other responsible officers of an enterprise. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that will clearly describe the scope of permitted practice in modifying testing procedures, interpreting of data and for communicating test results to people outside the laboratory. It is applicable to investigations of as well as addressing the broader needs of biotechnology and tissue culture applications. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in

	practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Receive samples and process associated	1.1. Check samples and request form details before they are accepted

ELEMENT	PERFORMANCE CRITERIA
request forms	1.2. Return samples and request forms that do not comply with requirements to source with reasons for non-acceptance 1.3. Log samples, recording details that allow accurate tracking and chain of custody 1.4. Distribute samples for local testing or dispatch samples to other testing facilities 1.5. Store samples appropriately where testing or transport is to be delayed
2. Prepare for safe microbiological work and aseptic applications	2.1. Select work area and equipment required for the safe handling of materials that may contain micro-organisms of specified risk groups 2.2. Wear protective apparel, replacing it when contamination is suspected 2.3. Apply correct disinfection procedures to work areas before and after use 2.4. Locate relevant emergency equipment for timely response to microbiological accidents 2.5. Apply standard precautions when handling biological materials 2.6. Minimise the production and release of aerosols, using biological safety cabinets where necessary 2.7. Clean spills, and report all spills and suspected incidents to supervisor 2.8. Wash hands before and after laboratory work and when contamination is suspected 2.9. Ensure the safe disposal of biohazardous materials and other laboratory wastes in accordance with enterprise procedures
3. Process samples for direct examination	3.1. Prepare thin smears of samples for subsequent staining to enable microscopic identification of cells 3.2. Prepare liquid films of specimens for direct observation for motility or cell structure 3.3. Prepare samples to concentrate material for subsequent staining or microscopy
4. Prepare pure cultures for microbiological work and aseptic applications	4.1. Select culture media to maximise growth of micro-organisms and cells 4.2. Inoculate media aseptically, applying techniques suitable for purpose of culture 4.3. Incubate inoculated media in conditions to optimise growth of organisms and cells

ELEMENT	PERFORMANCE CRITERIA
	4.4. Subculture on suitable media to optimise production of pure cultures
5. Perform procedures that can assist in the identification of micro-organisms	5.1. Select staining techniques to demonstrate required cellular characteristics 5.2. Stain prepared films to demonstrate diagnostically useful characteristics 5.3. Inoculate and incubate media with pure cultures to assist in the biochemical and immunological identification of micro-organisms 5.4. Perform tests on pure cultures to assist in the biochemical and immunological identification of micro-organisms
6. Estimate the number and/or size of micro-organisms in samples	6.1. Count cells in undiluted samples to indicate the dilution necessary to reliably count organisms in culture 6.2. Prepare serial dilutions of samples aseptically for culture and colony counting 6.3. Count colonies for calculating number of viable organisms per unit volume 6.4. Count micro-organisms in samples and cultures using spectrometric and electronic methodologies, where relevant 6.5. Estimate and document uncertainty of measurement in accordance with enterprise procedures, where relevant
7. Contribute to antibiotic sensitivity testing where required	7.1. Prepare inoculum suitable for antibiotic sensitivity testing 7.2. Dispense or position antibiotic discs as indicated by enterprise protocol 7.3. Incubate inoculated media under conditions to maximise growth of cultured organism 7.4. Read and record sensitivity reactions, noting phenomena that can assist in the correct interpretation of results
8. Maintain records of laboratory work	8.1. Make entries on report forms or into computer systems, accurately calculating, recording or transcribing data as required 8.2. Maintain instrument logs as required by accreditation checklists 8.3. Maintain security and confidentiality of all clinical information, laboratory data and records

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- using protective clothing and biological safety cabinets
- safely performing tasks for the culture, isolation, identification and use of micro-organisms
- not contaminatingoneself, other people, the work area, equipment or the samples or materials under test
- not contaminating media or reagents during manipulations involving transfer of cultures
- identifying artefacts or image aberrations attributable to misalignment or obstruction of light paths or condensers used in bright field, dark ground, phase and fluorescent microscopy, or with other steps in microscopic examinations
- Gram reactions
- describing bacterial colony forms on common media used in bacteriological investigations
- preparing documentation that is accurate, concise and in accordance with enterprise requirements
- reporting incidents or accidents
- disinfectingspillage and safely disposing of all contaminated materials
- decontaminating the work area upon completion of work

Required knowledge

Required knowledge includes:

- microbiological terminology, including, where relevant, that of bacteriology, parasitology, virology and mycology
- disinfection and sterilisation as applied to practical aspects of microbiology
- microbial diversity
- micro-organisms of importance in medicine, in production of foods and other manufactured goods, and in assessment of the natural environment
- cell biology and chemistry related to laboratory phenomena, such as growth and isolation of organisms for identification
- microbial genetics
- rationale for sample dilution when preparing materials for enumerating organisms and other pure culture work (e.g. Most Probable Number (MPN) technique)
- need for accurate identification of sample source (e.g. body, specimen, process line

REQUIRED SKILLS AND KNOWLEDGE

and field location)
- relevant health, safety and environment requirements

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Biomedical and biotechnology:

- aspects of normal and abnormal anatomy, physiology, biochemistry and immunology as these pertain to the microbiological investigation of health and disease of animals and plants
- interactions of micro-organisms with hosts
- issues of pathogenicity
- antimicrobial agents and antibiotic susceptibility/sensitivity testing
- use of polymerase chain reaction (PCR) procedures in virology testing
- handling of genetically altered cells
- freezing and thawing of cultured cells
- in tissue culture settings, maintaining the proper growth or storage conditions for the preservation of pure cell culture lines
- maintaining the proper containment and preservation of genetically altered cell lines
- use of micro-organisms in enzyme, vitamin, preservative and amino acid production

Biological and environmental:

- sampling for the microbiological testing of drinking water which should conform to the guidelines published by the National Health and Medical Research Council (NHMRC) and the Australian Water Resources Council
- testing procedures for the microbiological content of water which should be guided by advice of relevant national and state/territory environment protection agencies
- aspects of ecology and other biological disciplines as these pertain to the microbiological investigation of the natural environment
- use of micro-organisms in waste and toxic spill recovery
- use of micro-organisms in site remediation
- identification of micro-organisms to assist in determining the cause, time or nature of pollution

Food processing:

- sampling and test batteries which should conform to relevant food standards code
- aspects of food, pharmaceutical and other relevant processing as these relate to the involvement of micro-organisms in the production process and the microbiological monitoring of the production process
- use of bacteria as probiotics
- multiple resistant antibiotic strains of bacteria and their relevance to the food

REQUIRED SKILLS AND KNOWLEDGE
industry • importance of hazard analysis and critical control points (HACCP) to production processes • involvement of bacteria in food spoilage and poisoning • identification procedures for determining the source of a food poisoning event • limiting bacterial growth in foods and food preservation

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • safely perform tasks for the culture, isolation, identification and use of micro-organisms • not contaminate him/herself, other people, the work area, equipment or the samples or materials under test • not contaminate media or reagents during manipulations involving transfer of cultures • identify artefacts or image aberrations attributable to misalignment or obstruction of light paths or condensers used in bright field, dark ground, phase and fluorescent microscopy, or with other steps in microscopic examinations • be consistently accurate in the identification of Gram reactions • be consistently accurate in the description of bacterial colony forms on common media used in bacteriological investigations • preparedata and documentation that is accurate, concise and in accordance with enterprise requirements • report all incidents or accidents • disinfectany spillage and safely dispose of all contaminated materials • decontaminate the work area upon completion of

EVIDENCE GUIDE	
	work.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL934002A Apply quality system and continuous improvement processes*. Resources may include: • a standard microbiology laboratory with relevant equipment, samples and reagents • enterprise procedures, test methods and equipment manuals • under duty of care requirements, off-the-job training providers will only use samples and organisms of a risk category compatible with their laboratory as defined in AS/NZS 2243.3.
Method of assessment	The following assessment methods are suggested: • review of results/data/records generated by the candidate • feedback from peers and supervisors to confirm that enterprise procedures are consistently followed and those results meet workplace requirements • oral and/or written questions associated with laboratory determinations and record keeping • integrated assessment with a case study focus, such as the isolation and identification of bacterial species in a specimen containing two or more species, by relating sample, cultural, morphological and biochemical data, and such from other relevant tests and procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of

EVIDENCE GUIDE	
	assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** A patient's urine sample and request form have been brought to the laboratory for urgent testing. After preparation of the work area, the technical officer examines a cover-slipped preparation of the sample and notes the presence of pus cells and non-motile rod organisms. In a Gram stain he confirms the presence of pus cells and Gram negative bacilli. They inoculate a MacConkey's and a blood agar plate for growth and isolation of bacteria. After consultation with the supervisor they are asked to set up a direct culture for antibiotic sensitivity testing. The supervisor informs the clinician of the initial findings. The next morning the technical officer assists the supervisor to read the plates. The predominance of lactose fermenting organisms is noted. The supervisor asks the technical officer to set up a biochemical panel to assist in identifying the organism. The supervisor confirms the technical officer's reading of the direct sensitivities plate. Later in the day the team is able to confirm that the patient's urine is infected with Escherichia coli and that the organism is sensitive to a number of antibiotics, including a sulphonamide and a cephalosporin. **Food processing** A swollen can of tuna was received at the company laboratory for microbiological investigation. The technical officer recorded the details supplied with the can and prepared for the investigation. A range of media, including cooked meat media and nutrient broth were prepared and aseptic can opening equipment was sterilised. After the can was opened in the biohazard cabinet, the state of the contents was recorded, pH checked and Gram stains prepared and examined. The media was inoculated with the food samples and incubated at a range of temperatures under aerobic and anaerobic conditions. The can was then emptied for

EVIDENCE GUIDE	
	double seam tear down to determine the cause of the spoilage. The next day the technical officer examined the media and broth cultures. From all the data collected the technical officer and supervisor were able to determine that pre-processing spoilage had occurred, probably due to excessive delays in the process prior to can sterilisation. The results were reported to production personnel so that they could follow up the circumstances relating to the delays, and ensure that the SOP had been followed and sufficient product rejected.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	• Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243.3:2002 Safety in laboratories - Microbiological aspects and containment facilities
	  • ISO/TS 19036:2006 Microbiology of food and animal feeding stuffs - Guidelines for the estimation of measurement of uncertainty for quantitative determinations
	  • ISO7218:2007 Microbiology of food and animal feeding stuffs - General requirements and guidance for

RANGE STATEMENT	
	microbiological examinations • cleaning, hygiene, personal hygiene requirements • enterprise procedures, standard operating procedures (SOPs) and operating manuals • guidelines for small scale genetic manipulation work from the gene technology regulations • incident and accident/injury reports • instructions to comply with new legislation, standards, guidelines and codes • quality system and continued improvement processes • safety requirements for equipment, materials or products and material safety data sheets (MSDS) • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures
Equipment, **materials and systems**	Equipment, materials and systems may include: • protective and physical containment facilities and equipment for safe handling of micro-organisms personal protective equipment, such as gloves, gowns, masks and safety glasses and gloves for working with extremes of heat and cold • carbon dioxide cabinets and incubators • transfer equipment, such as inoculating loops, pipettes (quantitative and qualitative), flasks, tubes and spatulas • liquid nitrogen containers for cell storage • filtration membranes • microscopes with bright field and other relevant illumination systems and stereomicroscopes • counting chambers for micro-enumeration • colony counting devices • Bunsen burners and bench incinerators • Incubators and water baths • anaerobic jars, fermentation chambers,

RANGE STATEMENT	
	continuous culture systems and other devices for controlling growth environments of micro-organisms • laboratory information management systems (LIMS), databases, record and filing systems • stains, media, reagents and biological materials necessary for laboratory testing • laboratory glassware and measuring equipment • disinfecting and sterilising solutions and equipment, such as ultraviolet (UV) lamps • materials suitable for the safe containment, collection, processing and disposal of biological and non-biological wastes • autoclaves
Communication	Communication may involve: • supervisors and managers (laboratory, quality and customer service) • personnel in other laboratories in the enterprise or in other enterprises to which work may be referred • customers, patients and clients • external auditors and accreditation agencies (e.g. National Association of Testing Authorities (NATA))
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all work will assume the potential infectivity of samples and materials presented for laboratory processing • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and

RANGE STATEMENT	
	State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975002A Perform haematological tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to determine levels, function, activity and interactions of cellular and plasma components of blood using tests and procedures identified with the discipline of laboratory haematology.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in the biomedical industry sector. While this unit focuses on the laboratory investigation of human physiology and pathology, it reasonably describes aspects of work performed in veterinary settings. The unit of competency assumes that technical personnel would perform tests and procedures under close supervision. The results of their work would also normally be integrated, interpreted and reported on by supervising scientists and medical pathologists. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that will clearly describe the scope of permitted practice in modifying testing procedures, interpretation of data and for communicating test results to people outside the laboratory. It is understood that the management of any laboratory would establish for itself, in terms of its own responsibility and purposes, the ability of any worker to work in a haematology laboratory, regardless of the education and training record or presumed ability of any worker. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in

	practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

ELEMENT	PERFORMANCE CRITERIA
1. Process samples and associated request details	1.1. Sort specimens according to tests requested, urgent status and volume 1.2. Return samples and request forms that do not comply with requirements to their source with reasons for non-acceptance 1.3. Log acceptable samples and request forms, applying required document tracking mechanisms 1.4. Process samples as required by requested tests 1.5. Store samples and sample components appropriately until ready for testing
2. Perform tests	2.1. Select authorised tests that are indicated for the requested investigations 2.2. Conduct individual tests according to documented methodologies, applying required quality control procedures 2.3. Record all results, noting any phenomena that may be relevant to the interpretation of results 2.4. Seek advice of section head or other responsible colleague when result interpretation is outside parameters of authorised approval 2.5. Store unused sample or sample components, for possible future reference, under conditions suitable to maintain viability
3. Maintain a safe environment	3.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 3.2. Clean up spills using appropriate techniques to protect personnel, work area and environment from contamination 3.3. Minimise the generation of wastes 3.4. Ensure the safe disposal of biohazardous materials and other laboratory wastes in accordance with enterprise procedures
4. Maintain laboratory records	4.1. Make entries on report forms or into computer systems, accurately calculating, recording or transcribing required data as required 4.2. Update instrument maintenance logs as required by accreditation checklists 4.3. Maintain security and confidentiality of all clinical information, laboratory data and records

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- counting and measuring cells
- deriving cell data that can assist with classification of cell populations
- staining cells, identifying their morphology and classifying them
- determining of the amount and function of blood components
- measuring clinically useful phenomena, such as erythrocyte sedimentation or detecting markers of immune response
- assessing haemostasis, coagulation, fibrinolysis and thrombosis
- amplify and detect gene products (where appropriate)
- contributing to the general maintenance of equipment and processes to ensure ongoing compliance with enterprise and laboratory accreditation
- recognising problems in systems and documentation
- using the enterprise information system efficiently
- preparing documentation
- organising work to ensure the timely completion of tasks
- using samples, reagents and materials economically and disposing of wastes safely
- working safely

Required knowledge

Required knowledge includes:

- the necessity for a patient or client focus when performing laboratory procedures and tests, including issues of confidentiality and security of clinical and laboratory information and data
- the relationships that exists between the sample and the test result, including:
  - sample collection
  - the preservation and timely testing of samples
  - sample storage requirements and issues of artefact
  - sub-sampling routines, including the nature of unstable particulate suspensions
  - validated tests
  - quality control
  - quality assurance
- the use and maintenance of laboratory equipment and resources that contribute to accurate, precise, timely and economical generation of data for use by clinicians
- relevant aspects of normal and abnormal anatomy, physiology, genetics,

REQUIRED SKILLS AND KNOWLEDGE
biochemistry and immunology • the investigation of blood cell disorders, including anaemia, leucocytoses and leucocytopaenias, leukaemia and thrombocytopenia • heritable and acquired coagulopathies and therapeutic drug related alterations in haemostatic and coagulation mechanisms • haematological responses to infection, immunisation and malignancy • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • count and measure cells • derive cell data that can assist with classification of cell populations • stain cells, identify their morphology and classify them • determine of the amount and function of blood components, such as haemoglobin and other substances quantified by spectrophotometry • measure clinically useful phenomena, such as erythrocyte sedimentation • assess haemostasis, coagulation, fibrinolysis and thrombosis • detect markers of immune response (where appropriate) • amplify and detect gene products (where appropriate) • contribute to the general maintenance of equipment and processes to ensure ongoing compliance with enterprise and laboratory accreditation • recognise problems in systems and documentation • use the enterprise information system efficiently • critically analyse information in enterprise documents

EVIDENCE GUIDE	
	• prepare documentation that is accurate, easily understood by the intended audience and in accordance with enterprise requirements • manage tasks and organise work to ensure the timely completion of tasks • use samples, reagents and materials economically and dispose of wastes safely • use equipment safely • maintain equipment, recording and reporting malfunctions appropriately.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *MSL934002A Apply quality system and continuous improvement processes*. Resources may include: • standard haematology laboratory with relevant equipment, samples and reagents • enterprise procedures. Under duty of care requirements, off-the-job training providers should ensure that blood samples are known to be antibody free for hepatitis B and C, syphilis and human immunodeficiency virus (HIV). However, this does not reduce the need for universal precautions in the use of these samples.
Method of assessment	The following assessment methods are suggested: • review of results/data/records generated by the candidate • feedback from peers and supervisors that enterprise procedures were followed and that work is performed consistently in line with enterprise requirements • oral and/or written tests and paper problems associated with test methods and laboratory processes, such as equipment calibration and maintenance • integrated assessment by use of case studies to demonstrate performance of the range of tests and procedures implied in the critical aspects of competency and essential knowledge sections of this standard. Suitable case studies could involve:

EVIDENCE GUIDE	
	• performance of the routine full blood count, including the examination of the stained blood film • a coagulation screen, including tests to measure anti-vitamin K and anti-heparin therapeutic agents, and the counting of platelets • studies that can assist in identifying relationships between quantitative data from blood counts and morphological findings from stained blood films. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** A patient's blood sample and request form have been brought to the laboratory. The patient has complained of rectal bleeding for some months. The technical officer has been asked by the supervisor to perform a full blood count on the analyser, set up an erythrocyte sedimentation rate, and to prepare, stain and examine a film of the patient's blood. The technical officer checks the records for information on the patient. Finding none, the technical officer records the required data in the laboratory information management system (LIMS) and then performs the required tests. Satisfied that the results of the standards are within range, the technical officer prints an interim report for the supervisor. The report incorporates the results of the differential white cell

EVIDENCE GUIDE	
	count, calculations of the leucocyte numbers and comments on the morphology of the blood cells. The report and film is taken to the pathologist for supplementary comments, verification and signature. Following these checks, the technical officer telephones the ward to advise that the patient's results can be retrieved from the ward's computer terminal.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• cleaning, hygiene and personal hygiene requirements
	• enterprise procedures, SOPs and operating

RANGE STATEMENT	
	manuals • incident and accident/injury reports • instructions to comply with legislation, standards, guidelines and codes • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Equipment, **materials and systems**	Equipment, materials and systems may include: • blood mixers • reference material for automated and manual quality control and quality assurance systems • instruments for the semi-automated or automated electronic counting and partial characterisation of blood cells, the measurement of haemoglobin and the computation of red cell indices • staining machines • safe working cabinets • centrifuges, water baths and incubators • volumetric glassware and measuring devices • cell counting chambers • microscopes for bright field and phase contrast examinations • spectrometers • coagulometers • counters for single or multiple cell types • computer information systems, databases, record and filing systems • general laboratory glassware and equipment associated with a serology laboratory

RANGE STATEMENT	
Communication	Communication may involve: • supervisors and managers (laboratory, quality and customer service) • other laboratory or clinical personnel • patients and clients • personnel of accreditation agencies (e.g. national Association of Testing Authorities (NATA))
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975003A Perform histological tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform tests and procedures associated with processing and staining tissues for examination of tissue structure and abnormalities by pathologists and scientists to assist with disease diagnosis. The unit covers tests and procedures that are associated with anatomical pathology (including frozen sections), and may involve the use of automated processors and staining machines.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers in the biomedical sector. The unit principally refers to techniques performed on human tissues, but many aspects may be relevant to animal and plant tissues. This unit of competency assumes that the technical officer would perform tests and procedures under the close supervision of scientific and/or medical staff. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that will clearly describe the scope of permitted practice in modifying testing procedures, interpretation of data and for communicating test results to people outside the laboratory. Technical workers may need to interrupt their routine work in order to assist with or perform frozen sections or special staining procedures to facilitate rapid diagnosis of specimens from patients in the operating theatre. The involvement of the technical officer in mortuary work will be determined by the enterprise. Work of this nature will always be closely supervised by scientific/medical staff. Industry representatives have provided case studies to illustrate the practical application of this unit of

	competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Process specimens and associated request forms	1.1. Check and match specimens and request forms before they are accepted 1.2. Return specimens and request forms that do not comply with requirements to their source with reasons for non-acceptance 1.3. Process routine and non-routine specimens according to enterprise protocols 1.4. Log acceptable specimens, applying required document tracking mechanisms 1.5. Dispatch specimens to referral laboratories as required 1.6. Store specimens appropriately until required for testing
2. Prepare specimens for cut-up	2.1. Arrange tissues and request forms in cut-up area 2.2. Label tissue cassettes as required to maintain identity during subsequent procedures 2.3. Prepare containers for transport of tissues to processor 2.4. Select tissue fixative to prepare tissue for subsequent procedures 2.5. Weigh organs and count tissue chips and shavings 2.6. Take notes of gross features of specimens during cut-up if required
3. Process tissue	3.1. Select processor program and reagents 3.2. Inspect processor reagents for deterioration and adequate volume 3.3. Follow processing requirements for non-routine techniques, including histochemistry 3.4. Monitor processor regularly during processing sequence where appropriate
4. Embed tissue	4.1. Select embedding medium that is compatible with infiltrating agent 4.2. Check that temperature of embedding medium is suitable for embedding process 4.3. Check that volume of embedding medium is sufficient for uninterrupted embedding of processor load 4.4. Embed tissue in correct orientation 4.5. Apply procedures to prevent cross-contamination

ELEMENT	PERFORMANCE CRITERIA
	between patient tissues 4.6. Allow block to solidify according to requirements of embedding medium
5. Cut tissue sections	5.1. Check that flotation bath is ready and satisfactory for use 5.2. Prepare microtome and associated equipment to accommodate requirements of tissue batch 5.3. Secure block in microtome following specified safety procedures 5.4. Label required number of microscope slides with patient identification as prescribed by enterprise 5.5. Cut tissue sections according to needs of subsequent procedures 5.6. Float sections onto water bath to flatten tissues 5.7. Pick up sections onto microscope slides ensuring patient identification on slides matches that on block 5.8. Apply procedures to prevent cross-contamination between patient tissues 5.9. Maintain tissue sections in conditions compatible with intended subsequent procedures
6. Stain tissue sections	6.1. Apply staining procedures to demonstrate required morphological features 6.2. Prepare labile reagents for immediate use 6.3. Select reagents for specified technique, ensuring reagent sequence matches standard procedure 6.4. Stain sections according to method accommodating any authorised variations and applying required quality control 6.5. Mount slides using medium compatible with staining technique 6.6. Examine sections microscopically to ensure expected staining outcomes are achieved and procedural artefacts are detected 6.7. Confirm macroscopically or microscopically that tissue type conforms with labelling and pathologist specifications 6.8. Participate in final check to establish that the number of slides tallies with the worksheet 6.9. Attach permanent label giving specimen details as required by enterprise
7. Contribute to	7.1. Monitor and maintain resources for pathologists in

ELEMENT	PERFORMANCE CRITERIA
efficient provision of histological services	cut-up area 7.2. Liaise with clinical and nursing staff if required by enterprise regarding tissue fixative requirements in areas, such as wards, theatres and mortuary 7.3. Monitor and maintain volumes of fixatives in areas, such as wards, theatres and mortuary 7.4. Store slides and blocks according to legal and enterprise requirements under conditions that prevent degeneration
8. Maintain a safe environment	8.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 8.2. Handle non-fixed tissues safely to minimise cross-infection and contamination of personnel and environment 8.3. Store fixed tissues as specified to minimise exposure of personnel to dangerous fumes and vapours 8.4. Clean up spills using appropriate techniques to protect personnel, work area and environment from contamination 8.5. Minimise the generation of wastes 8.6. Ensure the safe disposal of biohazardous materials and other laboratory wastes in accordance with enterprise procedures
9. Maintain laboratory records	9.1. Make entries on report forms or into computer systems, accurately calculating, recording or transcribing data as required 9.2. File and store tissue sections to facilitate efficient retrieval as required 9.3. Maintain instrument logs as required by accreditation checks 9.4. Maintain confidentiality and security of all clinical information, and laboratory data and records

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

REQUIRED SKILLS AND KNOWLEDGE

Required skills

Required skills include:

- manual and automated histological tests and procedures
- preparing, storing and disposing of stains and reagents
- cutting paraffin embedded sections
- cutting and staining frozen sections
- staining paraffin embedded sections to demonstrate normal and abnormal tissue structure
- specialised staining(e.g. to demonstrate connective tissue)
- histochemical staining(e.g. to demonstrate carbohydrates)
- polarising microscopy
- fluorescent staining
- immunohistochemical staining
- recognising problems in systems and documentation, and troubleshooting under direction and/or where appropriate
- using the enterprise information system
- preparing documentation that is accurate, concise and in accordance with enterprise requirements
- managing tasks and organising work to ensure the timely completion of tasks
- using samples, reagents and materials economically and disposing of wastes safely
- working safely
- maintaining equipment

Required knowledge

Required knowledge includes:

- terminology used to communicate issues that relate to underpinning normal and abnormal anatomy, physiology, biochemistry and immunology
- relationship between strict adherence to enterprise procedures during each step and the maintenance of specimen integrity
- relevant health, safety and environment requirements, particularly those related to handling irritating, volatile, flammable and potentially carcinogenic substances, such as formaldehyde, xylene, histoclear, ethanol and chloroform
- importance of recognising the uniqueness of patient histological tissues (a non-renewable resource)
- relationship of the anatomy and morphology of tissue types and the macroscopic and microscopic appearance of stained sections
- chemistry of fixatives and their role in retaining size and spatial relationships in tissues and in preventing autolysis and putrefaction
- relationship between the tissue components to be demonstrated and the choice of fixatives and fixation procedures, such as microwave fixation, processing and

REQUIRED SKILLS AND KNOWLEDGE
staining techniques • chemistry of dehydration and rehydration of tissues during processing and staining • relationship between correct orientation of the tissue during embedding and ability to cut sections from surface required for subsequent microscopic examination • correlation between poorly maintained processing reagents and resultant tissue blocks being difficult to cut or unsuitable for cutting • properties of the embedding medium • labile nature and chemistry of stains and the importance of correct preparation and storage to ensure required staining outcome • chemical interaction between the tissues and the various staining procedures implemented, including histochemical and immunohistochemical procedures (that is, reasons why the stains work) • effects of the presence of artefacts in sections on microscopic examination of tissues

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform manual and automated histological tests and procedures • prepare, safely store and dispose of stains and reagents • cut paraffin embedded sections, free of wrinkles, scores and folds, at the specified thickness to demonstrate tissue and cellular structures, granules, inclusions and organelles,as required • cut and stain frozen sections at the specified thickness to demonstrate tissue and cellular structures and inclusions as required • stain paraffin embedded sections to demonstrate normal and abnormal tissue structure • perform specialised staining, for example, to demonstrate connective tissue, musclestriations, central nervous system, glands, basement membrane,

EVIDENCE GUIDE	
	micro-organisms, pigments and deposits • perform histochemical stains, for example to demonstrate carbohydrates, amyloid and mucins • perform specialised techniques, such as polarising microscopy, fluorescent staining and use of microwave ovens in histopathology • perform basic immunohistochemical staining • cover slip slides, ensuring that no air bubbles are formed and material is preserved for the life of the slide • label slides clearly with case, specimen and stain details • recognise problems in systems and documentation, and troubleshoot under direction and/or where appropriate • use the enterprise information system efficiently • critically analyse information in enterprise documents • prepare documentation that is accurate, concise and in accordance with enterprise requirements • manage tasks and organise work to ensure the timely completion of tasks • use samples, reagents and materials economically and disposes of wastes safely • use equipment safely • maintain equipment, recording and reporting malfunctions appropriately.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL934002A Apply quality systems and continuous improvement processes*. Resources may include: • standard histology/laboratory with relevant equipment, samples and reagents • enterprise procedures, test methods and equipment manuals. Under duty of care requirements, off-the-job training providers will only use samples and organisms of a risk category compatible with their laboratory as defined in AS/NZS 2243.3.

EVIDENCE GUIDE	

Method of assessment	The following assessment methods are suggested:
	• inspection of stained tissue sections/slides prepared by the candidate
	• feedback from peers and supervisors
	• observation of candidate performing tests and procedures, such as:
	  • preparation of microtome for cutting, cutting blemish free sections, successful flotation and pickup of section
	  • staining tissues to demonstrate tissue structures and cell components as required
	  • morphological identification of tissues, such as epithelial, muscle, central nervous and glandular
	• oral and/or written tests and paper problems associated with test methods and laboratory processes, such as equipment calibration and maintenance.

This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** In preparation for cutting some sections, a technical officer followed standard procedures. This involved checking the flotation bath temperature, checking the surface of the bath for cleanliness, inserting the microtome knife and checking the angle of the knife. They referred to the worksheet to confirm the number of slides required per patient and then labelled slides accordingly. They then proceeded with section cutting, carefully observing the safety protocols. They ensured that as the sections were picked up from the flotation bath, the patient identification on the slides and the block matched. They then cleaned the surface of the bath to prevent cross-contamination of samples between patients. The technical officer's care and diligence in performing these procedures ensured that specimen integrity was maintained.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• cleaning, hygiene and personal hygiene requirements
	• enterprise procedures, SOPs and operating manuals
	• incident and accident/injury reports
	• instructions to comply with legislation, standards, guidelines and codes
	• material data safety sheets (MSDS)
	• medico-legal and laboratory accreditation requirements for traceability of specimens and records
	• quality system and continued improvement processes
	• safety requirements for equipment, materials or products

RANGE STATEMENT	
	• sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Equipment, **reagents**, **specimens and systems**	Equipment, reagents, specimens and systems may include: • microtomes and microtome knives (non-disposable or disposable) • cryostats for frozen sections • microtome knife sharpeners • embedding centres • flotation baths, drying ovens and microwave ovens • tissue processors • staining and cover slipping machines • microscopes for bright field, phase contrast and fluorescence examinations • volumetric glassware and measuring devices • general laboratory glassware and equipment identified with an anatomical pathology laboratory • reagents, such as formaldehyde, ethanol, xylene, paraffin, picric acid and mercuric chloride • reference material for automated and manual quality control and quality assurance systems • fresh and fixed specimens • computer information systems, databases, record and filing systems, including specimen accessioning
Communication	Communication may involve: • supervisors and managers (laboratory, quality and customer service) • other laboratory or clinical personnel (pathologists, nursing staff, pathology

RANGE STATEMENT	
	registrars, other medical staff and clerical staff) • clients • external auditors and accreditation agencies (e.g. National Association of Testing Authorities (NATA))
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units	

Co-requisite units		

MSL975004A Perform chemical pathology tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform tests and procedures associated with the detection and monitoring of tissue and bodily fluid responses to normal physiological processes and disease through the identification and quantifying of chemical components. It covers tests and procedures that are usually associated with the discipline of clinical biochemistry.

Application of the Unit

Application of the unit	The unit of competency is applicable to laboratory technicians working in the biomedical industry sector. The unit principally refers to human pathology but many aspects are relevant to veterinary pathology. This unit of competency describes the testing of tissues, blood, bodily fluids (cerebrospinal fluid, peritoneal and wound aspirates, sweat and sputum), calculi, and excreta (urine and faeces) in laboratories. Tests examine and measure compounds that can give information about alterations in individual physiology and pathology, or compounds, such as therapeutic drugs or drugs of abuse that will alter normal physiology. The tests are performed in a full or partial computerised and automated environment where large numbers of samples must be managed, analysed and their results recorded. This unit of competency assumes that the technical officer would perform tests and procedures under the close supervision of scientific and/or medical staff. Although a supervisor may not always be present, the technical worker will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice in modifying testing procedures, interpretation of data and for communicating test results to people outside the laboratory.

	Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Process samples and associated request forms	1.1. Ensure sample labels and request forms are correctly completed in accordance with enterprise requirements 1.2. Return samples and request forms that do not comply with requirements to their source with reasons for non-acceptance 1.3. Log acceptable samples, applying required document tracking mechanisms 1.4. Process samples as required by test procedure and request status 1.5. Store sample components under optimal conditions until required for testing
2. Perform tests	2.1. Select authorised tests indicated for the requested investigations 2.2. Conduct individual tests, or batches of tests, according to documented methodologies, applying required quality control procedures 2.3. Manage tasks and organise work to ensure efficient use of time 2.4. Flag test results that are outside accepted quality control limits 2.5. Apply cognitive and technical processes to discriminate between significant data and artefact 2.6. Confirm with supervisor any further testing requirements 2.7. Record all test data, noting any phenomena that may be relevant to the treatment of data or the interpretation of results 2.8. Store unused sample for possible future reference
3. Maintain a safe work area and environment	3.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 3.2. Clean up spills using appropriate techniques to protect personnel, work area and environment 3.3. Identify instrument malfunction that may impact on safe operation 3.4. Ensure the safe disposal of biohazardous materials and other laboratory wastes in accordance with enterprise procedures
4. Maintain laboratory	4.1. Make entries on report forms or into computer

ELEMENT	PERFORMANCE CRITERIA
records	systems, accurately calculating, recording or transcribing required data 4.2. Maintain instrument logs as required by accreditation checklists 4.3. Maintain security and confidentiality of all clinical information, laboratory data and records

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- identifying chemical substances that are associated with organ dysfunction or are indications of success or failure of treatment
- testing for biological activity
- monitoring humoral immune system components
- applying DNA techniques
- testing for evidence of prior exposure to infective agents
- discriminating between significant data and artefact
- using the enterprise information system efficiently
- critically analysing information or documents and responding appropriately to an abnormal result
- preparing documentation that is accurate, concise and in accordance with enterprise requirements
- using samples, reagents and materials correctly and economically
- disposing of wastes safely
- communicating appropriately with a diverse range of internal and/or external customers
- reportingequipment malfunction
- liaising with contracted service technician to ensure equipment downtime is minimised

Required knowledge

Required knowledge includes:

- the central place the patient, client or customer occupies in the business of the enterprise

REQUIRED SKILLS AND KNOWLEDGE
• scientific, medical, clinical, technical and workplace terminology relevant to job role/function • relevant terminology and normal and abnormal anatomy, physiology, biochemistry and immunology to enable efficient communication with laboratory and clinical staff • enterprise procedures relating to selection and use of testing procedures, in terms of the supposed or defined clinical problem • range of test results that have meaningful clinical significance • selection and use of quality control and quality assurance processes, as they pertain to the issuance of meaningful results • sources of error in pre- and post-analyses of samples and corrective actions • need for confidentiality of work results • management of work flow for effective and efficient use of resources • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • identify chemical substances that are associated with organ dysfunction or are indications of success or failure of treatment • test for biological activity (e.g. assessment of enzyme activity indicative of organ/tissue damage) • monitor humoral immune system components • apply DNA techniques • test for evidence of prior exposure to infective agents, as in the case of identifying plasma changes that are consequent to or associated with immune responses • discriminate between significant data and artefact • use the enterprise information system efficiently (e.g. networks or ordering for consumable materials) • critically analyse information or documents and

EVIDENCE GUIDE	
	respond appropriately to an abnormal result • prepare documentation that is accurate, concise and in accordance with enterprise requirements • use samples, reagents and materials correctly and economically • dispose of wastes safely • communicate appropriately with a diverse range of internal and/or external customers • reportequipment malfunction or liaise with contracted service technician to ensure equipment downtime is minimised.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL9314002A Apply quality system and continuous improvement processes*. Resources may include: • enterprise documents, standard chemical pathology laboratory with relevant equipment, samples and reagents • enterprise procedures, test methods and equipment manuals. Under duty of care requirements, off-the-job training providers should ensure that blood samples are known to be antibody free for hepatitis B and C, syphilis and human immunodeficiency virus (HIV), but this does not preclude the use of universal precaution in the use of blood samples.
Method of assessment	The following assessment methods are suggested: • review of results/data/records generated by the candidate • feedback from peers and supervisors to confirm that enterprise procedures are consistently followed and that results meet enterprise requirements • oral and/or written questions associated with laboratory determinations and record keeping • integrated assessment with a case focus, such as the measurement of single or multiple chemical substances and metabolites in serum or other bodily fluids.

EVIDENCE GUIDE	
	In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** A patient's blood sample and request form have been brought to the laboratory. The sample has been recorded in the laboratory's log as 'urgent cardiac enzymes'. The specimen has been processed ahead of the other routine samples. The technical officer selects the panel of tests in the cluster designated cardiac enzymes on the automated analyser. The technical officer also ensures that the instrument has adequate reagents, quality control sera and reference sera loaded before placing the sample for analysis. At the end of the analysis cycle, the quality control is validated and the result report generated. An elevated troponin is noted. The technical officer alerts the supervisor and confirms that this result can be phoned through to the requesting physician. The rest of the sample is refrigerated awaiting immediate follow-up tests. Within 24 hours, it will be frozen for a week in case more tests are requested. At the end of the day, the technical officer sets the analyser on standby, stows sensitive reagents in the refrigerator, cleans his/ her work area, and safely disposes of biological and non-biological wastes.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• cleaning, hygiene and personal hygiene requirements
	• enterprise procedures, SOPs and operating manuals
	• incident and accident/injury reports
	• instructions to comply with legislation, standards, guidelines and codes
	• quality system and continued improvement processes
	• safety requirements for equipment, materials or products
	• sampling procedures (labelling, preparation, storage, transport and disposal)
	• schematics, work flows and laboratory layouts
	• statutory and enterprise occupational health

RANGE STATEMENT	
	and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Equipment, **materials and systems**	Equipment, materials and systems may include: • centrifuges, water baths and incubators • manual and automated spectrometers and other related measurement devices • various discrete and multi-channel analysers for chemical analytes • laboratory information management systems (LIMS), databases, record and filing systems • chemicals, reagents and biological materials, including immunological reagents and DNA probes necessary for laboratory testing • laboratory glassware and measuring equipment • materials suitable for the safe collection and disposal of biological and non-biological wastes
Communication	Communication may include: • supervisors and managers (laboratory, quality and customer service) • other laboratory or clinical personnel • patients and clients • external auditors and accreditation agencies (e.g. National Association of Testing Authorities (NATA))
Occupational health and safety (**OHS**) **and environmental management requirements**	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply

RANGE STATEMENT	
	current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975005A Conduct sensory analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to set up and coordinate sensory analysis and assess the results obtained from a routine sensory analysis.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in the food processing industry sector. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that will clearly describe the scope of permitted practice in modifying testing procedures and for communicating results to people outside of the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Select panellists/individuals for sensory analysis	1.1. Perform initial screening of potential panellists/individuals based on the testing brief 1.2. Use information to select suitable people 1.3. Analyse and report the results used to establish a panel
2. Prepare panellists for sensory analysis	2.1. Prepare panellists for sensory analysis 2.2. Conduct any training required to detect test characteristics 2.3. Instruct panellists on recording and reporting requirements of test data
3. Prepare samples for sensory analysis	3.1. Prepare reference samples to be used for the sensory analysis specification 3.2. Prepare evaluation samples to sensory analysis specification

ELEMENT	PERFORMANCE CRITERIA
	3.3. Apply food safety procedures in the preparation and presentation of samples 3.4. Identify and report on any defects or abnormalities in samples
4. Conduct routine sensory analysis	4.1. Select appropriate test materials for the information required 4.2. Ensure tests are conducted according to enterprise procedures 4.3. Analyse data 4.4. Report on process and results in accordance with enterprise procedures
5. Evaluate and report findings	5.1. Assess the possible effects of group attributes 5.2. Review reliability of results for group bias 5.3. Complete all relevant documentation and present findings
6. Maintain a safe work environment	6.1. Use established work practices to ensure personal safety and that of other personnel 6.2. Minimise the generation of wastes and environmental impacts 6.3. Ensure the safe collection of laboratory waste for subsequent disposal 6.4. Care for and store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • developing and using questionnaires • consumer research methods • completing the necessary documentation • selecting suitable panellists • recognising the significance of cultural and social contexts and communicating appropriately

REQUIRED SKILLS AND KNOWLEDGE
• selecting appropriate test procedures • preparing evaluation samples by dosing or processing • analysing data • communicating the significance of results, including the discussion of any errors and/or unexpected variation to appropriate personnel
Required knowledge
Required knowledge includes: • anatomy, physiology and functions of taste and smell • interaction of sensory activity (e.g. interaction between taste and smell and effect of temperature on samples) • associated characteristics of mouth feel and appearance • principles of effective control of the sensory testing environment (e.g. conditions that can dull sensitivity) • likely causes of variation in results and their control • principles of descriptive, discriminative and affective sensory analysis methods • development and use of questionnaires • use of consumer research methods • features of sensory quality control • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • complete the necessary documentation • perform initial screening of panellists and determine their suitability • select suitable panellists • communicate appropriately and recognise the significance of cultural and social contexts • select appropriate test procedures • ensue samples are in a suitable condition for analysis

EVIDENCE GUIDE	
	• accurately prepare evaluation samples by dosing or processing • thoroughly analyse data • communicate the significance of results, including the discussion of any errors and/or unexpected variation to appropriate personnel.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*. Resources may include: • statistical data sheets and charts, logbooks and scientific calculators • relevant ISO standards and AS standards • sensory evaluation panel room and group of panellists • access to a range of chemicals and samples.
Method of assessment	The following assessment methods are suggested: • review of written reports which include an analysis of findings from sensory tests conducted by the candidate • observation of candidate conducting panel tests • written/oral questions to assess underpinning knowledge • responses to market scenarios and/or case studies. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.

EVIDENCE GUIDE	
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food processing** The quality manager in a dairy food company has an identified product which does not meet enterprise standards. An alternative ingredient has been supplied and used. The sensory analyst has the task of determining whether consumers will be able to detect any differences in this product compared to the standard product. The sensory analyst chooses an appropriate difference test and considers a suitable panellist group from log book records. Samples of the relevant products are stored and prepared under standard test conditions. A full sensory panel is conducted with score sheets, coding, booth preparation and product presentation. After testing, the results are analysed and the test conditions are reviewed. The overall results are presented as a written report to management.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2542 Sensory analysis
	  • AS 2609.1-2005 Methods for assessing

RANGE STATEMENT	
	modifications to the flavour of foodstuffs due to packaging - Sensory analysis • AS 2609.2-1983 Materials used for the packaging of food and beverages - Methods for the assessment of odour and taint - Instrumental methods • SOPs • specifications • sampling plans • sensory analysis criteria • reporting documentation
Information used to select suitable panellists may	Information used to select suitable panellists may include: • selection criteria • whether people have been trained or not • information from an initial screening questionnaire • availability • characteristics of unsuitable people such as smokers • sources of bias • company procedures
Samples	Samples may include: • raw materials • ingredients • stages of production • final products • process aids and adjuncts • packaging materials • materials which come in contact with the product
Tests	Tests may be performed to determine the following aspects of a sample: • flavour • appearance • aroma • texture
Testing methods	Testing methods may include: • triangular test, duo-trio test, ranking test,

RANGE STATEMENT	
	paired comparison test and blending test • flavour profile • threshold analysis • discriminative testing, descriptive testing and affective testing
Attributes which could affect the results	Attributes which could affect the results may include: • age, gender and ethnicity • smoking • medications • qualifications and trained/untrained • random panel • cultural background, as related to food preferences/food styles
The primary flavour characteristics	The primary flavour characteristics include: • sweet/sour • umarmic • bitter/salty
The results obtained from the sensory analysis	The results obtained from the sensory analysis may be applied to: • marketing studies • purchasing requirements • quality assurance at various stages of production • quality control and troubleshooting • research and development of new products • customer returns • product recalls
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied

RANGE STATEMENT	
	• where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975006A Perform immunohaematological tests

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability of technical personnel to perform routine tests and procedures that are part of the requirements of pre- and post-blood transfusion practice. The unit also covers tests and procedures that are indicated in laboratory investigations in obstetric and perinatal medicine, in suspected haemolysis and haemolytic episodes and in other clinical circumstances.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and laboratory technicians working in the biomedical industry sector. It is understood that the management of any transfusion laboratory would establish for itself, in terms of its own responsibility and purposes, the ability of any worker to work in a transfusion science laboratory, regardless of the education and training record or presumed ability of any worker. Tests will be related to the determination of blood groups and the detection of antibodies of significance in: • transfusion (as laboratory evidence that in vivo cell destruction or immunisation may occur) • pregnancy and the peri-natal period (as evidence of sensitisation of foetal red cells by transplacental maternal antibody) • the investigation of haemolysis or haemolytic episodes. The tests that the worker will use will be validated and authorised procedures, clearly described in the laboratory's manual of procedures. The unit of competency is based on the assumption that technical personnel would perform

	tests and procedures under the close supervision of scientific and/or medical staff. The parameters of interpretation will be clearly described, indicating for the worker what he or she is permitted to sign-off without reference to supervisors or managers. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the

	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Process samples and associated request forms	1.1. Check and match samples and request forms before they are accepted 1.2. Return samples and request forms that do not comply with requirements to their source with reasons for non-acceptance 1.3. Log acceptable samples, applying required document tracking mechanisms 1.4. Process samples as required by requested tests 1.5. Store sample components appropriately until required for testing
2. Perform tests	2.1. Select authorised tests that are indicated for the requested investigations 2.2. Conduct individual tests according to documented methodologies, applying required quality control procedures 2.3. Record all results, noting any phenomena that may be relevant to the interpretation of results 2.4. Seek advice of section head or other responsible colleague when result interpretation is outside parameters of authorised approval 2.5. Store unused samples, for possible future reference, under conditions suitable to maintain viability
3. Maintain a safe environment	3.1. Use established work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 3.2. Clean up spills using appropriate techniques to protect personnel, work area and environment from contamination 3.3. Minimise the generation of wastes 3.4. Ensure the safe disposal of biohazardous materials and other laboratory wastes in accordance with enterprise procedures
4. Maintain laboratory	4.1. Make entries on report forms or into computer systems, accurately recording or transcribing

ELEMENT	PERFORMANCE CRITERIA
records	required data as required 4.2. Maintain instrument logs as required by accreditation checklists 4.3. Maintain records of blood and blood products received, used and returned to supplier 4.4. Maintain security and confidentiality of all clinical information, laboratory data and records
5. Issue blood and blood products	5.1. Complete documentation required to permit the issuing of blood or blood components that have been cleared for use by clinical staff 5.2. Advise courier of transport requirements to ensure blood or blood products are delivered in a timely and safe manner

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- following the laboratory's validated and authorised procedures
- selecting and applying testing procedures in terms of the suspected or known nature of the antibody and its possible range of testing behaviours
- detecting and recording accurate evidence of blood group antigen and antibody reactions
- selecting, testing and issuing blood cleared for transfusion
- selecting and applying confirmatory tests as required
- selecting and issuing blood products for therapeutic or prophylactic use
- critically analysing information/documents and recognising problems in systems and documentation
- using enterprise information systems efficiently
- preparing documentation that is accurate, concise and in accordance with enterprise requirements
- managing tasks and organising work to ensure the timely release of blood and blood products
- using samples, reagents and materials economically and disposing of wastes safely
- using equipment safely

REQUIRED SKILLS AND KNOWLEDGE
• maintaining equipment, recording and report malfunctions appropriately
Required knowledge
Required knowledge includes: • scientific, medical, clinical, technical and workplace terminology relevant to normal and abnormal anatomy, physiology, biochemistry, immunology and immunohaematology • antigen antibody reactions • testing procedures for the determination of blood groups and the detection of antibodies • types of blood products and their use • validated and authorised procedures, as described in the laboratory's manual of procedures • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • perform tests accurately and organise work so that the needs of all relevant patients and clients are met in a timely fashion • detect and record accurate evidence of blood group antigen and antibody reactions • recognise problems in systems and documentation • use enterprise information systems efficiently • critically analyse information/documents • prepare documentation that is accurate, concise and in accordance with enterprise requirements • manage tasks and organise work to ensure the timely release of blood and blood products, as they complete routine tasks • use samples, reagents and materials economically and dispose of wastes safely

EVIDENCE GUIDE	
	• use equipment safely • maintain equipment, recording and report malfunctions appropriately.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL934002A Apply quality system and continuous improvement processes* • *MSL975002A Perform haematological tests*. Resources may include: • standard transfusion/immunohaematology laboratory with relevant equipment, samples and reagents • enterprise procedures, test methods and equipment manuals. Under duty of care requirements, off-the-job training providers should ensure that blood samples are known to be antibody free for hepatitis B and C, syphilis and human immunodeficiency virus (HIV), but this does not preclude the use of universal precautions in the use of blood samples.
Method of assessment	The following assessment methods are suggested: • review of results/data/records generated by the candidate • feedback from peers and supervisors that enterprise procedures were followed and that work is consistently performed in line with enterprise requirements • oral and/or written tests and paper problems associated with ABO group determination, antibody identification and record keeping • integrated assessment with a case focus, such as the routine pre-transfusion cross-match, an antenatal antibody detection and preliminary identification, batch of routine ABO and Rh(D) groups to be completed at the same time as completion of a pre-transfusion battery of tests. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly.

EVIDENCE GUIDE	
	Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** A patient's blood sample and request form have been brought to the laboratory. The patient is to undergo elective surgery the next afternoon. The technical officer has been asked by the supervisor to determine the patient's ABO and Rh(D) blood groups, to screen the sample for irregular blood group antibodies and to cross-match two units of packed red cells in readiness for possible use during or after surgery. The technical officer checks the records for information on the patient. Finding none, they prepare the required data in the laboratory databases and then perform the required tests. They do not detect any irregular antibody and have had no difficulty in choosing suitable units for cross-matching. They complete the required documentation and labels and then store the compatible blood units for possible later use.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

RANGE STATEMENT	
regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• cleaning, hygiene and personal hygiene requirements
	• enterprise procedures, standard operating procedures (SOPs) and operating manuals
	• guidelines, policies and business rules of the Australian Red Cross Blood Service that are operable from time to time
	• Human Tissue Acts and regulations operable in Australian jurisdictions
	• incident and accident/injury reports
	• instructions to comply with legislation, standards, guidelines and codes
	• *Guidelines for Pre-transfusion Testing*, published by the Australasian Society of Blood Transfusion
	• quality system and continued improvement processes
	• safety requirements for equipment, materials or products
	• sampling procedures (labelling, preparation, storage, transport and disposal)
	• schematics, work flow and, laboratory layouts

RANGE STATEMENT	
	• statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Equipment, **materials and systems**	Equipment, materials and systems may include: • centrifuges, light boxes, calibrated pipettes, water baths, incubators and microscopes • laboratory information management systems (LIMS), computer databases, record and filing systems • general laboratory glassware and equipment identified with a serology laboratory • antisera and phenotyped red cells and other relevant reagents • gel systems
Communication	Communication may involve: • supervisors and managers (laboratory, quality and customer service) • other laboratory or relevant medical or nursing personnel • patients and clients • external auditors, or accreditation agency (e.g. National Association of Testing Authorities (NATA)) • couriers
Occupational health and safety (**OHS**) **and environmental management requirements**	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection

RANGE STATEMENT	
	control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975007A Supervise sampling, inspections and testing at construction sites

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to supervise and direct the placement of materials such as soil, concrete and asphalt at a construction site. The unit involves confirming the requirements of the inspection and testing plans, liaising with site personnel and organising sampling and testing activities, collecting reliable data and reporting results. Personnel are also expected to interpret results in the field, provide reliable advice to construction personnel, recognise and rectify obvious errors or unexpected results and troubleshoot common problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers working in the construction materials testing sector. This unit of competency is typically performed by experienced technicians or engineering paraprofessionals, who often supervise or direct less experienced technical personnel. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL954001A	*Obtain representative samples in accordance with sampling plan*
	MSL973009A	*Conduct field-based acceptance tests for construction materials*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for on-site operations	1.1. Identify the job, consult with the client and obtain relevant information, including the level of supervision required, drawings and specifications 1.2. Select equipment and materials required for the job 1.3. Identify site hazards and the personal protective equipment and safety procedures specified for job 1.4. Organise site induction for self and support personnel as required 1.5. Record description of the job to be undertaken, compare with specification and resolve any

ELEMENT	PERFORMANCE CRITERIA
	variations 1.6. Select suitable transport for site access 1.7. Brief support personnel on job-specific requirements
2. Establish on-site operations	2.1. Consult with the site superintendent to determine methods of communication, roles, responsibilities and expectations of each party, including identification of potential problems and conflicts 2.2. Set up facilities for supervision, testing and sample storage 2.3. Inspect the site to determine the characteristics of the project, including survey control points 2.4. Design inspection, sampling and testing program in accordance with specifications
3. Supervise materials placement	3.1. Conduct inspection, sampling and testing in accordance with project requirements 3.2. Direct and advise the site superintendent based on test results and observations 3.3. Record test data and observations in accordance with enterprise practices 3.4. Remit samples to the base laboratory for testing as required 3.5. Ensure cleaning of equipment does not cause environmental damage 3.6. Supervise the removal of equipment and materials from site
4. Analyse project data and report to client	4.1. Report test results to site superintendent at specified intervals 4.2. Analyse project data and provide reports to client in the agreed format and at agreed times
5. Maintain enterprise records	5.1. Ensure site results are documented in accordance with enterprise practices 5.2. Maintain security and confidentiality of enterprise information 5.3. Prepare and issue a final project report detailing supervision and testing carried out, statement of compliance and relevant tables and plans as required
6. Promote a safe work environment	6.1. Promote the use of safe work procedures and protective equipment 6.2. Minimise environmental impacts of testing/sampling and generation of waste

ELEMENT	PERFORMANCE CRITERIA
	6.3. Promote the collection and disposal of all waste in accordance with enterprise procedures

Required Skills and Knowledge

Required skills include:

- identifying and describing materials used in civil construction
- directing materials placement operations
- reading and interpreting site plans, specifications and codes to determine sampling locations and frequencies
- identifying and locating sampling and testing sites and taking representative samples
- setting up and maintaining tools and equipment
- measuring and estimating elevations, lengths, areas and volumes
- observing and recording project information in writing, by sketching and photography
- using tools and equipment to perform required sampling and insitu testing
- working safely with equipment and around civil construction plant and sites
- driving safely on and off-road
- cleaning equipment before leaving site in compliance with environmental authority requirements
- handling, transporting and storing samples
- comparing test results with specifications
- resolving problems appropriately
- seeking advice about problems beyond technical competence from appropriate personnel
- report writing
- using computer software to create/maintain databases and produce detailed reports

Required knowledge

Required knowledge includes:

- engineering properties of civil construction materials relevant to job role
- techniques used in civil construction
- plant and equipment used in civil construction
- insitu and laboratory test methods and their application to various materials
- roles and responsibilities for different levels of supervision
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • direct sampling and testing in accordance with inspection and testing plans • compare test results with specifications and draw valid conclusions on compliance • communicate problems to appropriate personnel and resolve problems constructively.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical, additional assessment techniques must be used. This unit of competency may be assessed with: • *MSL915001A Provide information to customers* • *MSL915002A Schedule laboratory work for a small team* • *MSL925001AAnalyse data and report results*. Resources may include: • access to construction sites, tools, equipment and materials • enterprise procedures, sampling plans, test methods and equipment manuals.
Method of assessment	The following assessment methods are suggested: • inspection of workplace documents completed by the candidate • review of work outputs over a period of time to ensure accuracy, consistency and timeliness • feedback from peers and supervisors • use of suitable simulation and/or a range of case studies/scenarios.

EVIDENCE GUIDE	
	In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials (1)** A geotechnical consultancy company has been contracted to provide level-one supervision for a commercial development in accordance with *AS3798 - Guidelines on earthworks for commercial and residential developments*. This will involve the construction of roadways, building pads and parking areas for heavy vehicles. A senior technician has been placed in charge of the project with an experienced tester to assist with routine testing and supervision. The principal contractor has provided copies of specifications, drawings and local authority requirements for this type of project. The project will involve clearing and stripping, setting-out (by contract surveyors), cut-to-fill, drainage, sewer lines and other services and construction of roadways and building pads.The supervision will be carried out in accordance with local authority requirements. Testing will involve measuring insitu densities of fill (including trench backfill) and road base materials. California Bearing Ratio (CBR) tests will be used as an aid in determining pavement thicknesses. Additional tests will be used to monitor the quality of pavement materials supplied from a local quarry. This will involve both on-site and off-site testing and require liaison with off-site personnel to ensure that the testing is timely and

EVIDENCE GUIDE	
	as specified. Based on test results and direct observations, the technician is able to direct and advise the contractor's operators so that the materials are correctly placed and compacted. Test locations are marked on drawings and sketches and photographs used to record details of the project. Detailed daily records are used to prepare monthly reports for the contractor, accompanied by test certificates. Office staff use this information to invoice the client. The technician monitors the project to avoid exceeding the project budget. When the project is finished, the technician prepares a completion report, including all test results, site observations and a scale drawing showing all filled areas and reviews the information as a guide to planning and costing future projects. **Construction materials** (**2**) A concrete supply company has been contracted to provide supervision and technical support for a high-rise commercial development. This will involve pumping concrete for placement up to forty floors. A senior technician has been placed in charge of the project with an experienced tester to assist with routine testing and supervision. The principal contractor has provided copies of specifications and drawings. The project will involve supervising the placement of concrete. Testing for consistency will be required for each truckload. Compressive strength cylinders and a flexure beam will be required for every fifth truckllload and a shrinkage bar for each day's production.This will involve both on-site and off-site testing and require liaison with off-site personnel to ensure that the testing is timely and as specified. Based on test results and direct observations, the technician is able to direct the batch plant how to adjust the mix to improve its pumpability and advise the contractor's operators so that the materials are correctly placed and compacted. **Construction materials** (**3**) Anasphalt supply company has been contracted to provide supervision and technical support for a runway upgrade at a major regional airport. This will involve laying asphalt so that airport operations are not impeded. A senior technician has been placed in charge of the project with an experienced tester to assist with routine testing and supervision. The principal contractor has

EVIDENCE GUIDE	
	provided copies of specifications and drawings and a Gantt chart showing the critical stages of the project. Testing for asphalt temperature will be required for each truckload. Nuclear density tests and core samples will be required for each lot.This will involve both on-site and off-site testing and require liaison with off-site personnel to ensure that the testing is timely and as specified. Based on test results and direct observations, the technician is able to advise the contractor's operators so that the materials are correctly placed and compacted.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **Procedures and/or enterprise requirements may include**:	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• environmental legislation and regulations
	• equipment manuals
	• equipment startup, operation and shutdown procedures

RANGE STATEMENT	
	• industry codes of practice • material, production and product specifications • National Association of Testing Authorities (NATA) documents regarding construction materials testing • occupational health and safety (OHS) national standards and codes of practice • production and laboratory schedules • quality manuals • standard operating procedures (SOPs)
Tools and equipment	Tools and equipment used may include: • sampling equipment including moulds and coring equipment • hand tools, including shovels, crowbars, scoops, spanners, wrenches and tape measure • consumables, including sample bags and labels • documentation, including maps, plans, contract documents and worksheets • field test equipment, including nuclear moisture/density gauge, dynamic cone penetrometers and slumping equipment • still/video camera • two-way radio and mobile telephone • levelling equipment and global positioning system (GPS) receiver
Site hazards	Site hazards may include: • solar radiation, dust and noise • manual handling of heavy materials and equipment • falling objects, slips, trips and fall hazards • vehicular and pedestrian traffic
Safety procedures	Safety procedures may include: • use of material safety data sheets (MSDS) • use of personal protective equipment, such as hard hats, hearing protection, sunscreen, gloves, masks, goggles, coveralls, safety boots and high visibility clothing • handling, and storage of hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise

RANGE STATEMENT	
	procedures and regulations • regular cleaning of equipment and vehicles • machinery guards • signage, barriers, flashing lights and traffic control
Typical problems	Typical problems include: • uncooperative site personnel • non-conformances leading to confrontation with other personnel • delays in obtaining test results • damage to services, materials and site conditions • displaced, missing and inaccurate survey markers • misidentification of samples and sampling locations • equipment breakdown and breakage • environmental problems and issues, including site access, inclement weather, traffic, wildlife, vegetation and construction activities
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975008A Apply electrophoretic techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using electrophoretic techniques. The unit also includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technical officers working in all industry sectors. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe their scope of permitted practice, including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973002A	*Prepare working solutions*
		OR
	MSL974001A	*Prepare, standardise and use solutions*
	MSL974003A	*Perform chemical tests and procedures*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with specification and record and report discrepancies

ELEMENT	PERFORMANCE CRITERIA
	1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks for analytical portion
3. Set up and optimise instrument	3.1. Perform pre-use and safety checks in accordance with enterprise procedures 3.2. Start up and condition the instrument using enterprise procedures 3.3. Optimise instrumental parameters to suit sample and test requirements 3.4. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable data 4.3. Return instruments to standby or shutdown condition as required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations 5.3. Record results with the appropriate accuracy, precision and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to

ELEMENT	PERFORMANCE CRITERIA
	be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting client requests, test methods and procedures
- setting up and shutting down equipment safely and following enterprise procedures
- checking the calibration/qualification status of equipment
- preparing standards and samples
- choosing and optimising procedures and equipment settings to suit sample/test requirements
- operating equipment to obtain valid and reliable data
- making approved adjustments to procedures for non-routine samples
- recognising atypical data/results
- identifying potential sources of uncertainty
- troubleshooting common analytical procedure and equipment problems
- applying theoretical knowledge to interpret data and make relevant conclusions
- calculating, recording and reporting data/results in accordance with enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- followingoccupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)

REQUIRED SKILLS AND KNOWLEDGE
Required knowledge
Required knowledge includes: • electrophoretic principles and concepts related to instrumentation operation, material preparation and testing • handling of unstable or hazardous chemicals or samples and/or the fragile/labile nature of biological material • sample preparation procedures • function of key components of the equipment • use of different electrophoresis procedures for analysis of specific samples • effects on results of modifying instrumental variables, such as field strength, constant current and constant power • procedures for optimising separation through changing operation parameters, such as buffers, pH and detection methods • basic procedure and equipment troubleshooting procedures • preparation and use of calibration charts and/or standards • calculation procedures to give results in appropriate precision, units and uncertainty • basic equipment maintenance procedures • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example: Biomedical and environmental services: • techniques that capitalise on biological properties to assist in electrophoretic separations

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Assessors should ensure that candidates can:

EVIDENCE GUIDE	
competency in this unit	• interpret client requests, test methods and procedures accurately • safely set up and shut down equipment using enterprise procedures • check the calibration/qualification status of equipment • prepare standards and samples appropriately • choose and optimise procedures and equipment settings to suit sample/test requirements • operate equipment to obtain valid and reliable data • make approved adjustments to procedures for non-routine samples • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • apply theoretical knowledge to interpret data and make relevant conclusions • record and report data/results in accordance with enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*. Resources may include: • standard laboratory equipped with routine electrophoresis equipment, laboratory reagents and equipment • SOPs and testing methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results • inspection of test records and workplace documentation completed by the candidate • feedback from peers and supervisors • observation of candidate applying a range of electrophoretic techniques

EVIDENCE GUIDE	
	• oral or written questioning of chemical principles and concepts, electrophoretic techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental** The advent of DNA typing in the mid-1980s has enormously increased the ability of forensic technicians to identify individuals uniquely by testing a variety of their body fluids found at the crime scene. The samples obtained from the scene are first treated to extract the DNA with short tandem repeated (STR) markers. After isolating the DNA from its cells, specific regions are copied by the polymerase chain reaction (PCR). The resulting PCR products are then separated and detected in order to characterise the STR region being examined. The most common separation methods used today are slab gel and capillary electrophoresis (CE). Given the enormous number of DNA samples to be processed, technicians frequently run fully automated injection, separation and detection stops. They use computerised data acquisition to enable rapid analysis and subsequent searching of digital storage of DNA results. **Food processing**

EVIDENCE GUIDE	
	Technicians who work in the food and beverage processing industries regularly monitor the purity of food additives, such as dyes and colouring agents in products, such as sweets and soft drinks. For example, technicians may sample a batch of soft drink by low temperature evaporation of a known percentage of the water and then subject the remains to electrophoresis separation technique. In this way, both the identification and concentration of a dye (or other additive) present in the soft drink can be determined. Technicians may also be required to examine the electrophoresis results for any indication of harmful or toxic impurities, which may have inadvertently contaminated the product. Quality control and use of appropriate standards are important components of these analytical procedures.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements may include**:	• Australian and international standards, such as: • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS 2243 Set:2006 Safety in laboratories set • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements • AS/NZS ISO 14000 Set:2005 Environmental management standards set • AS/NZS ISO 9000 Set:2008 Quality management systems set

RANGE STATEMENT	
	• AS ISO 1000-1998 The international system of units (SI) and its application • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise procedures, SOPs and operating manuals • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • incident and accident/injury reports • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Electrophoretic methods, **including both analytical and preparative procedures**	Electrophoretic methods, including both analytical and preparative procedures, may use: • vertical or horizontal apparatus • support materials, such as cellulose acetate • gels, such as agarose and polyacrylamide • buffer solutions

RANGE STATEMENT	
	• denaturing electrophoresis, such as SDS-PAGE • blot transfer procedures in conjunction with electrophoresis, such as Western and Southern Blot transfers, agarose and polyacrylamide DNA gels • capillary electrophoresis
Preparation of sample	Preparation of sample may include pre-treatment processes, such as: • identification of any hazardous properties associated with the samples and/or analytical chemicals • grinding, dissolving, extraction, centrifuging, refluxing, evaporation, washing and drying • determination of and, if appropriate, removal of any contaminants, impurities or interfering substances
Tests	Tests may include methods for: • control of starting materials, in-process materials and finished products (e.g. food and manufacturing) • therapeutic drug analysis • forensic testing • diagnostic pathology tests • determination of chemical analytes • special conditions for handling minute sample volumes • environmental monitoring • problem solving techniques for non-routine samples • troubleshooting enterprise processes
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • problems with interfering substances • inappropriate support material or operating procedures • toxic or hazardous materials, including impurities in samples • lack of suitable or high purity reference standards • changes in operating variables, such as field strength, constant current, constant power,

RANGE STATEMENT	
	buffers and pH • problems with obtaining adequate sample volume

Hazards	Hazards may include:
	• electric shock
	• biohazards:
	  • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids
	  • mycotoxins
	• chemicals:
	  • acrylamide
	  • acids (e.g. sulphuric, perchloric and hydrofluoric)
	  • hazardous materials, heavy metals, pesticides
	• sharps and broken glassware
	• aerosols from broken centrifuge tubes and pipetting
	• flammable liquids and gases
	• cryogenics, such as dry ice and liquid nitrogen
	• sources of ignition
	• disturbance or interruption of services

Addressing hazards	Addressing hazards may involve: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods and direct extraction of vapours and gases • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • use of Class PCII, PCIII and PCIV physical containment laboratories • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions

RANGE STATEMENT	
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975009A Apply routine chromatographic techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using routine chromatographic techniques. The unit also includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technical officers working in all industry sectors. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974003A	*Perform chemical tests and procedures*
		OR
	MSL974004A	*Perform food tests*
		OR
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*
		AND
	MSL973002A	*Prepare working solutions*
		OR
	MSL974001A	*Prepare, standardise and use solutions*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the

unit of competency.	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with specification and record and report discrepancies 1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks for analytical portion
3. Set up and optimise instrument	3.1. Perform pre-use and safety checks in accordance with enterprise procedures 3.2. Start up and condition the instrument using enterprise procedures 3.3. Optimise instrumental parameters to suit sample and test requirements 3.4. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable data 4.3. Return instruments to standby or shutdown condition, as required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations

ELEMENT	PERFORMANCE CRITERIA
	5.3. Record results with the appropriate accuracy, precision and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security and confidentiality of laboratory data and enterprise information 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • interpreting client requests, test methods and procedures • setting up and shutting down equipment using enterprise procedures • checking the calibration/qualification status of equipment • preparing standards and samples

REQUIRED SKILLS AND KNOWLEDGE

- installing and maintaining a variety of chromatographic columns
- choosing and optimising procedures and equipment settings to suit sample/test requirements
- operating equipment to obtain valid and reliable data
- making approved adjustments to procedures for non-routine samples
- recognising atypical data/results
- identifying and calculating potential sources of uncertainty
- troubleshooting common procedure and equipment problems
- applying theoretical knowledge to interpret data and makes relevant conclusions
- recording and reporting data/results in accordance with enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- followingoccupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- chromatographic principles and concepts related to instrumentation operation, material preparation and testing
- handling of unstable or hazardous chemicals and samples and/or the fragile/labile nature of biological material
- sample preparation procedures
- use of chromatographic techniques for qualitative and quantitative analysis
- function of key components of the instrument
- use of different chromatographic methods for analysis and preparation of specific samples
- effects on outputs and results of modifying instrumental variables (e.g. injection temperature, gas flow rate, column pressures, column type and detector type)
- procedure for optimising separation through changing operation parameters (e.g. injection technique, solvent type, sample size and sample preparation)
- basic procedure and equipment troubleshooting techniques
- preparation and use of calibration charts and/or standards
- calculation steps to give results in appropriate precision and units
- enterprise and/or legal traceability requirements
- basic equipment maintenance procedures
- relevant health, safety and environment requirements

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Biomedical and environmental services:

- techniques that capitalise on biological properties to assist in chromatographic

REQUIRED SKILLS AND KNOWLEDGE
separations

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • safely set up and shut down equipment using enterprise procedures • check calibration/qualification status of equipment • prepare standards and samples appropriately • install and maintain a variety of chromatographic columns • choose and optimise procedures and equipment settings to suit sample/test requirements • operate equipment to obtain valid and reliable data • make approved adjustments to procedures for non-routine samples • recognise atypical data/results • troubleshoot common procedure and equipment problems • apply theoretical knowledge to interpret data and makes relevant conclusions • record and report data/results in accordance with enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*.

EVIDENCE GUIDE	
	Resources may include: • standard laboratory equipped with routine chromatographic equipment, laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results • inspection of test records and workplace documentation completed by the candidate • feedback from peers and supervisors • observation of candidate applying a range of routine chromatographic techniques • oral or written questioning of chemical principles and concepts, chromatographic techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Technicians who conduct chemical synthesis frequently use chromatographic methods such as thin-layer chromatography (TLC), gas chromatography (GC), high performance liquid chromatography (HPLC) and other

EVIDENCE GUIDE	
	instrumental techniques to check the identity and purity of the material they have produced. For example, a technician reacted an amine with acetic anhydride to form the acylated amine to prepare a pilot batch of material for a new application. After completing the reaction, the technician collected the product in a Buchner funnel using vacuum assisted filtration, and used chromatographic techniques to purify the material. The product was then analysed by HPLC using a number of stationary phases and solvent systems. In each case, a reference standard was run. These tests confirmed the identity and purity of the material. **Biotechnology** Technicians in research facilities often prepare a protein by extracting it from tissue. This extraction process introduces impurities that must be removed before the purified protein is ready for use or the characterisation of its purity and molecular weight. Impurities such as salt, detergents and other proteins are sequentially removed by passing the protein extract through gel filtration columns of differing grades of chromatographic gel. For antibodies, the final column used is an affinity chromatography column. Demonstration of the purity of the protein is by the presence of one single band on an SDS-PAGE gel. The molecular weight of the protein can also be determined from the SDS gel. **Environment** An environmental protection authority was required to sample an oil slick off Australia's coast and to take oil samples from all ships which docked in Australian ports in the 48 hours after the discovery of the oil slick. The samples were analysed by column chromatography and compared with the oil slick 'finger print' of the oil samples from all ships which may have been in the area of the oil slick. Given that the analysis involved unknown oil samples and the results would be used in court proceedings, the analysts were careful to optimise the chromatographic system for the unknown samples, ensure that appropriate quality and control procedures were employed and that the sample and analyses were performed quickly before potentially polluting ships left Australian waters. The analysts were careful to ensure that all record keeping procedures would be able to stand up to court scrutiny.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• calibration and maintenance schedules
	• cleaning, hygiene and personal hygiene requirements
	• data quality procedures
	• enterprise procedures, SOPs and operating manuals

RANGE STATEMENT	
	• enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • incident and accident/injury reports • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Routine chromatographic techniques	Routine chromatographic techniques include both analytical and preparative procedures, and may include: • standard sample introduction systems • paper such as ascending and descending • thin-layer such as ascending, high performance, radical and descending • column chromatography • affinity chromatography and gel filtration chromatography • gas liquid and gas solid chromatography • high performance liquid chromatography, such as liquid-liquid (LLC), liquid-solid (LSC), ion (IC) and size exclusion (SEC)
Tests	Tests may include methods for:

RANGE STATEMENT	
	• control of starting materials, in-process materials and finished products (e.g. manufacturing, petroleum and biotechnology) • selection of appropriate separation technique, such as suitable substrate and support solvent, buffer, temperature, flow rate, column length and detection method • forensic testing • environmental monitoring of pollutants in air, water and soil • troubleshooting enterprise processes
Sample preparation	Sample preparation may include: • identification of any hazards associated with samples and/or analytical chemicals • grinding, dissolving, extraction, filtration, refluxing, centrifuging, evaporation, washing and drying • determination of and, if appropriate, removal of any contaminants, impurities or interfering substances
Common procedure and equipment problems	Common procedure and equipment problems may include: • problems with interfering substances • poor resolution of peaks • inappropriate selection of column or operating parameters (flow rate and temperature) • unsuitable substrate or support solvent • lack of suitable reference standards
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • transformed cultures/organisms and genetically altered organisms • chemicals, such as acids, phenol, benzene and ammonium persulphide • sharps and broken glassware • sources of ignition and hot surfaces, such as burners

RANGE STATEMENT	
	• aerosols from broken centrifuge tubes and pipetting • flammable liquids and gases (e.g. hydrogen) • cryogenics such as dry ice and liquid nitrogen • disturbance or interruption of services
Addressing hazards	Addressing hazards may involve: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • use of personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and waste gases • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • use of Class PCII, PCIII and PCIV physical containment laboratories • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975010A Perform fire assay techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to safely extract a range of precious metals from their host matrices in readiness for analysis. The unit also covers the ability to select and/or modify laboratory methods to suit particular ores and to ensure total recovery.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel working in the mineral assay industry sector. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL954002A	*Prepare mineral samples for analysis*
		OR

Prerequisite units		
	MSL973011A	*Perform fire pouring techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Classify ore samples and select fluxing method	1.1. Review client request to identify sample/analysis requirements, preparation methods and equipment involved 1.2. Inspect samples, compare with specifications, record and report any discrepancies 1.3. Conduct visual and simple chemical tests to identify the type of sample and sulphide concentrations 1.4. Review client sample/analysis history and identify possible chemical interferences 1.5. Decide whether non-standard fluxing is required 1.6. Select sample weight and flux to optimise precious metal recovery and purity
2. Prepare for precious metal recovery	2.1. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and equipment 2.2. Examine the recommended preparation method to

ELEMENT	PERFORMANCE CRITERIA
	identify the critical steps that will affect the quality of analytical results 2.3. Plan parallel work sequences to optimise the throughput of multiple sets of samples 2.4. Assemble all required equipments, materials, reagents and check they are fit for purpose
3. Recover precious metals from ore sample	3.1. Weigh required amounts of sample and flux components to achieve an acceptable button and fluid slag 3.2. Select the type and size of pot to suit sample method and client requirements 3.3. Mix charge to ensure homogeneity and optimal collection of precious metal 3.4. Set and monitor furnace temperature/time to ensure complete fusion 3.5. Separate slag and button with minimal loss of lead collector 3.6. Maintain sequencing in order to track samples, buttons and prills throughout the recovery process 3.7. Separate lead collector from the required precious metal and check for contamination, losses and evidence of other precious metals 3.8. Minimise personal exposure to hazards and the release of collectors to the work environment 3.9. Collate laboratory documentation and the prepared sample and present for analysis
4. Troubleshoot and correct failed recovery	4.1. Monitor all stages of recovery for indicators of potential loss 4.2. Recognise undesirable recovery conditions and decide whether the process requires correction 4.3. Choose an appropriate corrective action and restart the process 4.4. Document any adjustments made to standard methods and re-sequencing of samples 4.5. Seek advice when problems are beyond scope of responsibility or knowledge
5. Perform daily maintenance of assay equipment	5.1. Segregate and dispose of wastes in accordance with enterprise requirements 5.2. Grade and inspect pots using established criteria prior to storage for re-use 5.3. Inspect furnaces for cracks, unserviceable

ELEMENT	PERFORMANCE CRITERIA
	components and remove slag 5.4. Inspect and clean extractive systems 5.5. Report defective equipment and consumable requirements to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • planning and optimising throughput of multiple samples • accurately weighing samples and flux components • safely handling heavy/hot items of equipment and hazardous chemicals • hand-eye coordination during pouring and knocking up buttons • recognising and identifying the cause of non-acceptable received and fused samples, buttons and prills • adjusting recovery methods to solve recovery and contamination problems
Required knowledge

Required knowledge includes:
• chemical and physical principles relating to:
  • fusion of mineral ores
  • cupellation
  • parting and digestion processes
• expected physical and chemical properties of materials at each recovery stage
• standard methods for the fire assay of a range of precious metal ores
• hazards and effects of absorption of chemical reagents
• control measures and operation of safety equipment
• function and operation of assay/equipment
• enterprise and/or legal traceability requirements
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • recognise hazards and work safely at all times • interpret, follow and adjust (as necessary) standard recovery methods • maintain close attention to technical and safety requirements in a physically demanding/hazardous environment • maintain sequential control of samples through all recovery stages • optimise work flow to ensure efficiency of recovery for multiple client samples • identify indicators of poor recovery • apply a knowledge of mineral chemistry and fire assay techniques to select and implement logical corrective actions to improve recovery rates • minimise rework, waste and environmental impacts • dispose of all waste responsibly.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL975020A Apply routine spectrometric techniques*. Resources may include: • a variety of precious metal ore samples • fire assay methods • fire assay equipment, materials and reagents • safety equipment.
Method of assessment	The following assessment methods are suggested: • review of quality control performance and analytical results traceable to assay samples prepared by the candidate • review of workplace documentation prepared by the candidate

EVIDENCE GUIDE	
	• feedback from peers, clients and supervisors • written/oral questioning about precious metal recovery steps, typical problems and corrective actions. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting. **Mineral processing** A fire pourer has noticed a large amount of fine lead shot in the bottom of a pot and seeks advice from the fire assayer. The assayer examines the pot closely and notices a lime green slag colour on the inside of the pot and on the lead button. He/she identifies this as a possible 'chromite' problem and explains that the darker the lime green colour is, the higher the chromium contamination. He/she explains to the pourer that there are two ways of dealing with this problem. The first is to reduce the sample weight to ~5g (for >10% chromite) or to develop its own special flux that has low litharge and silica to ensure that the sample is properly reduced. Because there is no history of regular chromite problems with this particular client's samples, he/she decides that a special flux is not warranted and tells the pourer to reduce the charge weight and to ensure that the components are very well mixed. He/she gives the pourer clear instructions for conducting the repeat assay and documents how the sample was treated.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 3988-1991 Copper, lead, zinc, gold and silver ores - Guide to sample preparation for the determination of gold
	  • AS 3895.1-1991 Methods for the analysis of copper, lead, zinc, gold and silver ores - Determination of gold (Fire assay-Flame AAS method)
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• enterprise sampling procedures for specific samples, sites and clients
	• environmental legislation and regulations
	• equipment manuals and warranties, supplier catalogues and handbooks
	• equipment startup, operation and shutdown procedures

RANGE STATEMENT	
	• industry codes of practice • material safety data sheets (MSDS) • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, training manuals and induction manuals • standard operating procedures (SOPs) and published preparation methods
Samples	Samples may include: • solids, such as rocks, minerals, soils, sands and stream sediments • core and other drill samples (rotary air blast (RAB), reverse circulation (RC) and aircore) • slurries, powder concentrates and metallurgical solutions • dump samples and grab samples
Client requests/documentation	Client requests/documentation may include: • client profile, sample identification, sample receipt, storage and analyses • required preparation method/and service charges
Assay equipment	Assay equipment may include: • mixing equipment and balances • fusion and muffle furnaces and associated spares • temperature sensors and hotplates • compressed air service, extraction systems and fuel supply lines • pots, cupels, pouring equipment, pot loader, trolleys, moulds, tongs and hammers
Hazards	Hazards may include: • dust, silica, slag, glass shards and molten flux • chemicals, such as hydrofluoric acid, bromine, perchloric acid, aqua regia, cyanide, lead-based compounds, free-mercury and nickel compounds • noise and vibration

RANGE STATEMENT	
	• crushing, entanglement and cuts associated with moving machinery • manual handling of heavy loads, such as pots, racks and trolleys • heat exhaustion/stress and fatigue
Safety equipment and procedures	Safety equipment and procedures may include: • ensuring access to service shut-off points, fire extinguishers/fire hose, safety shower/eye wash stations and first aid station • recognising and observing hazard warnings and safety signs • labelling of samples, reagents and hazardous materials • direct extraction and fumehoods • guards for moving machinery parts • noise insulation • using personal protective equipment, such as dust masks, heat resistant mittens, safety face shields with tinted visor, coats, ear muffs, safety boots, heat reflective clothing and latex gloves for flux handling • following established manual handling procedures • regular cleaning of equipment and work areas using enterprise procedures • reporting of abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gasses, smoke, vapour, fumes, odour and particulars to appropriate personnel

Fluxes	Fluxes may include:
	• bulk fluxes containing PbO, borax, soda ash, silica, silver nitrate and flour
	• non-standard flux additives:
	  • flour (oxidising samples)
	  • nitre (reducing samples, sulphides)
	  • silica (basic ores)
	  • PbO (siliceous ores)
	• exotic additives, such as CaF_2 (refractory ores)
	• NiS ($NiCO_3$, sulphur, borax and soda ash)

RANGE STATEMENT	
Pots	Pots may include: • ceramic, acidic/basic, alumina, zirconia and graphite
Sequencing of pots in a rack	Sequencing of pots in a rack may include: • addition of silver wire • addition of coloured salts (e.g. copper (Cu)) • position of reagent blanks, standards, check samples
Collectors	Collectors may include: • lead (Pb), nickel sulphide (NiS), bismuth (Bi) and tin (Sn)
Criteria for an 'acceptable' button	Criteria for an 'acceptable' button could include: • one piece, mass >20g and <50g • malleable • separates cleanly from slag • free of undecomposed ore, matte and speiss
Separation of collectors	Separation of collectors may include: • cupellation • digestion • parting, annealing and weighing for a gravimetric finish
Contamination	Contamination may be caused by: • poorly made cupels • base metals (copper (Cu), nickel (Ni), zinc (Zn) and bismuth (Bi)) • arsenic (As), sulphur (S), antimony (Sb), selenium (Se), tellurium (Te) and chromium (Cr) • scoria • sprouting
Documentation	Documentation may include: • pour sheets (date, time, client, pour number and preparation method) • number of pots, positions of sample, blank and check in rack • adjustments made to standard preparation methods for specific samples

RANGE STATEMENT	
	• analytical method • assay data
Indicators of potential loss and the corrective action	Indicators of potential loss and the corrective action may include: • viscous slag - check furnace temperature, adjust flux and lower charge weight • lead shotting - adjust flux and lower charge weight to compensate for high oxides, silicates and chromites • sulphides - adjust fusion time and adjust sample weight and/or flux • matte, speiss - adjust sample weight and flux • incomplete fusion - adjust sample weight and/or flux • unacceptable button - adjust sample weight and/or flux • inquartation - add 3 parts silver (Ag) to prill, wrap in lead foil and re-cupel
Waste	Waste may include: • rejected pots and cupels • slag and furnace material • disposable personal protective equipment
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975011A Design and supervise complex environmental field surveys

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to design and supervise complex field surveys for a wide range of environmental systems. This unit covers confirming survey requirements, designing and organising field surveys to achieve their purpose and supervising the field survey according to a defined plan.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers working in the environmental industry sector. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL974007A	*Undertake environmental filed-based monitoring*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Confirm survey requirements with senior staff	1.1. Confirm the purpose and objectives of the field survey activities with senior management and the level/detail of information required 1.2. Clarify with all stakeholders the purpose and objectives of the field survey activities within the context of the enterprise's overall environmental program 1.3. Identify and accurately interpret all external statutory requirements and enterprise protocols that relate to the defined field survey activities 1.4. Analyse drivers and constraints that may influence field survey activities 1.5. Document the type, quantity and quality of data needed to meet the defined objectives 1.6. Refine and document the detailed objectives of the

ELEMENT	PERFORMANCE CRITERIA
	field activities with senior management and key stakeholders
2. Design field survey activities	2.1. Develop and document details of the field survey methodology and, if appropriate, trial and refine them under field conditions 2.2. Discuss and confirm survey methodology with senior staff and external experts or stakeholders, as appropriate 2.3. Develop work program, including timetable and staff roles and responsibilities for the total field survey and all related activities 2.4. Ensure that work program conforms to enterprise requirements covering risk management, data quality procedures, safety, environmental and emergency requirements 2.5. Document work program, address all administration requirements and obtain appropriate approvals
3. Identify resources and supervise pre-survey checks	3.1. Identify and list all resources required to implement the agreed work program 3.2. Arrange collection and checking of all equipment, field instruments, and supplies required for implementation of the work program 3.3. Supervise calibration of all appropriate field instruments 3.4. Arrange correct packaging and transportation of equipment and instruments 3.5. Ensure that all access, transport, communication and emergency systems have been arranged and are suitable for all field locations and activities
4. Supervise field survey activities	4.1. Supervise all field survey and associated activities 4.2. Monitor equitable duty rosters covering field surveys activities in consultation with all staff 4.3. Ensure that all data quality procedures are followed 4.4. Ensure that all survey work is performed safely and with minimal impact on the environment
5. Supervise close down of field activities	5.1. Arrange for the checking, packaging and transportation of all samples, equipment, and instruments back to base 5.2. Ensure that site is left in accordance with enterprise and environmental requirements 5.3. Monitor dispatch of collected samples for

ELEMENT	PERFORMANCE CRITERIA
	subsequent laboratory analyses 5.4. Ensure before final storage that all equipment and instruments are tested and decontaminated, as necessary 5.5. Ensure all field data is stored appropriately for subsequent analysis 5.6. Report results, any anomalies and recommendations to data analysers, users and/or supervisor

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- selecting and applying appropriate field survey practices
- identifying and using equipment and instruments
- sample collection, preservation, labelling, packaging, storage and transportation
- project management
- communicating effectively with senior staff and stakeholders
- modifying existing field survey protocols
- supervising junior staff
- developing, documenting and supervising field survey work programs
- managing day-to-day field surveys and associated activities
- adapting field activities to suit changing circumstances
- completing field survey planning and documentation
- communicating specific activities to all relevant staff as part of the total field survey work program
- negotiating effectively with staff and stakeholders and resolving conflict

Required knowledge

Required knowledge includes:

- understanding of the purpose and objectives of the activity including:
  - information and analysis required
  - end users of information
  - significance of outcomes for broader programs

REQUIRED SKILLS AND KNOWLEDGE
• rights and responsibilities of employers and employees • enterprise legal requirements regarding field survey activities • enterprise risk-management requirements • field survey protocols • specific field survey practices and techniques • correct terminology relevant to the defined field survey activity • data quality procedures • survey principles and practices • field safety, environmental and emergency requirements • data recording and storage methods • environmental planning and assessment procedures • current developments in field instrumentation, survey equipment and communication systems • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can:
	• demonstrate understanding of the purpose and objectives of the activity including:
	  • information and analysis required
	  • end users of information
	  • significance of outcomes for broader programs
	• demonstrate understanding of the rights and responsibilities of employers and employees in terms of the following:
	  • enterprise legal requirements regarding field survey activities
	  • enterprise data quality procedures
	  • enterprise field safety procedures
	  • riskmanagement requirements
	  • enterprise field emergency plans

EVIDENCE GUIDE	
	• enterprise environmental requirements • field survey protocols • communicate effectively with senior staff and stakeholders • modify existing field survey protocols • supervise junior staff, where appropriate • develop, document and supervise field survey work program • manage day-to-day field surveys and associated activities • adapt field activities to suit changing circumstances • complete field survey planning and documentation clearly and accurately within specified time frame • accurately communicate to all relevant staff their specific activities as part of the total field survey work program • negotiate effectively with staff and stakeholders and resolve conflicts, where possible.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL935004A Maintain instruments and equipment*. Resources may include: • legislation, regulations, codes of practice, enterprise procedures and field protocols • vehicles, survey equipment, sampling/monitoring equipment, consumables and manuals.
Method of assessment	The following assessment methods are suggested: • review of environmental field survey plan designed by the candidate • observation of fieldwork performed by the candidate with a focus on: • field survey practices and procedures • accurate data recording and reporting • safety, emergency and environmental impact assessment associated with survey activities • communication techniques • general pre-survey site reconnaissance • feedback from peers and supervisors that relevant

EVIDENCE GUIDE	
	enterprise procedures were clearly and accurately followed • feedback from stakeholders that consultation and outcomes met their needs, where appropriate • oral and written questions to assess underpinning knowledge • simulation exercises to observe general field survey preparation, accident situations and emergency responses. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental (1)** An environmental officer is asked to design and supervise a series of field surveys covering soils, flora, fauna and water quality. Part of the study area is potentially high in nature conservation value with the rest of the area being considered for low density residential development. The aim of the study is to determine which parts of the study area should be set aside for protected open space and, if so, to develop an environmental management plan based on the results of the field surveys. **Environmental (2)** A technical officer is part of a team preparing an environmental impact statement (EIS) for a large

EVIDENCE GUIDE	
	industrial site. The technical officer is responsible for supervising all associated field surveys. They need to understand the requirements of the relevant environment protection legislation and local environment department, full details of all field surveys and associated enterprise procedures and how to present data so that it can be efficiently incorporated into the draft EIS. Based on this information the technical officer prepares a detailed work plan, and associated timeline, which identifies all field survey activities and associated resources. They are also careful to identify all quality assurance requirements. The draft EIS report is reviewed closely by management before its release given the level of public interest and the possibility of court action sometime in the future.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • animal welfare codes and ethics committee approval • codes of practice and field protocols • consultation (e.g. with traditional owners) • data quality assurance procedures • emergency plans • environmental audits • environmental impact assessment procedures • environmental protection and conservation legislation

RANGE STATEMENT	
	• environmental standards (e.g. air, water and noise) • existing plans covering environmental field activities • field survey plans • fieldwork procedures and standard operating procedures (SOPs) • industry based protocols • national environment protection measures • occupational health and safety (OHS) national standards and codes of practice • permits for access to land (e.g. Aboriginal reserves) • permits for wildlife capture and handling • policies and statutory requirements • risk management plans • safety and accident/injury plans
Field survey activities	Field survey activities may include: • meteorology • geology • soils • hydrology • geomorphology • water quality • noise • vegetation • wildlife • climate • land uses • land resources • agriculture • forestry • mining • conservation • recreation
Clients and stakeholders	Clients and stakeholders may include: • Commonwealth, state/territory and local government agencies • organisation with monitoring and/or survey responsibilities

RANGE STATEMENT	
	• regulatory authorities • private companies • developers
The purpose or objective of the field survey	The purpose or objective of the field survey may include: • part of enterprise environmental management plan • statutory requirements • environmental impact assessment for major development • environment audit • pollution control activity • general environmental and ecological surveys • research studies
Drivers and constraints	Drivers and constraints may include: • political agendas, social and economic issues • new field survey protocols or codes of practice • recent judicial decisions • recent environmental impact assessments or audits • media or public concerns • field safety or accident/incident issues • competencies and availability of staff • time available to design and implement field activities
Hazards	Hazards may include: • solar radiation, dust and noise • personnel getting lost • accidents, emergencies and incidents, such as snake, insect or animal bites • exposure to severe weather conditions • manual handling of heavy objects • power tools, generators and moving machinery • vehicle and boat handling in rough/remote conditions
Safety procedures and control measures	Safety procedures and control measures may include: • use of personal protective equipment, such as sunscreen, hats, safety glasses, gloves,

RANGE STATEMENT	
	coveralls and safety boots • 'stay with vehicle' and other survival techniques • regular communication schedule • global positioning system (GPS), maps and aerial photos • handling, storage and disposal of all hazardous materials/waste in accordance with material safety data sheets (MSDS), labels, enterprise procedures, codes and regulations
Administrative requirements and approvals	Administrative requirements and approvals may include: • travel requisitions • authority for use of vehicles and equipment • insurance • permits
Field survey resources	Field survey resources may include: • staff with appropriate competencies • transport systems (e.g. vehicles, boats and aircraft) • navigation and communication equipment • sampling and monitoring equipment • standard and specialised monitoring equipment • survey equipment • general field monitoring and/or field testing equipment • first aid and/or survival kits and equipment • consumables
Field instruments and equipment	Field instruments and equipment may include: • samplers (e.g. air, surface and groundwater, bottom sediments, soils and animals) • meters (e.g. dissolved oxygen, conductivity, pH, turbidity, liquid flow, light, rainfall, humidity, temperature, oxides of carbon, oxides of sulphur, oxides of nitrogen, particulates, ozone and hydrocarbons) • associated information, such as equipment operating manuals, field instrument operating instructions, calibration procedures, instrument fault finding procedures, general maintenance

RANGE STATEMENT	
	and repair procedures, first aid and survival manuals
Field procedures	Field procedures may include: • sampling • field testing (validated and authorised) • animal trapping (and release), tagging and keeping • emergency response, safety and survival aspects • data collection, analysis and reporting • protection of the environment
Typical problems	Typical problems may include: • unexpected restriction on access to sites • seasonal conditions • equipment failure or loss • communication failure/difficulties • unforseen environment impacts • contact with hazardous wastes
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975012A Provide input to production trials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to work closely with production personnel to conduct a routine trial to adjust formulations or develop products and processes following preliminary laboratory work. The unit covers monitoring critical process parameters, collecting and testing of samples and analysing results. The unit does not cover the planning and management of the trial, development of product briefs or the troubleshooting of equipment and production processes.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in the manufacturing, biotechnology, construction materials, pharmaceutical and food processing industry sectors. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974003A	*Perform chemical tests and procedures*
		OR
	MSL974004A	*Perform food tests*
		OR
	MSL974005A	*Perform physical tests*
		OR
	MSL974010A	*Perform mechanical tests*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Prepare for the trial	1.1. Clarify trial objectives, specifications, documentation and reporting requirements 1.2. Identify the environmental, health, safety, and /or food safety hazards associated with the trial and the

ELEMENT	PERFORMANCE CRITERIA
	recommended control procedures 1.3. Determine the availability of resources and the need for any clearances, special safety and storage requirements 1.4. Review the recommended trial schedule to identify potential barriers/constraints and develop alternatives as necessary 1.5. Communicate and confirm all laboratory requirements with plant operators and personnel in related work areas and functions
2. Participate in the trial	2.1. Reconfirm trial details with all relevant personnel 2.2. Identify any last minute changes and delays and make appropriate adjustments 2.3. Liaise closely with production personnel to conduct the trial safely and efficiently 2.4. Collect required product samples for laboratory analysis and/or reference 2.5. Monitor critical process parameters and record required data 2.6. Monitor data to identify problems, significant process variations and/or unacceptable product 2.7. Recommend changes to production processes as required 2.8. Leave plant in condition suitable for routine production to recommence
3. Assess and report trial outcomes	3.1. Arrange for, or conduct, testing of product samples to check specifications 3.2. Analyse test results and relate properties of product samples to formulation details and processing methods 3.3. Identify and investigate out of specification or unacceptable outcomes, as required 3.4. Recommend possible modifications and/or opportunities for improvements within limits of role and responsibility 3.5. Document and report trial outcomes in accordance with enterprise procedures
4. Maintain a safe work environment	4.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other personnel 4.2. Minimise the generation of wastes and

ELEMENT	PERFORMANCE CRITERIA
	environmental impacts 4.3. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 4.4. Care for and store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • analysing trial objectives and specifications to accurately determine resource requirements • liaising with relevant personnel to ensure trials are organised and conducted efficiently • following safety requirements • working within production constraints, priorities and pressures • communicating effectively with personnel • collecting accurate trial data and samples in the time available • recognising, interpreting and reporting problems, atypical situations or unacceptable products • recommending product modifications and improvements • reporting trial outcomes in accordance with enterprise procedures
Required knowledge
Required knowledge includes: • trial objectives, laboratory trial requirements, documentation and reporting requirements • recipes/formulations, technical specifications and quality parameters for trial products • effect on product properties of variations in recipes/formulations • product properties, process stages and unit operations involved in the trial • relationship between temperature and viscosity • friction, pumping and fluid flow • expected nature/condition of materials at each process stage • causes and remedies for common processing problems associated with trial

REQUIRED SKILLS AND KNOWLEDGE
products • sampling and test methods for trial products • occupational health and safety (OHS), food safety and /or environmental management procedures relevant to trial

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • analyse trial objectives and specifications to accurately determine resource requirements • liaise with relevant personnel to ensure trials are organised and conducted efficiently • follow all safety requirements on the production floor • work within production constraints, priorities and pressures • communicate effectively with personnel • collect accurate trial data and samples in the time available • recognise, interpret and report problems, atypical situations or unacceptable products • recommend product modifications and improvements within scope of responsibility • report trial outcomes in accordance with enterprise procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL924001A Process and interpret data* • *relevant MSL974000 series units of competency* • *relevant MSL975000 series units of competency*. Resources may include:

EVIDENCE GUIDE	

	• access to operating plant or pilot plant for duration of trials
	• trials, sampling and testing enterprise procedures for:
	  • sampling containers and sampling equipment
	  • test equipment, laboratory instruments and reagents.

Method of assessment	The following assessment methods are suggested: • review of trial documentation completed by candidate to ensure quality and timeliness • feedback from personnel involved in trials, supervisors • observation of candidate participating in production trials • oral or written questioning to check underpinning knowledge of trial procedures, sampling and test methods, common causes and remedies for product/processing problems. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A new manufacturing plant has been constructed to produce titanium dioxide ($TiO_{2)}$ for use in food and paint manufacture. An experienced laboratory technician is involved in the plant's commissioning process which has

EVIDENCE GUIDE	
	been designed by plant engineers. The commissioning involves trial operation of each section of the plant to achieve intermediate products, such as titanium tetra-chloride ($TiCl_4$) of acceptable quality for use in subsequent stages. The technician provides input to the trials by collecting and testing samples, analysing the results and providing regular reports to the engineers. The importance of the technician's work cannot be overestimated. They have to work under tight time deadlines, quality requirements and the overall pressure of commissioning the plant on time and within budget. **Food processing** The laboratory is notified of an upcoming trial for sour cream using a new starter culture. A technician is assigned to perform the laboratory assessment of the trial. The technician discusses with the production supervisor about when the cream will be cultured. It is agreed that the technician will monitor the fermentation, collect samples, and coordinate testing of the final product. The technician obtains protective footwear and hearing protection to wear while in the production area. On the day of the trial the technician calibrates the process pH meter and monitors the pH of the vat as fermentation progresses. Once the desired pH is reached, the technician advises the production team to commence packing of the product. After collecting samples of the final product from the start, middle and end of packing, the technician records the sample details and distributes the sample for both internal and external laboratory testing. Final product results are collated by the technician, who reports any out of specification results to the quality and production departments.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and

RANGE STATEMENT	
regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• Australia New Zealand Food Authority (ANZFA) Code and User Guides
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• equipment startup, operation and shutdown procedures
	• material safety data sheets (MSDS)
	• material, production and product specifications
	• principles of good laboratory practice (GLP)
	• production and laboratory schedules
	• quality, equipment and procedures manuals
	• standard operating procedures (SOPs)
	• Therapeutic Goods Regulations 1009

Product properties, **process stages and unit operations involved in the trial**	Product properties, process stages and unit operations involved in the trial may include: • classification of samples (screening and sieving) • milling • mixing • separation (distillation, sieves, filtration, solvent extraction and chromatography) • drying • concentrating

RANGE STATEMENT	
	• diluting • depositing (injecting, forming and extrusion) • retorting • cooling, freezing, refrigeration and heat transfer • closure (vacuum sealing) • weighing and packaging • materials handling and transport • warehousing
Trial specifications	Trial specifications may include: • product specifications • recipe/formulations • processing parameters • trial size, production target and timeline • trial schedule and resources required • required product samples and tests • analysis of relevant OHS, food safety and environmental hazards and controls • storage requirements
Hazards	Hazards may include: • electric shock • microbiological organisms and agents associated with soil, air and water • solar radiation, dust and noise • chemicals, such as acids, heavy metals, pesticides and hydrocarbons • aerosols from broken centrifuge tubes and pipetting • radiation, such as gamma and X-ray • sharps, broken glassware and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam and industrial gases • sources of ignition • disturbance or interruption of services • manual handling, working at heights and working in confined spaces • crushing, entanglement and cuts associated with moving machinery or falling objects

RANGE STATEMENT	
	• pedestrian and vehicular traffic
Safety procedures and hazard control measures	Safety procedures and hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as hard hats, hearing protection, gloves, safety glasses, coveralls, gowns, body suits, respirators and safety boots • machinery guards • signage, barriers, flashing lights and traffic control • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Resources	Resources may include: • operators and personnel from affected work areas and functions • production, testing and sampling equipment • enterprise procedures and standard methods for sampling and testing • raw materials/ingredients, packaging components and consumables • trial documentation, such as technical specifications, plant or production line layout, MSDS, trial request and result forms
Occupational health and safety (OHS) and environmental	OHS and environmental management requirements:

RANGE STATEMENT	
management requirements	• all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975013A Perform tissue and cell culture techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare, maintain and preserve cells and cell lines for a variety of applications, such as large scale culture, production of monoclonal antibodies, production of viral vaccines and amniocentesis studies. Personnel are required to optimise equipment setup, media and growth techniques. They are required to detect and investigate contamination and take preventative and/or corrective actions under supervision.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in laboratories in the biomedical, environmental, biotechnology and education industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule production requirements	1.1. Review client request and confirm quantity and nature of cells, tissue or products 1.2. Select, appropriate media, materials, equipment and methods 1.3. Plan parallel work sequences to optimise production 1.4. Maintain a chain of custody, traceable to the worker, for all cells and tissues
2. Work safely according to the legal and regulatory	2.1. Ensure work practices and personal actions conform to regulations, codes, guidelines and enterprise

ELEMENT	PERFORMANCE CRITERIA
framework	quality assurance procedures 2.2. Identify hazards and enterprise control measures associated with the sample, preparation methods, reagents and equipment 2.3. Select, fit and use personal protective clothing and safety equipment 2.4. Address hazards and incidents as they arise 2.5. Ensure the safe disposal of biohazardous materials and other laboratory wastes
3. Assemble and maintain tissue culture equipment	3.1. Assemble, sterilise or decontaminate equipment according to enterprise procedures 3.2. Perform pre-use and safety checks in accordance with relevant enterprise and operating procedures 3.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4. Decontaminate area and equipment after use
4. Prepare and test cell and tissue culture media	4.1. Confirm media specifications and processes/methods 4.2. Prepare culture media to suit client request 4.3. Sterilise culture media and check for sterility 4.4. Perform quality control checks to ensure that culture media is fit for purpose 4.5. Store culture media in accordance with specifications
5. Obtain, monitor and maintain tissue and cell lines	5.1. Retrieve/obtain the cell lines or tissue sample from fresh or preserved sources and prepare a culture 5.2. Select specified culture media and add any necessary growth agents or nutrients 5.3. Incubate cells/tissue in specified conditions 5.4. Inoculate the media with the specified amount of sample 5.5. Monitor growth of tissue and cell lines and products 5.6. Detect contamination and troubleshoot materials, equipment and techniques 5.7. Passage samples by subculturing to preserve or grow the line 5.8. Harvest cells or cell products to optimise yields
6. Preserve cells and tissues	6.1. Select the appropriate preservation method 6.2. Preserve the cell lines or tissue in accordance with the method 6.3. Check preserved cell lines regularly to ensure

ELEMENT	PERFORMANCE CRITERIA
	viability is maintained
7. Maintain records	7.1. Maintain records of batches of media and test data 7.2. Maintain records of active and stored tissue and cell lines 7.3. Ensure records are retrievable, legible and accurate 7.4. Ensure records conform to the information management, records, quality system and legal requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • working safely and satisfying all legal and regulatory requirements • preparing, diluting and sterilising reagents and culture media • choosing media and substrate material based on cost, cleaning, sterilising and maintenance of cell growth • passaging cell cultures by subculturing • growing cell lines and tissue to specifications without contaminating the original sample and the environment • counting cells, identifying a wide range of cell types and contaminants and recognising normal and abnormal cells • monitoring cell growth and recognising and troubleshooting problems • storing cells so that they remain viable • demonstrating chain of custody for all cells, cell lines and tissues • maintaining accurate, traceable records of cell lines and tissues and logs of procedures and work completed
Required knowledge
Required knowledge includes: • purposes of cell lines • normal and abnormal cell morphology • terminology, such as cell lines, growth media, primary culture, passaging, passage number, subculture, anchorage dependent cells, suspension culture, monolayer, confluent, cell line, cell strain, contact inhibition, diploid and viability

REQUIRED SKILLS AND KNOWLEDGE
• cell biology (structure, physiology, function, physiological cell growth requirements, nutrient requirements, respiration, temperature and growth cycle) • critical components of the cell environment and their effects on cell growth, such as pH, temperature, buffering, osmotic pressure, osmolarity, viscosity and foaming • types of tissue used as source material, such as embryonic, adult or malignant tissue • techniques for characterising a cell line • the differences between finite and continuous cell lines • characteristics of cell culture media and substrates • nature of substrates (e.g. solid, semi-solid, gel or sponge, glass, disposable plastics and three-dimensional matrices) • techniques for pre-treating substrates (e.g. feeder layers, chemical treatments, such as poly D-lysine, collagen, gelatine and fibronectin) • role of ingredients in media (e.g. salts, carbohydrates, amino acids, vitamins, hormones, growth factors, serum and antibiotics) • contaminants, such as endotoxins, bacteria, yeast, fungi and Mycoplasma • requirements, typical problems and procedures associated with the production of specific cell lines • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • work safely and satisfy all legal and regulatory requirements, including the use and care of safety cabinets • demonstrate chain of custody for all cells, cell lines and tissues • prepare, dilute and sterilise reagents and culture media that are fit for purpose • choose and justify appropriate media and substrate material based on cost, cleaning, sterilising and maintenance of cell growth

EVIDENCE GUIDE	
	• successfully passage cell cultures by subculturing • grow cell lines and tissue to specifications without contaminating the original sample and the environment • count cells, identify a wide range of cell types and contaminants and recognise normal and abnormal cells • monitor cell growth and recognise and troubleshoot problems, such as contamination • store cells so that they remain viable • maintain accurate, traceable records of cell lines and tissues and logs of procedures and work completed.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL933001AMaintain the laboratory/field workplace fit for purpose*. Resources may include: • laboratory equipped with appropriate test equipment/instruments, standards and reagents • enterprise procedures and standard methods • relevant tissues and cell lines.
Method of assessment	The following assessment methods are suggested: • review of records of cell lines and tissues produced by the candidate • periodic observation of the candidate establishing and maintaining viable cell lines • feedback from peers and supervisors to confirm that workplace procedures are consistently followed and that results meet workplace requirements • oral and/or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or

EVIDENCE GUIDE	
	assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biotechnology** A laboratory technical officer works at a research institute that genetically modifies myocardial cell lines to express Angiotensin II receptors and modify their action. Their role in the team is to grow the cells. This involves selecting the appropriate media, growth conditions and equipment and carefully monitoring cell growth. Each day, they visually check the cells and, when necessary, modify pH, temperature, buffering, osmolarity and substrates to enhance growth. The technical officer keeps accurate and legible records of cells, cell lines, tissues, observations and details of all modifications so that the team has a complete, reliable record of all work done. **Biomedical** A laboratory technical officer works at a metropolitan pathology laboratory. Their role is to prepare and use cell cultures for the initial isolation of viruses, such as the herpes simplex (HSV I and II). They routinely subculture human embryonic lung (HEL) cells using appropriate media, flasks and aseptic techniques in a Class II biohazard cabinet. They inoculate each flask with 0.1mL of patient swab washings and incubate them at 37°C for seven days. They also use appropriate positive and negative controls as required by the laboratory's quality assurance procedures. Each day, the technical officer examines the cell monolayer for distinctive changes (cytopathic effect). When the effect is detected, they seek confirmation of the changes from a senior technician. The flask is then sent for immunofluorescent testing to identify the virus isolate.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1678 Emergency procedure guide -Transport
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4187:2003 Cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• client and product specifications
	• enterprise procedures, standard operating procedures (SOPs) and quality assurance procedures
	• gene technology regulations

RANGE STATEMENT	
	• Guide to physical containment levels and facility types • HB 9-1994 Occupational personal protection • laboratory manuals • manufacturer's instructions or verbal direction from laboratory manager, supervisor or senior technician • material safety data sheets (MSDS) • National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)] • occupational health and safety (OHS) national standards and codes of practice • operation and maintenance manuals for automated media preparation equipment • quality assurance procedures • principles of good laboratory practice (GLP) • production schedules and instructions • Therapeutic Goods Regulations 1009 • verified test methods
Hazards	Hazards may include: • biohazards, such as infectious agents and oncogenic DNA • chemical and radiation hazards • allergenic factors • cryogenic liquids, such as nitrogen • heat from burners and molten agar • ultraviolet (UV) light • sharps • contaminated clothing
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and

RANGE STATEMENT	
	work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses, coveralls, gowns, body suits and respirators • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Tissue culture equipment and facilities	Tissue culture equipment and facilities may include: • growth cabinets • culture vessels, growth chambers, sterile containers, culture plates, flasks and bottles • autoclaves • positive filtration apparatus • auto pipettes and pipette pumps • cell counting chambers • incubators, including specialised atmosphere and carbon dioxide • binocular inverted microscope • centrifuges • cryogenic vessels and transfer equipment, and liquid nitrogen
Selection criteria for media, **materials and equipment**	Selection criteria for media, materials and equipment may include: • costs • ease of cleaning or sterilisation • maintenance of cell growth
Pre-use checks	Pre-use checks include: • performing routine maintenance • checks on raw materials and consumables, including use by date, possible contamination and storage conditions

RANGE STATEMENT	
Cells and tissues	Cells and tissues may include: • animal cell lines, such as hybridoma, liver, epidermal, lymphoblastic and fibroblastic • plant cell lines, such as tobacco, arabidopsis, soya bean, tomato, roses and meristomatic tissue • yeasts • fungi • sperm, ova and embryos • adherent and suspension cultures
Preparing a primary culture	Preparing a primary culture may include: • thawing of cryopreserved cells and monitoring of cell recovery • enzymatic disaggregation from tissue • mechanical disaggregation from tissue • primary explant technique • pre-treatment • selection techniques, such as cloning, micromanipulation, use of selective media, density gradient centrifugation, selective adhesion techniques and selective detachment
Monitoring growth of tissue and cell lines	Monitoring growth of tissue and cell lines may include: • identification of normal and abnormal cells viewed using an inverted stereo microscope • recognition of contamination by cytopathic changes to cells, biochemical tests, gene detection and microbiological culture • testing for products, such as insulin • checking growth rates • performing viable cell counts, such as the dye exclusion test, Trypan Blue viability stain to determine percentage viability and total cell concentration • staining and assessment of morphology(e.g. by Giemsa) • karyotype analysis
Preservation of cell lines	Preservation of cell lines may include: • freezing

RANGE STATEMENT	
	• cryopreservation (dry ice and liquid nitrogen)
Records	Records may involve: • paper or laboratory information management systems (LIMS) • cataloguing of all cell lines • stock levels • viability test results
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975014A Perform molecular biology tests and procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to isolate, purify, verify and manipulate biomolecules and their products. This work requires close attention to working with small volumes, multiple-step procedures and prevention of contamination. Personnel are required to apply a wide range of molecular biology tests and procedures.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers working in manufacturing (e.g. macro, micro, nanotechnology, pharmaceutical and blood product), food processing, biomedical (e.g. forensics, pathology and veterinary) and environmental industry sectors. All operations must comply with relevant regulations, codes of practice, standards, test methods and enterprise procedures. Results are generally interpreted and reported to supervising scientists, medical, veterinary or other responsible officers of an enterprise, regulatory authority or legal agency. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Review test request to identify samples to be tested, test method and equipment/instruments involved 1.2. Identify hazards and enterprise control measures associated with the sample, preparation methods,

ELEMENT	PERFORMANCE CRITERIA
	reagents and/or equipment
2. Receive and handle samples	2.1. Log and label samples according to enterprise procedures 2.2. Record sample description, compare with specification and note and report discrepancies 2.3. Store samples in accordance with enterprise and test method requirements 2.4. Maintain chain of custody, traceable to the worker, for all samples
3. Prepare equipment and reagents	3.1. Set up equipment/instrumentation in accordance with test method requirements and perform pre-use and safety checks 3.2. Select and collect reagents in accordance with test method requirements 3.3. Prepare and label reagents in accordance with test method requirements
4. Extract, verify and manipulate biomolecules	4.1. Produce/extract biomolecules from samples using appropriate isolation methods 4.2. Prevent contamination of samples by unwanted biomolecules 4.3. Recognise the presence of common inhibitors of biomolecular reactions and take corrective action 4.4. Quantify and qualify biomolecular yields from purified extractions 4.5. Use appropriate techniques to prepare and test a range of biomolecular samples 4.6. Use controls and reference standards to confirm the integrity of biomolecular sample preparation and procedures
5. Process data	5.1. Record test data noting atypical observations 5.2. Ensure results are consistent with reference standards and expectations 5.3. Record and report results in accordance with test methods 5.4. Interpret trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot basic procedure, reagent or equipment problems which have led to atypical data or results
6. Maintain a safe work	6.1. Use established safe work practices and personal protective equipment to ensure personal safety and

ELEMENT	PERFORMANCE CRITERIA
environment	that of other laboratory personnel 6.2. Minimise the generation of wastes 6.3. Ensure the safe disposal of wastes, including hazardous wastes and tested samples 6.4. Clean, care for and store equipment and reagents
7. Report and communicate results	7.1. Record approved data into enterprise system 7.2. Keep accurate, traceable work records to protect the enterprise's intellectual property rights 7.3. Maintain confidentiality and security of enterprise information and laboratory data 7.4. Maintain equipment logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- conducting work practices in an ethical and professional manner and in accordance with relevant legislation, regulation and codes of practice
- maintaining security, integrity, traceability and identity of samples, sub-samples and work records
- performing molecular biology tests and procedures
- following enterprise safety standards, procedures and practices
- identifying atypical results as out of normal range or an artefact
- tracing and sourcing obvious causes of artefacts
- communicating identified problems to a supervisor
- recording results according to enterprise procedures

Required knowledge

Required knowledge includes:

- hazards and risks in molecular biology laboratories
- common biotechnology terms
- molecular biology principles and concepts underpinning tests/procedures, such as:
  - DNA and RNA structure and function

REQUIRED SKILLS AND KNOWLEDGE
• protein structure and function • relationship between chemical and physical properties of nucleic acids and proteins and the techniques used for sampling, preparation and testing • replication • transcription, translation and gene regulation • relationship between structure, organisation and function of biomolecules to the storage of information in cells, chromatin, circular and linear chromosomes, RNA, genes and plasmids • molecular genetics (molecular nature, organisation and function of genes) • molecular mechanisms of DNA mutation and variation • DNA transfer in prokaryotes (transformation, conjugation and transduction) • restriction enzyme and ligase structure, nomenclature, function, specificity and stability, and cohesive versus blunt ends • ethical issues associated with biotechnology, such as: • use of animals for research • genetic modification of organisms and food • use of gene therapy, cloning and stem cells • in vitro fertilisation • forensic testing of populations • importance of commercial confidentiality, protection of intellectual property and patents • genetic screening of humans • sex determination and parentage testing of embryos/humans • importance and appropriate use of validation methods, controls and certified reference materials • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Assessors should ensure that candidates can:

EVIDENCE GUIDE	
competency in this unit	• conduct work practices in an ethical and professional manner and in accordance with relevant legislation, regulation and codes of practice • maintain security, integrity, traceability and identity of samples, sub-samples and work records • obtain purified biomolecules from samples • prevent/minimise DNA/RNA contamination • perform tests/procedures, such as PCR, ligation and restriction enzyme digestion with appropriate controls • follow enterprise safety standards, procedures and practices • follow enterprise procedures and test methods consistently and accurately • operate test equipment to enterprise standards and/or manufacturer's specification • identify atypical results as out of normal range or an artefact • trace and source obvious causes of artefacts • communicate identified problems to a supervisor • record and communicate results as per enterprise procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL974008A Capture and manage scientific images* • *MSL975001A Perform microbiological tests* • *MSL975008A Apply electrophoretic techniques* • *MSL975009A Apply routine chromatographic techniques* • *MSL975013A Perform tissue and cell culture techniques* • *MSL975020A Apply routine spectrometric techniques*. Resources may include: • laboratory equipped with appropriate test equipment/instruments, standards and reagents • enterprise procedures, standard methods, manuals and supplier documentation.
Method of assessment	The following assessment methods are suggested:

EVIDENCE GUIDE	
	• review of test records and workplace documentation completed by the candidate • review of results obtained by the candidate over a period of time to ensure accurate and consistent results are obtained within required timelines • observation of candidate isolating, purifying, verifying and manipulating biomolecules • oral or written questioning • feedback from peers and supervisors. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biomedical** As part of a diagnostic service to verify progenitor status of livestock, a technician is required to extract DNA from a blood sample, perform the PCR to amplify micro-satellite DNA and prepare the sample for DNA electrophoresis and fragment size analysis. The technician provides documentation to meet evidentiary standards. The technician understands the implications of the tests for the client and is careful to ensure the sample can be traced from the source, that no contamination takes place and that the results are kept confidential. **Food processing** A meat export company has commissioned a study of the effectiveness of the introduction of a 'cold-chain' process

EVIDENCE GUIDE	
	to a client country. The company requires rapid results. As part of the monitoring team, a technician is required to perform routine testing of surface swabs of meat samples for bacterial contamination using a PCR analytic technique. Although the tests are quite routine, the technician pays close attention to all aspects of the work as the consequences of invalid results would be severe for the company and laboratory. The technician also keeps comprehensive work records and maintains strict confidentiality.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2162.1-1996 Verification and use of volumetric apparatus - General - Volumetric glassware
	  • AS 2252 Biological safety cabinets
	  • AS 3753-2001 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 1269 Set:2005 Occupational noise management set
	  • AS/NZS 1337 Eye protection

RANGE STATEMENT	
	• AS/NZS 2161 Set:2008 Occupational protective gloves set • AS/NZS 2210:1994 Occupational protective footwear • AS/NZS 2243.3:2002 Safety in laboratories - Microbiological aspects and containment facilities • AS/NZS 4501 Set:2008 Occupational clothing set • HB 9-1994 Occupational personal protection • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • cleaning, hygiene, personal hygiene requirements • enterprise procedures, standard operating procedures (SOPs) and operating manuals • equipment startup, operation and shutdown procedures • European Union (EU) • Guide to physical containment levels and facility types • guidelines for small scale genetic manipulation work from the gene technology regulations • incident and accident/injury reports • instructions to comply with new legislation, standards, guidelines and codes • material, production and product specifications • National Association of Testing Authorities (NATA) Accreditation programs requirements • National Health and Medical Research Council (NHMRC) • National Registration Authority (NRA) • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals and equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products and material safety data sheets

RANGE STATEMENT	
	(MSDS) • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • test procedures (validated and authorised) • Therapeutic Goods Regulations 1009 • United States Food and Drug Administration (USFDA) • validated and authorised test methods • waste minimisation, containment, processing and disposal procedures • World Health Organisation (WHO)
Hazards	Hazards may include: • electric shock (e.g. electrophoresis power packs) • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • chemicals, such as acrylamide, temed, phenol and ammonium persulphate • mutagens, such as ethidium bromide, tumour promoters and cytotoxic materials • genetically altered organisms, transformed cultures and organisms • allergenic proteins • radioisotopes • transilluminators and other ultraviolet (UV) light sources • aerosols from broken centrifuge tubes and pipetting • sharps and broken glassware • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • disturbance or interruption of services
Safe work practices and hazard control measures	Safe work practices and hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted

RANGE STATEMENT	
	samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses, coveralls, gowns, body suits and respirators • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Equipment and instrumentation	Equipment and instrumentation may include: • pipettes, tubes and racks • heating blocks and polymerase chain reaction (PCR) thermal cyclers • swabs • centrifuges and shakers • electrophoresis tanks and power supplies • incubation cabinets for micro-organisms and cell culture • liquid nitrogen containers • autoclaves • water baths • waste containers • fumehoods • analytical instruments, such as spectrophotometers
Reagents	Reagents may include: • DNA, RNA and proteins

RANGE STATEMENT	
	• enzymes (restriction, ligation and polymerisation) • buffers • agarose, starch and polyacrylamide for electrophoresis gels • commercial kits for extraction and manipulation of DNA/RNA • phenol and chloroform • ethidium bromide • cell and culture media • DNA, and protein stains • specialised probe materials, such as radioactive, chemical and chemiluminescent labels • blotting membranes • chromatographic media

Molecular biology tests and procedures	Molecular biology tests and procedures may include:
	• generic skills:
	  • sample digestion, extraction, filtration, separation, dialysis, precipitation and centrifugation
	  • accurate and reliable use of micropipettes
	  • application of aseptic techniques
	  • labelling (e.g. digoxin, fluorescence, enzymes, radioactivity and antibodies)
	  • production, labelling and use of DNA probes
	  • preparation of competent bacterial cells
	• preservation and storage of samples (e.g. freezing)
	• extraction of nucleic acids:
	  • isolation of genomic and plasmid DNA and RNA from samples, such as plants, bacterial suspensions, white blood cells, cheek cells, animal and plant tissue, cultured cells and forensic specimens
	  • mini-prep and rapid method isolation of plasmid DNA
	• purification of nucleic acids and proteins:
	  • purification of DNA using cesium

RANGE STATEMENT	
	gradients, commercial purification buffer kits and columns • purification of recombinant protein by chromatography • production of nucleic acids: • amplification of DNA by polymerase chain reaction • transformation with recombinant DNA • identification of transformed organisms with appropriate selection and analytical techniques, such as selective media and insertional inactivation • use of enzymes: • storage and handling of enzymes taking into account segregation, temperature, buffers and labelling to avoid wastage, denaturation and contamination • ligation • assistance with analysis of nucleic acids and proteins: • sequencing DNA • assaying of DNA purity and concentration using spectrometric analysis • electrophoresis of restriction enzyme digests of plasmid and genomic DNA using agarose gel • DNA sequencing by Sanger method • testing using restriction fragment length polymorphism (RFLP), probes and microsatellites • detection of protein products by measuring activity, including a range of immunological assays • assistance with hybridisations: • hybridisation to screen cDNA libraries • blotting (southern blots for DNA and Western blots for protein) • cloning: • cloning and sub-cloning of genes and fragments of DNA • applications of techniques:

RANGE STATEMENT	
	• PCR • methods to detect gene expression, such as RNA hybridisation, immunological techniques and radioactive labelling • testing DNA for sequence variation that is either causative of, or associated with, human disease • testing blood for the presence of viruses using the polymerase chain reaction • identification of species, such as bacterial contaminants • generating data for taxonomic and ecological investigations
Corrective action	Corrective action may involve: • purification • dilution • additional extraction steps
Records	Records may include: • test and calibration results • equipment use, maintenance and servicing history • photo images of gels, radioisotopes and digital images • chain of custody from sample to result • supplier certificates of analysis • quality control/analysis data
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and

RANGE STATEMENT	
	Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975015A Prepare animal and plant material for display

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to perform a range of techniques to collect and preserve animals and plant material for both public and scientific research display. Personnel are required to assist clients to clarify their display requirements, select the most appropriate collection and preservation procedures and display configuration and then assemble and conserve the display items. The unit does not cover techniques and procedures for handling vertebrates that are subject to national and state/territory animal care and ethics regulations.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants and technical officers in research and teaching institutions, museums, herbariums, commercial taxidermy, forestry, zoos and fauna park industry sectors. This unit of competency is relevant to technicians who may work individually or as part of a team. The enterprise will need to equip its personnel with relevant animal handling skills should they be required. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Confirm the requirements of the display and plan the work	1.1. Clarify the purpose and design of the display in consultation with other staff 1.2. Determine suitable methods of collection, preservation and display in order to meet the display

ELEMENT	PERFORMANCE CRITERIA
	requirements
2. Work safely according to the legal and regulatory framework	2.1. Ensure work practices and personal actions conform to all relevant legislation, regulations, codes and guidelines 2.2. Identify hazards and enterprise control measures associated with the specimens, samples, collection and preservation methods, reagents and equipment 2.3. Select, fit and use personal protective clothing and safety equipment 2.4. Address hazards and incidents as they arise 2.5. Ensure the safe disposal of biohazardous materials and other wastes
3. Collect plants and animal material	3.1. Assemble equipment required for collection and preservation 3.2. Collect specimens to meet display requirements 3.3. Check identification of specimens and assess their suitability for the display 3.4. Label specimens and accurately record data to ensure traceability of specimen from the source through to the final display 3.5. Store specimens during transportation to ensure it retains the required characteristics
4. Preserve plant and animal material	4.1. Confirm the identification of specimens and suitability for the purpose 4.2. Examine the specimens and record data 4.3. Take samples from the specimens and prepare them for preservation 4.4. Preserve the specimens using enterprise procedures
5. Display plant and animal material	5.1. Ensure the specimen is conserved to minimise deterioration 5.2. Place the preserved specimen in the display to meet the display plan and security requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

REQUIRED SKILLS AND KNOWLEDGE
Required skills
Required skills include: • complying with all legislative, regulatory and enterprise requirements • selecting collection, preservation and display techniques to suit particular display requirements • recognising, identifying and collecting suitable animal and plant specimens • storing and transporting specimens safely while maintaining their wellbeing, viability and/or integrity • preserving and preparing animal and plant specimens for a range of display purposes • completing displays that meet client and security requirements • keeping records to providing chain of custody of specimens and samples through collection, storage, preservation and display
Required knowledge
Required knowledge includes: • enterprise processes and procedures for creation of displays • classification/taxonomy/flora and fauna recognition and identification methods • legislative limitations on collection of flora and fauna • principles of fixation and preservation • principles of a range of methods for preparing skeletal material • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • select appropriate collection, preservation and display techniques to suit particular display requirements • recognise, identify and collect suitable animal and plant specimens • store and transport specimens safely while

EVIDENCE GUIDE	
	maintaining their wellbeing, viability and/or integrity, as appropriate • comply with all legislative, regulatory and enterprise requirements • preserve and prepare animal and plant specimens for a range of display purposes • complete a variety of displays that meet client and security requirements (could be part of a team) • keep records to provide chain of custody of specimens and samples through collection, storage, preservation and display.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL975017A Perform laboratory-based ecological techniques.* Resources may include: • standard laboratory equipped with appropriate equipment and reagents • enterprise procedures for the collection, storage, preservation, mounting and documentation of specimens and preparation of displays.
Method of assessment	The following assessment methods are suggested: • review of display plans prepared by the candidate (or as part of a team) • examination of animal and plant display material prepared by the candidate • observation of the candidate collecting, preserving and mounting specimens • oral and written tests for relevant knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required.

EVIDENCE GUIDE	
	The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Education** A laboratory technician at a university botany school is required to prepare display material for a practical class to study cycads. They look up the procedures manual and discuss the requirements of the class with the lecturing staff and then arrange to visit the botanic gardens and collect the required specimens with the curator. The specimens are identified, collected and labelled, transported back to the laboratory in water in a refrigerated van and displayed for the practical class to use the next day. **Museum** An exhibition project officer in a museum works in a team to design and create a display as part of an exhibition about spiders. It is decided that a display of live funnel web spiders in a perspex showcase would capture public interest. The project officer designs and makes the showcase taking note of the need to provide for the environmental, feeding and security requirements of the specimens, the safety and information needs of the public, and the display's visual appeal and accuracy of the spider habitat. They liaise with a nearby reptile park to obtain the spiders for the duration of the display and prepare the necessary documentation.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work

RANGE STATEMENT	
situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1940-2004 Storage and handling of flammable and combustible liquids
	  • AS 2252 Biological safety cabinets
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 4452:1997 The storage and handling of toxic substances
	  • AS/NZS 4501 Set:2008 Occupational clothing set
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • HB 9-1994 Occupational personal protection
	• Australian Dangerous Goods Code
	• animal welfare legislation and codes of practice
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• gene technology regulations
	• Guide to physical containment levels and facility types
	• National Code of Practice for the labelling of workplace substances (NOHSC:2012 (1994))
	• occupational health and safety (OHS) national standards and codes of practice
	• permits for wildlife capture and handling
	• principles of good laboratory practice (GLP)

Staff	Staff may include: • curator • conservator • design exhibition project officer

RANGE STATEMENT	
	• project manager
Requirements of a display plan	Requirements of a display plan may include: • purpose (public display or part of a collection for research purposes) • length of time (permanent or temporary) • accessibility (static or interactive) • type (diorama, live or preserved specimens and additions to existing showcase) • two- or three-dimensional • exclusion of pests • specific features of the specimen to be demonstrated • lighting that is sympathetic to the conservation of the specimen • security (particularly for valuable, vulnerable or irreplaceable specimens) • user friendliness for both visitors and maintenance staff
Collection	Collection may include: • collecting live specimens from the wild • accessing specimens from existing collections in the base or other institutions • netting, trapping and light traps • use of euthanasia techniques, such as shooting, stunning, anaesthetics, gases and chemicals
Hazards	Hazards may include: • electric shock • microbiological organisms and agents associated with soil, air, water, animal tissue and fluids • solar radiation, dust and noise • chemicals, such as preservatives and stains • sharps, broken glassware and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • disturbance or interruption of services • slips, trips and falls • manual handling and working at heights • crushing, entanglement and cuts associated with moving machinery or falling objects

RANGE STATEMENT	
	• pedestrian and vehicular traffic • vehicle and boat handling
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • using material safety data sheets (MSDS) • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using recommended procedures • using personal protective equipment, such as hearing protection, sunscreen lotion, gloves, safety glasses, face guards, coveralls, gowns and safety boots • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel • following established procedures for handling animals
Identification	Identification may include: • collection access number • tags and labels on existing specimens • use of field guides, keys and taxonomic charts • collaboration with experts
Suitability of specimen	Suitability of specimen may include: • whole or part • sex, age and breeding condition • type and characteristics • level of preservation • whether dead or alive • inclusion of features for identification, such as

RANGE STATEMENT	
	flowers, fruit, roots and leaves

Data to be recorded	Data to be recorded may include:
	• collection information, such as location, time, date, collector, behaviour, environment, depth, altitude, weather and habitat
	• reference photographs of the environment in the field
	• reference drawings to characterise colour and shape
	• identification number, collection access number, collection database and catalogue details
	• ossification of bird skulls
	• characteristics of the specimen:
	  • standard measurements (mass, length and size)
	  • plumage characteristics (age, pattern and colour)
	  • flesh characteristics (skin tone, naked flesh texture and internal organs)
	  • sex
	• X-rays and scans
	• manual or electronic data

Samples	Samples may include: • DNA • tissue • bone fragments • stomach contents
Preparation for preservation	Preparation for preservation may include: • treatment of the specimen (dissection, mounting, pinning, use of backing boards, fixing, staining, colour retention, latex injection and vascular preservation) • preparation of the display (painting, making of wet boxes, choice of vessel and storage fluid, planning of mould sections and lay up) • maceration of tissue from skeletons by sand, invertebrates, cold or warm water, enzymes, physical removal or chemical treatment

RANGE STATEMENT	
Preservation	Preservation may include: • temporary (freezing) • wet (whole mounts in formalin and tissue staining) • dry (freeze drying, air drying, pressing, taxidermy, including exhibition quality mounts, study skins, tanning and plastination techniques, such as dry mounting of seeds, bird skins, pin mounted invertebrates and pressing of plants) • skeletal (maceration, degreasing, bleaching, articulation and mounting or sectioning (e.g. whale skeletons)) • mould and cast (alignate, plaster, stone plaster, polyester, latex, silicone, Vinamould, gelatine, urethane elastomers, glass and carbon fibre (e.g. fish, amphibians and reptiles)) • embedding (encapsulation in clear plastic or resin, can be wet or dry techniques)
Detailing of specimens	Detailing of specimens may include: • cleaning • touch up • addition of false eyes
Conservation	Conservation involves minimisation of deterioration which can be caused by: • pests • light • humidity
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply

RANGE STATEMENT	
	current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975016A Perform complex tests to measure engineering properties of materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare test specimens and perform multi-stage mechanical tests on them. The unit requires personnel to create test conditions that suit the materials intended use, optimise measurement procedures and recognise critical measurement points during the tests. The unit also covers data analysis and troubleshooting procedures/equipment that have led to atypical data or results.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory personnel in the construction materials, mining and manufacturing industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974012A	*Perform tests to determine the properties of construction materials*
		AND
	MSL973010A	*Conduct laboratory-based acceptance tests for construction materials*
		OR
	MSL973001A	*Perform basic tests*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Interpret and schedule test requirements	1.1. Review test request and sample documentation to identify required test parameters and intended use of bulk material

ELEMENT	PERFORMANCE CRITERIA
	1.2. Identify hazards and enterprise control measures associated with the sample, preparation/testing methods and equipment 1.3. Inspect samples, compare with specifications, record and report discrepancies 1.4. Liaise with client when samples and/or request forms do not comply with enterprise procedures 1.5. Match required parameters with suitable test methods, available equipment and instrument specifications 1.6. Plan parallel work sequences to optimise throughput of multiple sets of samples, as required
2. Prepare and measure test specimens	2.1. Prepare test specimens in accordance with test method 2.2. Conduct preliminary measurements to establish initial dimensions and conditions 2.3. Store test specimens and residual sample materials to maintain their integrity
3. Check equipment before use	3.1. Set up equipment/instruments in accordance with test method 3.2. Perform pre-use and safety checks in accordance with enterprise procedures and manufacturers specifications 3.3. Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4. Check calibration status of equipment and quarantine out of calibration or faulty items
4. Test samples	4.1. Position and secure test specimen in test equipment/instrument 4.2. Conduct preliminary measurements to determine optimum test conditions and instrument settings 4.3. Perform each measurement stage in sequence, terminating each stage at the appropriate end point 4.4. Record all test measurements, observations and factors that may impact on quality of results 4.5. Remove test piece and conduct post-test measurements 4.6. Shut down equipment and store used test pieces in accordance with enterprise procedures
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are

ELEMENT	PERFORMANCE CRITERIA
	consistent with estimations and expectations 5.3. Record results with the appropriate accuracy, precision and units 5.4. Estimate and document uncertainty of measurement in accordance with enterprise procedures, if required 5.5. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Troubleshoot procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Use established safe work practices to ensure personal safety and that of other laboratory personnel 6.2. Minimise the generation of wastes and environmental impact 6.3. Ensure the safe disposal of laboratory wastes 6.4. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system 7.2. Maintain security and confidentiality of enterprise information and laboratory data 7.3. Maintain equipment and calibration logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • interpreting client requests, complex tests and sample preparation methods accurately • applying enterprise procedures • planning work sequences involving multiple/parallel tasks • interpreting safety information, such as material safety data sheets (MSDS) and working safely

REQUIRED SKILLS AND KNOWLEDGE

- checking and using test equipment in accordance with enterprise procedures
- maintaining concentration and applying multi-stage test methods accurately
- estimating/calculating scientific quantities (e.g. total and effective stress, strain and pressure)
- using calibration charts
- interpreting significant features of data and graphs and making logical conclusions
- identifying atypical data, errors and unexpected results and tracing any obvious causes
- recording and presenting results accurately and legibly
- maintaining security, integrity and traceability of all samples/test pieces, data/results and technical records
- cleaning and maintaining equipment
- seeking advice from a supervisor
- communicating with clients or outside service technician
- demonstrating a professional approach and positive company/organisation image

Required knowledge

Required knowledge includes:

- complex test methods routinely used in job role, including:
  - purpose and principles of test
  - relationship between the engineering properties and uses of construction materials
  - key sample preparation stages
  - key treatment/measurement stages
  - calculation steps to give results in appropriate units and precision
  - expected values for sample type
  - sources of uncertainty and methods for their control
- principles and concepts underpinning the test method, such as:
  - stress, strain, pressure, total and effective stress, fatigue, creep, failure modes of materials, strength/consolidation of materials and permeability
  - electrical safety concepts including voltage, current, resistance, conductors/insulators and AC/DC
- principles and concepts related to equipment/instrument operation including the function of key components and effects on test of modifying variables
- pre-use checks and operating procedures for test equipment/instruments routinely used in job role
- basic equipment/method troubleshooting procedures
- enterprise and/or legal traceability requirements for samples, test pieces, test data and results
- procedures for recording and reporting test results, calculations, test observations

REQUIRED SKILLS AND KNOWLEDGE
and unexpected or atypical results and equipment problems • health, safety and environmental management requirements relevant to job role • confidentiality requirements relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • select test methods, operating parameters and test ranges to suit the material and its intended use • prepare and orient test pieces precisely • safely set up, start up and shut down equipment • maintain close attention to measurement procedures, accuracy and precision during lengthy complex tests • calculate/determine required engineering properties with appropriate accuracy, precision and units • recognise atypical data/results and trace artefacts and problems with procedures or equipment • record and report data/results in accordance with enterprise procedures • maintain security, integrity and traceability of all samples, test pieces and documentation.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*. Resources may include: • engineering materials testing laboratory with appropriate test equipment, instruments and samples • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of results obtained by the candidate over a

EVIDENCE GUIDE	
	period of time to ensure accurate and consistent results are obtained within required timelines • inspection of testing records and workplace documentation completed by the candidate • observation of candidate conducting a range of complex tests on engineering materials • feedback from clients, peers and supervisors • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials** A consulting company is investigating a possible dam site and needs to assess a particular soil in the foundation. They request a geotechnical testing authority to determine the permeability of the soil. A senior technician checks the client request and inspects the soil sample, noting that it is plastic, clay and fissured. He/she checks the dam design parameters and notes that the overburden pressure will be 500 kPa. The senior technician uses a triaxial permeability test using a constant head configuration. He/she trims a cylindrical test piece, determines the sample's bulk density and uses the trimmings to determine its moisture content. The test piece is mounted in a triaxial test cell and the equipment carefully de-aired. All pressure gauges, regulators and transducers are checked and the

EVIDENCE GUIDE	
	equipment is leak tested. A confining stress is applied and after allowing the sample to come to equilibrium, it is back saturated. The cell pressure is increased to 500 kPa and as the sample consolidates, the technician monitors the sample volume change and pore water pressure. A differential pressure is applied in stages and the water flow through the sample is optimised. After reaching a steady state the flow rate is monitored to determine the sample permeability. After taking sufficient readings to ensure a valid measurement, the senior technician prepares plots of permeability and time and reports the steady state values. After completing the test, he/she shuts down the equipment in the recommended sequence, cleans and restores all items. He/she then removes the test piece and determines the after-test moisture content.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
	  • AS 1289 Methods of testing soils for engineering
	  • AS 1012 Methods of testing concrete
	  • AS 2981 Methods of sampling and testing

RANGE STATEMENT	
	asphalt • DIN 19683 series - Soil testing in agricultural hydrology - Physical laboratory tests • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • National Association of Testing Authorities (NATA) supplementary requirements for the relevant field of testing • NATA technical notes and guides • MSDS • standard operating procedures (SOPs) • quality manuals, equipment and procedures manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • enterprise recording and reporting procedures • production and laboratory schedules • material, production and product specifications
Preparation of samples	Preparation of samples may include: • moisture conditioning and compaction of soil • trimming to required size and shape • orientation of test pieces • polishing • curing concrete test pieces
Test methods and procedures	Test methods and procedures may include: • consolidation of soil (e.g. one-dimensional and triaxial) • shear testing of soil and rock (e.g. total stress, effective stress, direct stress and triaxial stress) • permeability of soil, rock and concrete (e.g. falling head and constant head) • California Bearing Ratio (CBR) (4 point) • fatigue and creep of metals, polymers and concrete • wheel tracking in asphalt • stiffness and creep of asphalt

RANGE STATEMENT	
Hazards	Hazards may include: • microbiological organisms and agents associated with soil • chemicals, such as acids and solvents • sharps and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure such as steam and industrial gases and hydraulics • disturbance or interruption of services • crushing, entanglement and cuts associated with moving machinery or falling objects
Hazard control measures	Hazard control measures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, hazardous materials and equipment • machinery guards • handling and storage for hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as hard hats, hearing protection, gloves, safety glasses, coveralls and safety boots • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management

RANGE STATEMENT	
	requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975017A Perform laboratory-based ecological techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to participate in laboratory investigations involving animals, plants and related environmental parameters. The animals or plants might be single specimens, parts of specimens or be in culture or under propagation. The investigations might also be part of experimental models that examine interactions of animals and/or plants and their environments. Investigations would generally relate to taxonomy, physiology and pathology, and would be oriented to scientific research, food production and manufacture, and to investigation of biological environments and ecosystems.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in biological, biotechnology and environmental industry sectors. It is expected that all work would conform to statutory and enterprise occupational health and safety (OHS) codes of practice. This unit of competency assumes that the worker would perform tests and procedures under the close supervision of scientific staff and that the enterprise will equip its workers with relevant animal handling skills should such be required. The unit does not cover procedures related to the handling of vertebrates that are subject to national and state/territory animal care and ethics regulations. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in

	practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**

ELEMENT	PERFORMANCE CRITERIA
1. Process specimens and documentation	1.1. Check specimens and request forms for labelling and documentation before acceptance 1.2. Log specimens, applying required document tracking mechanisms 1.3. Dispatch specimens to referral laboratories as required 1.4. Store specimens appropriately until required for testing
2. Participate in the identification and classification of species	2.1. Record macroscopic and/or microscopic details of specimens to assist in their identification and classification 2.2. Use taxonomic keys to assist in the identification and classification of species 2.3. Perform laboratory analyses that can assist in identification and classification of species 2.4. Preserve specimens for future reference 2.5. Label preserved specimens for storage and reliable retrieval from collections
3. Maintain viability and integrity of specimens during experimentation	3.1. Provide nutrients and environments to maintain viability of individual specimens and organisms being cultured or propagated 3.2. Perform procedures and analyses to monitor the experimental environment 3.3. Perform procedures and analyses to monitor the physiology of organisms in the experimental environment 3.4. Adjust nutrient requirements and environmental conditions as indicated by monitoring data 3.5. Report to supervisors data and phenomena that may risk viability of individual specimens or cultures 3.6. Report to supervisors data and phenomena that are incompatible with the experimental design parameters
4. Integrate laboratory and field data	4.1. Locate field data relevant to the study or experiment 4.2. Ensure that field and laboratory data codes are matched for tracking, reporting and chain of custody requirements 4.3. Log field and laboratory data into information systems 4.4. Assist with writing reports of experiments and related field studies

ELEMENT	PERFORMANCE CRITERIA
5. Maintain a safe work environment	5.1. Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel 5.2. Minimise the generation of wastes and environmental impacts 5.3. Ensure the safe collection of laboratory and hazardous waste for subsequent disposal 5.4. Care for and store equipment and reagents as required

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skill include:

- communicating scientific and technical concepts and terminology accurately to supervisors, peers and clients
- maintaining the viability of specimens
- identifying and classifying species
- taking representative samples for analysis
- relating field and laboratory data for the generation of meaningful results
- working safely for the protection of self and co-workers
- disposing of wastes carefully for the protection of those who may handle and process wastes and to minimise contamination of the environment

Required knowledge

Required knowledge includes:

- growth requirements of organisms that are subjects of laboratory or greenhouse culture or propagation
- general anatomy of plants and animals that is useful as classification data
- processes that are essential for preservation of plant and animal material for use as reference material
- relationships between field and laboratory data that are useful in giving commentary on the integrity or distress in biological environments
- rationale for selection of techniques used to monitor the experimental environment and the effects of variables on organisms in the experimental environment

REQUIRED SKILLS AND KNOWLEDGE
• uses of environmental impact statements that incorporate the results of field and laboratory analyses • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • relate field and laboratory data for the generation of meaningful results • identify and classify animal and plantspecies for scientific and experimental purposes • maintain the viability of species during experimentation • monitor the physiology and interactions of plants and animals and their environments • take representative samples for analysis • work safely for the protection of self and co-workers • communicate appropriately with customers and be aware of cultural and social contexts • not contaminate sterile environments or specimens • dispose of wastes carefully for the protection of those who may handle and process wastes and to minimise contamination of the environment.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results* • *MSL974007AUndertake environmental field-based monitoring*. Resources may include:

EVIDENCE GUIDE	
	• equipment and resources for investigating the physiology of plants and animals in the laboratory • enterprise procedures, sampling plans, test methods and equipment manuals • computers and programs for simulated experiments or data analysis.

Method of assessment	The following assessment methods are suggested:
	• review of data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results
	• inspection of records and workplace documentation completed by the candidate
	• observation of the candidate processing specimens and/or conducting analyses
	• review of computer and literature research of data to support an experiment
	• questioning about procedures that form part of experiments in progress
	• review of case studies prepared by the candidate, such as:
	  • relating field and laboratory data in an environmental impact statement
	  • preservation of plant species and placement in a herbarium
	  • plant propagation in a variety of controlled environments
	  • maintenance of cultures of protozoans or invertebrates.
	In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly.
	Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
	Access must be provided to appropriate learning and/or assessment support when required.
	The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like

EVIDENCE GUIDE	
	environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental (1)** A technical officer has been asked to preserve plant specimens and compile a report of classified species using material and data collected during a recent visit to a decommissioned open cut mine site and its adjacent areas. The supervising ecologist has been asked to advise the mine owner about replacement planting to restore the mine site in sympathy with its locality. The technical officer records descriptions of features of each specimen. They use this data to classify the species by referring to the field report, atlases and specimens in the reference herbarium. They then prepare each specimen for drying and preservation in readiness for labelling and cataloguing. To compile the report, the technical officer prepares a map of the area to be regenerated. The map details the topographic features and illustrates possible species which could be planted. To assist the landscape contractors, the technical officer advises where the required species can be purchased and the type of soils required for growth. **Environmental (2)** A technical officer, who worked for a large aluminium smelter, was asked to examine some grapevine leaves that a local farmer argued were affected by fluoride emissions from the plant. Initially, the leaves were subjected to a detailed microscopic examination using standard procedures developed by the company covering the effect of gaseous pollutants (such as ozone and fluoride) on major natural and/or agricultural plants. The preliminary findings suggested that the leaves were affected by a fungi rather than fluoride. However, given the sensitive nature of the issue, they checked with the supervisor and arranged to send the affected leaves to a nearby university for a second opinion. This additional study also concluded that the impact on the leaves was not due to fluoride.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	• AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• animal welfare legislation and codes of practice
	• OHS national standards and codes of practice
	• national environment protection measures
	• Guide to physical containment levels and facility types
	• Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
	• instructions to comply with new legislation, standards, guidelines and codes
	• enterprise procedures, standard operating procedures (SOPs) and operating manuals
	• validated and authorised test procedures
	• laboratory sampling procedures for labelling, preparation, storage, transport and disposal
	• safety procedures to minimise contraction of zoonoses
	• safety requirements for equipment, materials or products

RANGE STATEMENT	
	• quality system and continued improvement processes • incident and accident/injury reports • schematics, work flows and laboratory layouts • stock records and inventory • waste minimisation, disposal protocols and environment protection procedures
Items of equipment, **reagents**, **specimens and systems for botanical and zoological techniques**	Items of equipment, reagents, specimens and systems for botanical and zoological techniques may include: • dissecting, stereo and other microscopes • hand lenses • dissecting equipment • balances and scales • calipers, rules and measuring tapes • pH meters, dissolved oxygen probes and other potentiometric equipment • spectrometers • physiological monitors for temperature and respiration • monitors for experimental variables, such as temperature and humidity • hand-held microtomes and microtome knives (non-disposable or disposable) • tissue processors • incubators, water baths and controlled environment chambers • greenhouse • volumetric glassware and measuring devices • general laboratory glassware and equipment identified with an anatomical pathology laboratory • chemicals for preparation of nutrient and culture requirements • chemicals for tests of plant and animal physiology and pathology • reference material for quality control and quality assurance systems • computer or other classification keys • laboratory information management systems (LIMS), databases, record and filing systems, including specimen accessioning

RANGE STATEMENT	
Communication	Communication may include: • scientists • field workers • local government professionals or representatives of state/territory authorities, such as environmental protection agencies • supervisors and managers (laboratory, quality and customer service) • clients
Hazards	Hazards may include: • microbiological organisms and agents, associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • solar radiation, dust and noise • chemicals, such as acids, solvents and stains • sharps and broken glassware • flammable liquids and gases • fluids under pressure, such as steam and industrial gases • disturbance or interruption of services
Safe work practices	Safe work practices may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, material safety data sheets (MSDS) and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective equipment, such as gloves, safety glasses, coveralls, gowns, hearing protection and safety boots • using containment facilities (PCII, PCIII and PCIV physical containment laboratories),

RANGE STATEMENT	
	containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Disposal of biohazardous wastes	Disposal of biohazardous wastes may include: • collection for sterilisation by autoclaving (e.g. autoclaving of microbiological plates) • appropriate storage (e.g. of waste containing radioactive isotopes) • use of biohazard waste containers
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975018A Perform complex tests to measure chemical properties of materials

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to isolate analytes from complex matrices and perform multi-staged and/or multi-component analysis on them. The unit requires personnel to apply detailed knowledge of analytical chemistry to plan the analysis, prepare and measure samples, analyse and report results and make approved adjustments to procedures as required. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical working in all industry sectors. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice, including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL975009A	*Perform routine chromatographic techniques*
		OR
	MSL975020A	*Apply routine spectrometric techniques*
		AND
	MSL974003A	*Perform chemical tests*
		OR
	MSL974004A	*Perform food tests*
		OR
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination, and*
	MSL973004A	*Perform aseptic techniques*
		AND
	MSL973002A	*Prepare working solutions*
		OR
	MSL974001A	*Prepare, standardise and use solutions*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop an analysis plan with supervisor	1.1. Liaise with client or sample provider to determine test requirements and sample characteristics 1.2. Record sample description, compare with specification, record and report discrepancies 1.3. Confirm suitable sample preparation methods, quantification and analytical techniques with supervisor 1.4. Schedule analysis using enterprise procedures
2. Reduce the complexity of the sample	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare validation checks for analytical portions 2.3. Use enterprise procedures to simplify the sample matrix 2.4. Conduct tests to ensure that sample preparation is complete
3. Apply quantification method	3.1. Add modifiers to remove/minimise interferences 3.2. Conduct preliminary analysis to estimate analyte concentration 3.3. Match the concentration of analyte in the sample with the working range of the instrument 3.4. Prepare calibration standards to suit quantification method

ELEMENT	PERFORMANCE CRITERIA
4. Perform analysis	4.1. Set up and optimise instruments to suit sample/test requirements 4.2. Measure analyte response for standards, validation checks and samples 4.3. Conduct sufficient measurements to obtain reliable data 4.4. Return instruments to standby or shutdown condition as required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with estimations and expectations 5.3. Record results with the appropriate accuracy, precision units and uncertainty 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks/hazards, safety equipment and control measures associated with sample handling, preparation and test methods 6.2. Use personal protective equipment and safety procedures as specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impact 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain security, integrity and traceability of samples and documentation 7.3. Maintain equipment and logs in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting client requests, test methods and procedures accurately
- safely setting up, starting up and shutting down equipment using enterprise procedures
- checking calibration/qualification status of equipment
- preparing samples and standards
- optimising procedures and equipment to suit sample/test requirements
- maintaining close attention to measurement procedures, accuracy and precision during lengthy complex tests
- calculating analyte concentrations with appropriate accuracy, precision, units and uncertainty
- recognising atypical data/results
- troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results
- maintaining security, integrity and traceability of samples and documentation
- following occupational health and safety(OHS) procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- principles and concepts underpinning the analysis, such as:
  - effects of interferents with analyte behaviour, such as ionisation, complexation, precipitation, masking and association
  - quantification methods, such as internal standards, standard additions, Gran's Plot and recovery checks
  - chemical, physical treatments to minimise interferences
- function of key components of equipment
- effects of modifying instrumental variables on outputs and results
- handling of hazardous chemicals and samples and/or the fragile/labile nature of biological material
- sample preparation procedures
- preparation and use of calibration charts and/or standards
- calculation steps to give results in appropriate units, precision and uncertainty
- enterprise and/or legal traceability requirements
- basic procedure and equipment troubleshooting techniques

REQUIRED SKILLS AND KNOWLEDGE
• basic equipment maintenance procedures • relevant health, safety and environment requirements **Specific industry** Additional knowledge requirements may apply for different industry sectors. For example: • nature of specific sample matrices • special needs for sample treatment/pre-treatment • industry specific instrumentation

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client request, test methods and procedures accurately • safely set up, start up and shut down equipment using enterprise procedures • check calibration/qualification status of equipment • prepare samples and standards appropriately • optimise procedures and equipment to suit sample/test requirements • maintain close attention to measurement procedures, accuracy and precision during lengthy complex tests • calculate analyte concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and reports data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.

EVIDENCE GUIDE	
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*. Resources may include: • standard laboratory with appropriate analytical instruments, laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results • inspection of test records and workplace documentation completed by the candidate • observation of candidate conducting a range of complex tests to measure chemical properties of materials • feedback from clients, peers and supervisors • oral or written questioning of relevant chemical principles, concepts, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting.

EVIDENCE GUIDE	
	Environmental The analysis of a soil sample for nutrient profiles requires a complex procedure for simplifying the soil matrix and then performing multiple analyses on the sample in order to obtain data on both macro and micro soil nutrients. To determine the chemical suitability of a particular soil for agricultural activity, a detailed analysis is required of macro-nutrients, such as nitrate, phosphate and potassium as well as micro-nutrients, such as metals (including copper (Cu), selenium (Se)molybdenum (Mo), iron (Fe) and sulphate. A technician is given a composite soil sample from a client and uses the standard techniques of riffling and coning and quartering to obtain representative sub-samples for laboratory analysis. The technician then removes the soil matrix by one of several methods depending on the type of nutrient analysis being performed. For soil micro-nutrients, such as trace metals, they dry the sample (to remove moisture and obtain the dry weight), then wet ash it with concentrated sulphuric acid (to remove carbonaceous components), and finally resuspend it in dilute nitric acid. Once the technician is satisfied that the matrix has been simplified sufficiently, they then use an inductively coupled plasma spectrophotometer to ascertain the concentration of trace metals in the soil. The analysis for macro-nutrients, such as phosphate, is performed in several ways due to the enormously variable processes involved in weathering of parent material into soil. One common macro-nutrient test is for leachable phosphate, which involves extraction of labile phosphate from the soil matrix. In this case, the technician uses the Olsen method. They remove the analyte from the complex soil matrix by extracting it with hydrogen carbonate solution and quantify the liberated analyte using visible spectrophotometry.

Range Statement

RANGE STATEMENT

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • AS 2162.1 General - Volumetric glassware
	  • AS 2134.1 Flame atomic absorption spectroscopy
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• use of specific standards such as:
	  • Association of Analytical Communities International (AOAC International) Official Methods of Analysis
	  • American Society for Testing and Materials

RANGE STATEMENT	
	(ASTM) • United States Environmental Protection Agency (US EPA) • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise procedures, SOPs and operating manuals • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • incident and accident/injury reports • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Test requirements	Test requirements may include: • specification of concentration and limits of analytes • time and cost limitations

RANGE STATEMENT	
Sample preparation	Sample preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding, mulling, preparation of disks, digestion, dissolving, ashing, refluxing, extraction, filtration, evaporation, flocculation, precipitation, washing, drying and centrifugation • solid-phase micro-extraction • determination of, and if appropriate, removal of any contaminants or impurities • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware
Quantification techniques	Quantification techniques may include: • matrix matched standards • standard additions • international standards
Analytical techniques	Analytical techniques may include: • spectrometric techniques, such as inductively coupled plasma optical emission spectroscopy (ICP-OES) and inductively coupled plasma mass spectroscopy (ICP-MS) • chromatographic techniques, such as gas chromatography mass spectroscopy (GC-MS), ion chromatography (IC) • electrometric techniques, such as ion selective electrodes, voltammetry (polarography) and anodic stripping voltammetry • electrophoretic techniques, such as capillary electrophoresis
Typical analytes and samples requiring complex tests	Typical analytes and samples requiring complex tests may involve: • contaminants in food, such as heavy metals and afflotoxins • trace level (microgram and nanogram/litre) analytes • forensic testing, drug testing in body tissues and fluids • multiple analytes, such as organochlorins and

RANGE STATEMENT	
	polyaromatic hydrocarbons • environmental contaminants in water, soil and air (such as pesticides) • sludge, waste water and sewage • samples with matrix interferences
Validation checks	Validation checks may include: • recovery checks • use of standard/certified samples
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • matrix interference • spectral interference • problems associated with the physical state of the analyte, such as blockages and viscosity changing flow rates to instruments

Hazards	Hazards may include:
	• electric shock
	• biohazards:
	  • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids
	  • mycotoxins
	• chemicals:
	  • acids (e.g. sulphuric, perchloric and hydrofluoric)
	  • heavy metals and pesticides
	  • anions (e.g. fluoride)
	  • hydrocarbons)e.g. mono-aromatics)
	• radiation (nuclear, lasers and ultraviolet (UV))
	• sharps and broken glassware
	• aerosols from broken centrifuge tubes and pipetting
	• flammable liquids and gases
	• cryogenics, such as dry ice and liquid nitrogen
	• fluids under pressure, such as hydrogen in gas liquid chromatography, acetylene in atomic absorption spectrometry
	• sources of ignition

RANGE STATEMENT	
	• high temperature ashing processes • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • use of personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods and direct extraction of vapours and gases • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • minimising exposure to radiation ionising, such as lasers, electromagnetic and UV radiation
Tests for completeness of sample preparation	Tests for completeness of sample preparation may include: • visual inspection for colour and solids • odour • pH and conductivity • chemical tests for interferents, such as precipitation and colour forming • basic screening instrumental tests, such as IR, ultraviolet-visible (UV-VIS) and gas chromatography
Modifiers	Modifiers may include: • ionisation suppressants, such as Caesium for Ca, Na, K in atomic absorption spectroscopy (AAS) • ionic strength and pH buffers, such as TISAB for fluoride in ion-selective electrode (ISE) • releasing agents, such as Lanthanum and Strontium for Ca in AAS • volatility suppressants, such as phosphate for Pb in electrothermal AAS
Occupational health and safety (OHS) and environmental	OHS and environmental management requirements:

RANGE STATEMENT	
management requirements	• all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975019A Apply complex instrumental techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using specialised analytical instruments that require highly developed technical skills to operate effectively. Competency includes the ability to establish client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers working in all industry sectors, government agencies and research laboratories. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technical officer will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL975009A	*Apply routine chromatographic techniques* ***OR***
		OR
	MSL975020A	*Apply routine spectrometric techniques* ***AND***
		AND
	MSL974003A	*Perform chemical tests* ***OR***
		OR
	MSL974004A	*Perform food tests* ***OR***
		OR
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination, and*
	MSL973004A	*Perform aseptic techniques*
		AND
	MSL973002A	*Prepare working solutions*
		OR
	MSL974001A	*Prepare, standardise and use solutions*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold

unit of competency.	italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with specification and record and report discrepancies 1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes. 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks and/or calibration standards for analytical portions 2.4. Use specialised procedures for ultra-trace sample and standard preparation as required
3. Setup, optimise instrument and sub-systems	3.1. Perform pre-use and safety checks using enterprise procedures 3.2. Assemble appropriate instrument sub-systems to construct the required analytical path 3.3. Start up and condition the instrument using enterprise procedures 3.4. Check and optimise each instrument sub-system 3.5. Optimise instrumental parameters to suit sample and test requirements 3.6. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable

ELEMENT	PERFORMANCE CRITERIA
	data 4.3. Return instruments to standby or shutdown condition as required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations 5.3. Record results with the appropriate accuracy, precision, uncertainty and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

REQUIRED SKILLS AND KNOWLEDGE

Required skills

Required skills include:

- establishing client needs for routine and non-routine samples
- interpreting client request, test methods and procedures accurately
- preparing samples and standards optimise procedures and equipment to suit sample/test requirements
- safely setting up, starting up and shutting down equipment
- obtaining valid and reliable data
- troubleshooting common analytical procedure and equipment problems
- assembling checks and optimising instrument sub-systems
- checking the calibration/qualification status of equipment
- operating equipment to obtain valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognising atypical data/results
- applying theoretical knowledge to interpret data and make relevant conclusions
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- followingoccupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- principles and concepts related to instrument operation, material preparation and testing, such as:
  - mechanisms for absorption/emission
  - distinction between selective ion monitoring (SIM) and total ion current (TIC) mode in gas chromatographic mass spectroscopy (GC-MS)
  - sequence of steps required for successful anode stripping voltameter (ASV)
- function of key components and sub-system of the instrument
- handling of hazardous chemicals and samples and/or the fragile/labile nature of biological material
- sample preparation procedures
- effects on outputs and results of modifying instrumental variables
- procedures for optimising instrument performance
- basic procedure and equipment troubleshooting techniques
- preparation and use of calibration charts and/or standards
- calculation steps to give results in appropriate units and precision
- basic equipment maintenance procedures

REQUIRED SKILLS AND KNOWLEDGE
• enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client request, test methods and procedures accurately • safely set up, start up and shut down equipment using enterprise procedures • assemble checks and optimise instrument sub-systems • check calibration/qualification status of equipment • prepare samples and standards appropriately • optimise procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data • calculate analyte concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • apply theoretical knowledge to interpret data and make relevant conclusions • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with:

EVIDENCE GUIDE	
	• *MSL925001 Analyse data and report results*. Resources may include: • standard laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results • inspection of test records and enterprise documentation completed by the candidate • observation of candidate using specialised instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant chemical principles, concepts, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental (1)** If oysters and other shellfish accumulate significant levels of heavy metals, they can represent a public health risk when consumed by humans. Analysis of heavy metal

EVIDENCE GUIDE	
	residues requires digestion of the sample in a concentrated acid, typically nitric. The digest is diluted in ultra pure water and analysed by standard addition and electrothermal atomic absorption spectroscopy (AAS) using a phosphate modifier to reduce lead volatility. The technician must pay careful attention to the digestion process and to the widely varying absorbances that will result from oysters of having accumulated different concentrations of residue. **Manufacturing** (**1**) Electrothermal atomic absorption (AA) spectrophotometers are one of the more common instruments for the analysis of microgram/litre levels of metals. Setting up the instrument requires more skill and care than a normal flame AAS instrument. Firstly, the technician must check the graphite tube for wear, replace it if necessary, and re-align it. The auto sampler delivery tube must also be checked for its alignment so that delivery of the micro-litre aliquots of solution is accurate and precise. The technician must also make the standards with great attention to avoid contamination from glassware and reagents. **Manufacturing** (**2**) The physical and mechanical properties of metal alloys are crucially dependent on their composition. Therefore, the composition of alloys must be checked carefully. While acid dissolution and analysis by flame AAS or ICP emission spectroscopy is possible, one of the most common techniques used is X-ray fluorescence (XRF) because it does not have the same demanding sample preparation requirements. XRF samples, after polishing to remove any surface defects, can be analysed directly against reference standards of the same alloy. Control of instrument variables is critical in obtaining accurate results. This requires the technician to carefully optimise a number of components within the overall instrument before conducting the analysis. **Environmental** (**2**) An insurance company contracted a consulting laboratory to conduct tests on an accelerant residue that may have been used in a recent arson attack on a local school building. The residue was run through a column chromatograph and compared with reference standards (such as petrol, kerosene, 50% mixtures, evaporated

EVIDENCE GUIDE	
	petrol) to establish the identity of the sample. Confirmation of these results was obtained by using a GC-MS instrument to establish the identity of the sample beyond reasonable doubt along with additional tests for heavy metals such as lead.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction-General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • AS 2162.1 General - Volumetric glassware
	  • AS 2134.1 Flame atomic absorption spectroscopy

RANGE STATEMENT	
	• ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise procedures, SOPs and operating manuals • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • incident and accident/injury reports • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Specialised analytical instruments	Specialised analytical instruments may include: • spectrometric instruments such as:

RANGE STATEMENT	
	• electrothermal (AAS) • vapour generation (AAS) • X-ray fluorescence (XRF) and diffraction (XRD) • nuclear magnetic resonance (NMR), magnetic resonance imaging (MRI) • mass spectrometry (MS) • neutron activation analysis (NAA) • inductively coupled plasma mass spectrometry (ICP-MS) • chromatographic instruments such as: • GC-MS • GC sampling devices (e.g. headspace and thermal desorption) • specialised GC detection devices (e.g. electron capture detector (ECD), flame photometric detector (FPD) and nitrogen phosphorous detection (NPD)) • specialised GC detection devices (e.g. fluorescent, diode array and electrochemical) • liquid chromatography mass spectroscopy (LC-MS), electro-spray MS • gas chromatography fourier transform infra red (GC-FTIR) • electrometric instruments, such as anodic stripping voltammetry • flow injection analytical equipment
Tests requiring specialised instruments	Tests requiring specialised instruments may include: • trace analysis • non-destructive testing • multi-analyte determination • analysis involving high sample throughput
Instrument sub-systems	Instrument sub-systems may include: • sample introduction units and auto sampling equipment • detectors and signal conditioning units • temperature control devices such as cryostats, ovens, and thermostat baths

RANGE STATEMENT	
	• software control/interface
Sample preparation	Sample preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding, mulling, preparation of disks, digestion, dissolving, ashing, refluxing, extraction, filtration, evaporation, flocculation, precipitation, washing, drying and centrifugation • solid-phase micro-extraction • determination of, and if appropriate, removal of any contaminants or impurities • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • sample introduction blockages • incomplete atomisation of analyte • poor resolution of peaks • poor sensitivity

Hazards	Hazards may include:
	• electric shock
	• biohazards:
	  • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids
	  • mycotoxins
	• chemicals:
	  • acids (e.g. sulphuric, perchloric and hydrofluoric)
	  • heavy metals and pesticides
	  • anions (e.g. fluoride)
	  • hydrocarbons (e.g. mono-aromatics)
	• radiation (alpha, beta, gamma, X-ray and neutron)
	• sharps and broken glassware
	• aerosols from broken centrifuge tubes and pipetting

RANGE STATEMENT	
	• flammable liquids and gases • cryogenics such as dry ice and liquid nitrogen • fluids under pressure such as hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry • sources of ignition • high temperature ashing processes • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment such as gloves, safety glasses, and coveralls • use of fumehoods, direct extraction of vapours, gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • minimising exposure to radiation ionising such as lasers, electromagnetic and ultraviolet (UV) radiation
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975020A Apply routine spectrometric techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using routine spectrometric techniques. The unit also includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers working in all industry sectors, government agencies and research laboratories. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice, including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974003A	*Perform chemical tests and procedures*
		OR
	MSL974004A	*Perform food tests*
		OR
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*
		AND
	MSL973002A	*Prepare working solutions*
		OR
	MSL974001A	*Prepare, standardise and use solutions*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the

unit of competency.	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with specification and record and report discrepancies 1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks for analytical portion
3. Set up and optimise instrument	3.1. Perform pre-use and safety checks in accordance with enterprise procedures 3.2. Start up and condition the instrument using enterprise procedures 3.3. Optimise instrumental parameters to suit sample and test requirements 3.4. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable data 4.3. Return instruments to standby or shutdown condition as required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations

ELEMENT	PERFORMANCE CRITERIA
	5.3. Record results with the appropriate accuracy, precision, uncertainty and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • interpreting client requests, test methods and procedures accurately • safely setting up and shutting down equipment using enterprise procedures • checking calibration/qualification status of equipment • identifying and calculating potential sources of uncertainty

REQUIRED SKILLS AND KNOWLEDGE
• preparing standards and samples appropriately • choosing and optimising procedures and equipment settings to suit sample/test requirements, such as selection of wavelength maxima and position of burner • operating equipment to obtain valid and reliable data • making approved adjustments to procedures for non-routine samples • recognising atypical data/results • troubleshooting common analytical procedure and equipment problems • applying theoretical knowledge to interpret data and making relevant conclusions • recording and reporting data/results • maintaining security, integrity and traceability of samples and documentation • followingoccupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)
Required knowledge
Required knowledge includes: • spectrometric principles and concepts related to instrumentation operation and testing • relationship of chemical structure to electromagnetic radiation absorption • handling of unstable or hazardous chemicals and samples and/or the fragile/labile nature of biological material • sample preparation procedures • use of spectroscopy for qualitative and quantitative analysis • function of key components of the equipment • effects on spectra of modifying and/or optimising instrumental variables, such as wavelength, slit width, burner position and lamp voltage • basic procedure and equipment troubleshooting techniques • preparation and use of calibration charts and/or standards • calculation steps to give results in appropriate accuracy, precision, uncertainty and units • enterprise and/or legal traceability requirements • basic equipment maintenance procedures • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • safely set up and shut down equipment using enterprise procedures • check calibration/qualification status of equipment • prepare standards and samples appropriately • choose and optimises procedures and equipment settings to suit sample/test requirements, such as selection of wavelength maxima and position of burner) • operate equipment to obtain valid and reliable data • make approved adjustments to procedures for non-routine samples • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • apply theoretical knowledge to interpret data and makes relevant conclusions • record and report data/results in accordance with enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results.* Resources may include: • standard laboratory equipped with appropriate spectrometers, laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results

EVIDENCE GUIDE	
	• inspection of test records and workplace documentation completed by the candidate • feedback from peers and supervisors • observation of candidate applying a range of routine spectrometric techniques • oral or written questioning of chemical principles and concepts, spectrometric techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Ultraviolet (UV) spectroscopy is a sensitive technique for measuring polycyclic hydrocarbons. Because polycyclic hydrocarbons are considered carcinogenic, they are strictly regulated, and technicians making these measurements must follow enterprise procedures when handling samples. A technician conducting such an analysis noted variable results. After some discussion with the laboratory scientist, it was determined that the standard materials were light sensitive and were being degraded. The technician suggested that they change the light in the work space to yellow. When the lighting was changed, the standard remained stable and the measurements for polycyclic hydrocarbons were carried out successfully.

EVIDENCE GUIDE	
	Biotechnology DNA can be extracted from human blood for subsequent identification of inherited genetic disorders, paternity disputes or forensic investigations. It is not a difficult procedure and is performed by technical officers in diagnostic molecular biology laboratories and those working in university research laboratories. In such a procedure, the DNA is separated from the haemoglobin and blood cells, the protein in the plasma and the fat by a series of enzymic digests and phenol/chloroform extractions. The last purification step involves precipitation by clod ethanol and dissolving the DNA in TRIS buffer. The yield from 10mL of human blood is about 12-20mg of DNA if all is well. The yield is determined by spectrometric absorption at 260 and 280nm. The two wavelengths are used to determine the DNA extract and the degree of protein contamination. The technical officer will carry out this step before proceeding. Too small a yield will make further testing impractical and a polymerase chain reaction (PCR) will then be used to amplify the DNA in the sample. **Food processing** A technician was determining the amount (by mass) of (-carotene in imported tomato paste. The technician extracted a known mass of the paste into acidified ether, evaporated off the solvent and measured the absorbance of the remaining material by spectrometry. After reference to the Australian Food Additive Guide, the technician was able to report the tomato paste met the requirements of the Australian standard.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS 2134.1-1999 Recommended practice for chemical analysis by atomic absorption spectrometry - Flame atomic absorption spectrometry
	  • AS 3753-2001 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• calibration and maintenance schedules
	• cleaning, hygiene and personal hygiene requirements
	• data quality procedures
	• enterprise procedures, SOPs and operating manuals
	• enterprise recording and reporting procedures

RANGE STATEMENT	
	• equipment startup, operation and shutdown procedures • Guide to physical containment levels and facility types • incident and accident/injury reports • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Routine spectrometric methods	Routine spectrometric methods may include: • ultraviolet-visible (UV-VIS) • infrared, including Fourier transform infrared and near infrared • atomic absorption spectroscopy (AAS) • fluorescence • flame emission spectroscopy
Tests	Tests may include methods for: • control of starting materials, in-process materials and finished products (e.g. petroleum, food, mining and manufacturing) • environmental monitoring pollutants in air, water, soil and vegetation • forensic tests

RANGE STATEMENT	
	• therapeutic drug analysis • diagnostic pathology tests • determinations of enzyme activity • routine chemical analytes, such as starch, glucose, DNA, and therapeutic degradation products • troubleshooting enterprise processes
Preparation of sample	Preparation of sample includes processes, such as: • identification of any hazards associated with samples and/or analytical chemicals • grinding, mulling, preparation of discs, ashing, dissolving, refluxing, extraction, filtration, evaporation, precipitation, centrifugation, drying and washing • determination of and, if appropriate, removal of any contaminants, impurities or interfering substances
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • dirty or contaminated sample cells • inappropriate selection of wavelength • problems with interfering or complexing substances • incomplete atomisation of analyte • poor resolution of peaks • poor sensitivity • need to dilute samples

Hazards	Hazards may include:
	• electric shock
	• radiation (UV)
	• biohazards:
	  • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids
	  • mycotoxins
	• acids (e.g. sulphuric and nitric)
	• hazardous materials (e.g. heavy metals and pesticides)
	• hydrocarbons (e.g. phenol, benzene, toluene

RANGE STATEMENT	
	and complex mixtures) • aerosols from broken centrifuge tubes and pipetting • sharps and broken glassware • flammable liquids and gases • fluids under pressure, such as acetylene in atomic absorption spectrometry (AAS) • sources of ignition • high temperature ashing processes • disturbance or interruption of services
Addressing hazards	Addressing hazards may involve: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • use of personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and waste gases • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • use of Class PCII, PCIII and PCIV physical containment laboratories • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975021A Apply routine electrometric techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using routine electrometric techniques. The unit also includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers and analysts working in all industry sectors, government agencies and research laboratories. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'"

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974003A	*Perform chemical tests and procedures*
		OR
	MSL974004A	*Perform food tests*
		OR
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*
		AND
	MSL973002A	*Prepare working solutions*
		OR
	MSL4001A	*Prepare, standardise and use solutions*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the

unit of competency.	required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with specification and record and report discrepancies 1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks for analytical portion
3. Set up and optimise instrument	3.1. Perform pre-use and safety checks in accordance with enterprise procedures 3.2. Start up and condition the instrument using enterprise procedures 3.3. Optimise instrumental parameters to suit sample and test requirements 3.4. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable data 4.3. Return instruments to standby or shutdown condition as required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations

ELEMENT	PERFORMANCE CRITERIA
	5.3. Record results with the appropriate accuracy, precision, uncertainty and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • interpreting client requests, test methods and procedures • safely setting up and shutting down equipment • checking the calibration/qualification status of equipment • preparing standards and samples

REQUIRED SKILLS AND KNOWLEDGE
• choosing and optimising procedures and equipment settings to suit sample/test requirements • operating equipment to obtain valid and reliable data • making approved adjustments to procedures for non-routine samples • recognising atypical data/results • troubleshooting common analytical procedure and equipment problems • applying theoretical knowledge to interpret data and make relevant conclusions • recording and reporting data/results in accordance with enterprise procedures • maintaining security, integrity and traceability of samples and documentation • followingoccupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)
Required knowledge
Required knowledge includes: • redox and electrical principles and concepts related to instrumentation operation and testing • handling of unstable or hazardous chemicals and samples and/or the fragile/labile nature of biological material • sample preparation procedures • use of various electrometric techniques for qualitative and quantitative analysis • function of key components of the instrument • effects on outputs and results of modifying instrumental variables such as voltage and current ranges • procedure for optimising equipment by changing operation parameters such as drop rate and scan speed • basic procedure and equipment troubleshooting techniques • preparation and use of calibration charts and/or standards • calculation steps to give results in appropriate accuracy, precision, uncertainty and units • enterprise and/or legal traceability requirements • basic equipment maintenance procedures • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

EVIDENCE GUIDE	
Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • safely set up and shut down equipment using enterprise procedures • check calibration/qualification status of equipment • prepare standards and samples appropriately • choose and optimise procedures and equipment settings to suit sample/test requirements • operate equipment to obtain valid and reliable data • make approved adjustments to procedures for non-routine samples • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • apply theoretical knowledge to interpret data and make relevant conclusions • record and report data/results in accordance with enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*. Resources may include: • standard laboratory equipped with routine electrometric equipment, laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results • inspection of test records and workplace

EVIDENCE GUIDE	
	documentation completed by the candidate • feedback from peers and supervisors • observation of candidate applying a range of routine electrometric techniques • oral or written questioning of chemical principles and concepts, electrometric techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Quality control tests on toothpaste require the monitoring of the soluble fluoride in the product. To analyse a sample, the technician uses an ultrasonic bath to disperse the paste in a buffer which controls ionic strength and pH (known as TISAB). He/she then measures the fluoride content using a fluoride ion-selective electrode which has been calibrated against a range of fluoride in TISAB standards. **Environmental** A technician routinely analyses effluent samples from a copper smelter for their lead and zinc content using differential pulse polarography. The samples require no pre-treatment other than the addition of solid KCl as electrolyte. The technician programmes the polarograph to analyse multiple samples on a carousel and to perform

EVIDENCE GUIDE	
	standard additions automatically by drawing aliquots from a concentrated standard of the two metals. **Food processing** One of the important quality tests for a wine is its total acidity (principally tartaric acid). Because of the colour of red wine, it is not possible to perform a titration using an indicator for endpoint detection. The technician is required to calibrate a pH electrode and titrate aliquots of the wine to a pH of 8.4 with standardised NaOH. The endpoint pH is the generally accepted one for wines of all types.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set

RANGE STATEMENT	
	• ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise procedures, SOPs and operating manuals • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • Guide to physical containment levels and facility types • incident and accident/injury reports • material safety data sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Routine electrometric	Routine electrometric techniques may include use

RANGE STATEMENT	
techniques	of: • ion-selective electrodes • potentiometric titrations • conductometric titrations • amperometry • polarography
Tests	Tests may include: • control of starting materials, in-process materials and finished products • environmental monitoring • therapeutic drug analysis • determination of enzyme activity • routine determination of chemical analytes such as fluoride, nitrate, water hardness, lead, copper and quinine • troubleshooting enterprise processes
Sample preparation	Sample preparation may include: • identification of any hazards associated with samples and/or analytical chemicals • grinding, mulling, digestion, dissolving, ashing, refluxing, extraction, filtration, evaporation, flocculation, precipitation, washing, drying and centrifugation • determination of and, if appropriate, removal of any contaminants or impurities
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • matrix interferences such as formation of complexes • physical damage to electrodes
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • chemicals: • acids (e.g. sulphuric, perchloric and hydrofluoric)

RANGE STATEMENT	
	• heavy metals and pesticides • anions (e.g. fluoride) • hydrocarbons (e.g. phenol, toluene, benzene and mono-aromatics) • ammonium persulphide • sharps and broken glassware • aerosols from broken centrifuge tubes and pipetting • flammable liquids and gases • cryogenics such as dry ice and liquid nitrogen • sources of ignition • disturbance or interruption of services
Addressing hazards	Addressing hazards may involve: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • use of personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods and direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and

RANGE STATEMENT	
	State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975022A Perform food analyses

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse the nutrient and ingredient composition of foods and the identification and quantification of both chemical and biological contaminants within raw and processed foods. These tests may involve complex sample preparation followed by multi-staged and/or multi-instrumental analysis, immunoassay and computer-based nutrient analysis.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technical officers and analysts working in the food and beverage processing industry sectors. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. The unit covers tests and procedures that are usually performed in a full or partially computerised and automated laboratory environment. Although a supervisor may not always be present, the technical worker will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice including varying enterprise/test procedures and communicating results to people outside the laboratory. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974004A	*Perform food tests*
		OR
	MSL974006A	*Perform biological procedures*
	MSL973007A	*Perform microscopic examination*
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Establish client needs and schedule analysis	1.1. Liaise with client or sample provider to determine client needs and sample history 1.2. Record sample description, compare with

ELEMENT	PERFORMANCE CRITERIA
	specification and record and report discrepancies 1.3. Identify non-routine samples and the possible need to vary enterprise procedures 1.4. Seek advice from supervisor about any proposed variations and document all approved changes 1.5. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Obtain a representative analytical portion of the laboratory sample 2.2. Prepare sample in accordance with testing requirements 2.3. Prepare validation checks and/or calibration standards for analytical portion 2.4. Use specialised procedures for ultra-trace sample and standard preparation, as required
3. Set up and optimise instrument	3.1. Perform pre-use and safety checks using enterprise procedures 3.2. Start up and condition the instrument using enterprise procedures 3.3. Optimise instrumental parameters to suit sample and test requirements 3.4. Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1. Measure analyte response for standards, validation checks and samples 4.2. Conduct sufficient measurements to obtain reliable data 4.3. Return instruments to standby or shutdown condition as required 4.4. Store unused/prepared laboratory samples for future reference if required
5. Process and analyse data	5.1. Confirm data is the result of valid measurements 5.2. Perform required calculations and ensure results are consistent with standards or estimations and expectations 5.3. Record results with the appropriate accuracy, precision and units 5.4. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5. Troubleshoot analytical procedure or equipment

ELEMENT	PERFORMANCE CRITERIA
	problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system (LIMS) 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting client requests, test methods and procedures accurately
- safely setting up, starting up and shutting down equipment using enterprise procedures
- checking calibration/qualification status of equipment
- handling, preparing and storing samples and standards appropriately
- choosing and optimising procedures and equipment settings to suit sample/test requirements
- operating equipment to obtain valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision and units
- recognising atypical data/results

REQUIRED SKILLS AND KNOWLEDGE

- troubleshooting common analytical procedure and equipment problems
- applying theoretical knowledge to interpret data and make relevant conclusions
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- followingoccupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- structure, properties and nutritional value of proteins, lipids, carbohydrates, vitamins and minerals and fibre
- chemical composition of common food and beverages and the methods that can determine their composition
- key food processing and preservation techniques and their effect on nutrients
- packaging and controlled atmosphere storage and their effect on nutrients
- glycaemic index (GI) and its significance
- significance of digestion and absorption of macro and micro-nutrients in food and the implications of food additives and fortification on absorption of nutrients such as fortification of milks with iron (Fe) and calcium (Ca) and breakfast cereal with Fe
- interrelationships of specific nutrient composition with public health and health promotion issues
- food labeling regulations and their implications for nutritional claims
- micro-organisms responsible for food spoilage, contamination, food borne disease and used in food processing for preservation or probiotic application
- quality control programs for raw materials, process control and finished product inspection
- sample preparation methods and correct storage conditions for specific food samples and tests
- principles and concepts related to instrument operation, material preparation and testing
- function of key components and sub -system of the instrument
- effects on outputs and results of modifying instrumental variables
- procedures for optimising instrument performance
- basic procedure and equipment troubleshooting techniques
- preparation and use of calibration charts and/or standards
- calculation steps to give results in appropriate units and precision
- sources of error in specific tests and reproducibility and accuracy of commonly used test method for nutrient analysis
- enterprise and/or legal traceability requirements
- basic equipment maintenance procedures

REQUIRED SKILLS AND KNOWLEDGE
• relevant health, safety and environment requirements • emerging character of pharmaceutical properties of foods and probiotics • public perception of food safety including genetically modified foods and food irradiation • role, and methods, of production of genetically modified foods in the market • nature, structure and function of food additives • food allergies and intolerances • food legislation relevant for enterprise • hazard analysis and critical control points (HACCP) procedures for enterprise Additional knowledge requirements may apply for different food processing industry sectors, such as dairy, grains, fruit and vegetables, meat and cereals

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • safely set up, start up and shut down equipment using enterprise procedures • check calibration/qualification status of equipment • handle, prepare and store samples and standards appropriately • choose and optimise procedures and equipment settings to suit sample/test requirements • operate equipment to obtain valid and reliable data • calculate analyte concentrations with appropriate accuracy, precision, uncertainty and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • apply theoretical knowledge to interpret data and make relevant conclusions

EVIDENCE GUIDE	
	• record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925001A Analyse data and report results*. Resources may include: • standard laboratory with appropriate analytical instruments, laboratory reagents and equipment and samples • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results • inspection of test records and workplace documentation completed by the candidate • observation of candidate using instruments to conduct food analyses • feedback from clients, peers and supervisors • oral or written questioning of relevant principles, concepts, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like

EVIDENCE GUIDE	
	environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food processing** (**1**) A food laboratory technician is required to conduct nutritional analyses to meet Food Standards nutrition labelling requirements for a client's food sample. The client's product makes nutritional claims (for cholesterol and fatty acids) which require more than the standard format for a nutrition information panel (for energy, protein, total fat and saturated fat, carbohydrate, sugars and sodium). The technical officer schedules the nutritional assays according to enterprise procedures, sets up and calibrates the equipment, and prepares the samples and controls. She/he performs all required analyses carefully, recording sufficient readings to obtain reliable data for all samples and controls and satisfying all quality assurance and client specific requirements. The technician presents the analytical data to her/his supervisor for checking and signing off within specified time frame and the results are released to client. **Food processing** (**2**) A new breakfast cereal is going to be launched. The cereal has been developed, a manufacturing process devised and the marketing and legal teams have collaborated with the food technologists to determine what information needs to be on the label and what can be proclaimed on that label. The cereal has been fortified with iron and the laboratory team is requested to perform analyses on the product to confirm the nutrient analysis. This analysis will involve chemical and biochemical food analyses as well as computer nutrient analysis based on ingredient quantities computed for adding during manufacture. The technical officer is allocated the task of estimating iron levels by nutritional analysis (computer-based) and using atomic absorption spectrophotometry (AAS) on the ashed sample.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards such as:
	  • AS 1766.0-1995 Food microbiology - General introduction and list of methods
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
	• Australian Quarantine and Inspection Service (AQIS) Import Guidelines
	• calibration and maintenance schedules
	• data quality procedures
	• enterprise recording and reporting procedures
	• equipment startup, operation and shutdown procedures
	• gene technology regulations
	• industry standards, such as Royal Australian

RANGE STATEMENT	
	Chemical Institute (RACI) or American Association of Cereal Chemists (AACC) methods for colour, moisture, total ash, fats and proteins, nitrogen, fibre, micro-organisms and viscosity • material safety data sheets (MSDS) • material, production and product specifications (including maximum residue levels) • national measurement regulations and guidelines • principles of GLP • production and laboratory schedules • quality manuals, equipment and procedures manuals • SOPs and in-house methods • Therapeutic Goods Regulations 1009 • test methods and SOPs involving, for example, sampling, sample preparation, storage, disposal, transport, data quality, waste minimisation, cleaning and hygiene and safety • nutrient analysis or food composition tables • Australia New Zealand Food Authority (ANZFA) Code and User Guides • National Association of Testing Authorities (NATA) Accreditation programs requirements • Association of Analytical Communities International (AOAC International) Official Methods of Analysis

Analytical instruments	Analytical instruments may include:
	• Spectrometric instruments:
	  • ultraviolet-visible (UV-VIS)
	  • infrared including Fourier transform infrared and near infrared
	  • atomic absorption including flame and flameless
	  • fluorescence, flame emission, inductively coupled plasma (ICP) optical emission and inductively coupled plasma-mass spectrometry (ICP-MS)
	• chromatographic techniques and instruments:
	  • paper such as ascending and descending
	  • thin layer such as ascending, high

RANGE STATEMENT	
	performance, radical and descending • column chromatography • affinity chromatography and gel filtration chromatography • gas liquid and gas solid chromatography • high performance liquid chromatography (HPLC) such as liquid-liquid (LLC), liquid-solid (LSC), ion (IC), size exclusion (SEC) • gas chromatography mass spectroscopy (GC-MS) • electrophoretic techniques, such as capillary electrophoresis • electrometric techniques: • ion-selective electrodes • potentiometric titrations • conductometric titrations • amperemetry • polarography
Sample preparation:	Sample preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding to required particle size, milling, preparation of disks, digestion, dissolving, ashing, refluxing, extraction, filtration, evaporation, flocculation, precipitation, washing, drying, centrifugation, degassing and temperature equilibration • culturing of micro-organisms • determination of, and if appropriate, removal of any contaminants or impurities • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware
Nutrient analysis may	Nutrient analysis may include: • percentage composition of foods for major macro-nutrients such as starch, sugars, fats, protein and fibre • percentage composition of foods for saturated, unsaturated (mono, poly and omega3) fats and trans fatty acids

RANGE STATEMENT	
	• soluble and insoluble fibre • micro-nutrients with positive or negative health implications • micro-nutrients that figure in Recommended Daily Intake (RDI) lists • enzymic and immunological assays
Ingredient composition	Ingredient composition, may include specification of: • gluten free, lactose free, wheat free, cholesterol, salicylates, amines, monosodium glutamate (MSG), alcohol, nuts, additives, such as maltodextrose, egg white, wheat varieties, antioxidants, flavins, soy and phytoestrogens, and glycaemic index (GI) • probiotic claims • genetically modified food, irradiation of foods or ingredients
Ingredient composition involved with the development of new processes, **new products**, **and flavours**	Ingredient composition involved with the development of new processes, new products, and flavours may include: • quantitative analysis of oils in condiments and mustards • characterisation of probiotic and prebiotic foods • characterisation of flavins and phytoestrogens • characterisation of starch variants such as resistant starch • characterisation of tannins and polyphenols in beverages • analysis of ingredients that impart flavour and colour

Checking for contaminants	Checking for contaminants may include:
	• identification of microbial contaminants
	• heavy metals
	• allergens
	• chemical contaminants that constitute either:
	  • a public health risk with long term implications such as afflotoxin in peanuts
	  • a food poisoning risk
	  • spoiling of food leading to flavour changes

RANGE STATEMENT	
	and loss of sale
The test results	The test results may contribute to: • optimising production processes • nutritional information • labeling requirements • food safety • establishment, monitoring and troubleshooting of the HACCP process

Hazards	Hazards may include:
	• electric shock
	• biohazards:
	  • microbiological organisms and agents associated with soil, air, water, animal tissue and fluids
	  • mycotoxins
	• chemicals:
	  • acids (e.g. sulphuric, perchloric and hydrofluoric)
	  • hazardous materials, such as heavy metals and pesticides
	  • anions (e.g. fluoride)
	  • hydrocarbons (e.g. mono-aromatics)
	• sharps, and broken glassware
	• aerosols
	• flammable liquids and gases
	• cryogenics such as dry ice and liquid nitrogen
	• fluids under pressure such as hydrogen in gas liquid chromatography and acetylene in atomic absorption spectrometry
	• sources of ignition
	• dusts
	• high temperature ashing processes
	• disturbance or interruption of services

Addressing hazards	Addressing hazards may include: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment, such as gloves, safety glasses and coveralls

RANGE STATEMENT	
	• use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • minimising exposure to radiation ionising such as lasers, electromagnetic and ultraviolet (UV) radiation
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL975023A Supervise geotechnical site investigations

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to supervise and direct geotechnical site investigations based on observation and testing. The unit involves confirming the scope of the investigation, liaising with site personnel and coordinating geotechnical sampling and testing activities, collecting reliable data and reporting results. Personnel are also expected to interpret results in the field, provide reliable advice to clients, recognise and rectify obvious errors or unexpected results and troubleshoot common problems.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical officers working in the construction materials testing sector. This unit of competency is typically performed by experienced technicians or engineering paraprofessionals, who often supervise or direct less experienced technical personnel. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974002A	*Conduct geotechnical site investigations*
	MSL973012A	*Assist with geotechnical site investigations*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Plan geotechnical investigation	1.1. Identify the job, consult with stakeholders and obtain relevant information, including the purpose and scope of the investigation 1.2. Conduct desktop study of existing site information 1.3. Inspect the site to determine the characteristics of the project 1.4. Design inspection, sampling and testing program in accordance with specifications 1.5. Select human and physical resources required for the job 1.6. Identify site hazards and conduct risk assessment 1.7. Organise site induction for support personnel, as

ELEMENT	PERFORMANCE CRITERIA
	required 1.8. Brief support personnel on job-specific requirements 1.9. Ensuring ongoing liaison with stakeholders during project
2. Establish on-site operations	2.1. Consult with project personnel to determine methods of communication, roles, responsibilities and expectations of each party, including identification of potential problems and conflicts 2.2. Arrange deployment of personnel and resources to site 2.3. Arrange for the physical location of services, as required, and reconcile test locations
3. Coordinate geotechnical sampling and testing	3.1. Ensure sampling and testing is conducted in accordance with project requirements 3.2. Ensure test data and observations are recorded in accordance with enterprise practices 3.3. Review the progress of sampling and testing against the project schedule and provide any feedback to client as required 3.4. Review samples and field data and schedule testing as required 3.5. Ensure the finalisation of site operations according to project brief or relevant standard
4. Analyse project data and report to client	4.1. Report test results to site superintendent at specified intervals 4.2. Analyse project data and provide regular reports to the client using the agreed format
5. Maintain enterprise records	5.1. Ensure site results are documented in accordance with enterprise practices 5.2. Maintain security and confidentiality of enterprise information 5.3. Prepare and issue a final project report in accordance with client requirements
6. Promote a safe work environment	6.1. Promote the use of safe work procedures and protective equipment 6.2. Minimise environmental impacts of testing/sampling and generation of waste 6.3. Promote the collection and disposal of all waste in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting maps, site plans and drawings
- planning and managing projects
- identifying and locating site services, sampling and testing sites (e.g. using global positioning system (GPS))
- identifying soil, rock and fill materials
- observing, interpreting and reportingsite features and geotechnical conditions
- maintaining accurate and complete records
- interpreting test data
- resolving problems appropriately
- seeking advice about problems beyond technical competence from appropriate personnel
- driving safely on- and off-road
- working safely on construction sites aroundheavy equipment and earthmoving plant
- report writing
- using computer software to create/maintain databases and produce detailed reports

Required knowledge

Required knowledge includes:

- the purposes and principles of geotechnical site investigation
- identification and classification of materials
- principles of planning and project management
- engineering properties of soil and rock materials
- representative sampling and testing (both in situ and laboratory)
- uses of engineering materials in civil construction
- civil construction techniques
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the

EVIDENCE GUIDE	
performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • liaise with stakeholders at various levels of complexity • plan, coordinate and monitor a diverse range of geotechnical activities • analyse, collate and report geotechnical investigation findings.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical, additional assessment techniques must be used. This unit of competency may be assessed with: • *MSL915001A Provide information to customers* • *MSL915002ASchedule laboratory work for a small team* • *MSL935001A Monitor the quality of test results and data*. Resources may include: • access to sites, tools and equipment • enterprise procedures, sampling plans, test methods and equipment manuals.
Method of assessment	The following assessment methods are suggested: • review of work outputs over a period of time to ensure accurate and consistent work is obtained within required timelines • examples of completed workplace documentation • feedback from peers and supervisors • oral or written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made

EVIDENCE GUIDE	
	to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing** The materials laboratory of a large local authority has been requested to investigate a 10 km section of road pavement that shows varying degrees of distress. As the road is to be rebuilt and upgraded, the supervising engineer requires information to identify the reasons for the distress and to inform the design of the new pavement. The investigation will require test pits at 500 m intervals to allow examination of the underlying strata, in situ testing and sampling of existing pavement and sub-grade materials. The work will be performed by an experienced technician and a testing assistant, with supervision by a senior technician. The Council's Works Department will provide a backhoe with an operator and traffic management team. The engineer briefs the senior technician on the scope, purpose and requirements of the investigation and provides himher/ with the available documentation including maps, drawings and previous reports on the project. They refer to relevant ARMIS data, Falling Weight Deflection testing and surface defect mapping data. They carry out an on-site reconnaissance to confirm the available data and initial assumptions. The senior technician conducts a desk study to ensure that he/she understands the full requirements of the project. He/she plans the on- and off-site activities including locating the relevant services and utilities, arranging for the necessary permits and preparing a health and safety management plan. He/she also plans the excavations, sampling and in situ testing and the

EVIDENCE GUIDE	
	laboratory testing regime. Finally, he/she prepares a GANTT chart showing all activities and the critical control points. The project is expected to take one week to complete. He/she conducts a briefing session with the relevant stakeholders to nominate job roles and explain the required timelines. The scope of testing requires coring of UCS samples, cutting of asphalt slabs for MATTA testing, Material Quality testing (i.e. gradings, atterbergs and CBR's) as well as in situ DCP and moisture content testing. PAVSET data is also to be collected onsite. On completion of the field activities, the senior technician checks the samples and then, if required, adjusts the testing schedule so as to capture enough relevant test data. Once all required testing has been completed and checked, the senior technician collates the test data and summarises it into a report for the project engineer. He/she then meets with the engineer who, after reviewing the report, finds that a 1 km section of the road needs further sampling and testing because this section is in a known flood plain. The engineer issues a new test request specifying that this section of road requires a sample and test pit every 100 m. Previously collected data is to be collated with these new samples. The senior technician then organises for the added sampling and testing to be included into the laboratory's work schedule, mindful of any new time constraints. After completing the additional testing, he/she collates all the data into a final report for the engineer.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of

RANGE STATEMENT	
	practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• environmental legislation and regulations
	• equipment manuals
	• equipment startup, operation and shutdown procedures
	• industry codes of practice
	• laboratory schedules
	• material, production and product specifications
	• National Association of Testing Authorities (NATA) documents regarding construction materials testing
	• occupational health and safety (OHS) national standards and codes of practice
	• production and laboratory schedules
	• project management methodology
	• quality manuals
	• standard operating procedures (SOPs)

Site hazards may include:	Site hazards may include: • solar radiation, dust and noise • manual handling of heavy materials and equipment • working in/on trenches, confined spaces, wet and uneven surfaces, heights and slopes • vehicular and pedestrian traffic

RANGE STATEMENT	
Safety procedures	Safety procedures may include: • location of site services before investigations commence • use of material safety data sheets (MSDS) • use of personal protective equipment, such as hard hats, hearing protection, sunscreen, gloves, masks, goggles, coveralls, safety boots and high visibility clothing • handling, and storage of hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations • regular cleaning of equipment and vehicles • machinery guards • signage, barriers, flashing lights and traffic control
Tools and equipment	Tools and equipment may include: • excavation equipment, hand and power augers • consumables, including sample bags and labels • documentation, including maps, plans, contract documents and worksheets • field test equipment, including sand replacement apparatus and dynamic cone penetrometer • still/video camera • communication equipment, such as two-way radio and mobile telephone • levelling equipment (dumpy and automatic levels)
Common site problems	Common site problems may include: • caving of the excavation • drilling difficulties • not knowing the requirements of the design engineer • not understanding the nature of the item being designed (e.g. retaining wall, piled structure and earthworks) • sample loss during retrieval • knowing when to stop a hole, or what and when to test and sample • misidentification of samples and sampling

RANGE STATEMENT	
	locations • equipment breakdown and breakage • environmental problems and issues, including site access, inclement weather, traffic, wildlife, vegetation and construction activities
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL976001A Classify building sites

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to classify building sites, including residential, light industrial, commercial and institutional structures for the purpose of providing guidance for the design of footing systems.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers working in the construction materials testing industry sector. Site classification is applicable to single dwelling houses, townhouses and commercial, institutional or light industrial buildings. The classification depends on reactivity of the foundation soils and other potential problems, such as mine subsidence, groundwater conditions and slope. These influence the design of footings, so as to minimise damage due to foundation movement during the life of the building. Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. This competency is typically performed by paraprofessionals who often guide the work of experienced testers. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL975007A	*Supervise sampling, inspections and testing at construction sites*
		OR
	MSL975023A	*Supervise geotechnical site investigations*
		AND
	MSL974002A	*Conduct geotechnical site investigations*
	MSL973012A	*Assist with geotechnical site investigations*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for on-site operations	1.1. Identify the job, consult with the client and obtain relevant information, drawn from such sources as maps, drawings, specifications and codes of practice 1.2. Select equipment and materials required for the job 1.3. Identify personal protective equipment and safety procedures specified for the job and organise site induction, as required 1.4. Record description of the job to be undertaken, compare with specification and resolve any variations 1.5. Select suitable transport for site access 1.6. Brief support personnel on job requirements
2. Conduct on-site investigations	2.1. Identify the location of the proposed structure 2.2. Observe and record physical characteristics of the site, including topography, vegetation, recent activity and the presence of underground services 2.3. Conduct subsurface investigations, obtain samples and record strata details, including groundwater conditions, while minimising disturbance and potential contamination of site 2.4. Perform relevant in situ testing 2.5. Clean up on completion, backfilling or sealing the excavation or ensuring that it is left in a safe and uncontaminated condition
3. Conduct laboratory testing	3.1. Perform relevant laboratory tests to determine foundation materials properties 3.2. Report test results in accordance with enterprise practices
4. Assign a classification to the site	4.1. Analyse field data, test results and observations, checking for accuracy and validity 4.2. Ascertain whether fill is present on-site, its extent, and whether controlled or uncontrolled 4.3. Determine the classification of the site in accordance with approved procedures or as documented in the relevant code 4.4. Report results to client in accordance with enterprise procedures
5. Maintain records	5.1. Record and store observations, data and results in accordance with enterprise procedures

ELEMENT	PERFORMANCE CRITERIA
	5.2. Maintain confidentiality and security of client and enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • conducting site and laboratory operations, and analysingtest results and observationsto assign a site classification • reading and interpreting maps, drawings, specifications and codes of practice • conducting subsurface explorations and log strata • conducting insitu testing for site classification purposes • conducting disturbed and undisturbed sampling • recording project details in writing, by sketching and photography • conducting laboratory testing for site classification purposes • observing, interpreting and reporting atypical situations • communicating problems to appropriate personnel • reporting results to clients using enterprise procedures
Required knowledge
Required knowledge includes: • engineering properties of soil and rock materials • insitu and laboratory test methods applicable to site classification • methods of assigning a site classification • mathematical principles and processes used in site classification • provisions and requirements of relevant codes • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the

EVIDENCE GUIDE	
performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • conduct site and laboratory operations, and analyse test results and observationsto assign a site classification • read and interpret maps, drawings, specifications and codes of practice • conduct subsurface explorations and log strata • conduct insitu testing for site classification purposes • conduct disturbed and undisturbed sampling • record project details in writing, by sketching and photography • conduct laboratory testing for site classification purposes • observe, interpret and report atypical situations • communicate problems to appropriate personnel • report results to clients using enterprise procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL915001A Provide information to customers* • *MSL916003A Supervise laboratory operations in work/functional area*. Resources may include: • access to building sites, site tools, equipment and materials • standard construction materials testing laboratory, samples, equipment, materials, test methods and enterprise procedures • access to more than one workplace or simulated learning environment if the primary workplace or learning environment is unable to provide a suitable range of equipment.
Method of assessment	It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is

EVIDENCE GUIDE	
	not practical, additional assessment techniques must be used. The following assessment methods are suggested: • review of site classifications and other enterprise documentation prepared by the candidate • analysis of work completed over a period of time to ensure accurate and consistent work is obtained within required timelines • feedback from peers and supervisors • use of suitable simulation and/or a range of case studies/scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Construction materials testing** A geotechnical consultancy company has been contracted to perform a site investigation for the purpose of determining the classification of a building site. The client is a structural engineer who will use the information to design a block of townhouses for the site. The company manager assigns a senior technician to the project along with an experienced tester to perform the site work. A second tester will perform the laboratory testing. The senior technician is a signatory for all tests for which the organisation is NATA accredited. They obtain a map of the area and establish that there is no

EVIDENCE GUIDE	
	local information available on conditions in the immediate vicinity. There are no buried services to be damaged during the investigation. They brief the field tester on the project, specifying the number and suggested locations of boreholes as well as the sampling and testing requirements. The field tester performs the site investigation by drilling power auger holes, logging and sampling the strata and performing dynamic cone penetrometer (DCP) tests. They push tubes to obtain undisturbed samples of material that they classify as high plasticity clay. They note the presence of uncontrolled fill in one corner of the site, and take several photographs with a digital camera. When the site investigation is completed, the senior technician inspects the field logs, notes and photographs and then specifies an appropriate testing program, including shrink-swell tests on the high plasticity clay. Using the shrink-swell test result, they calculate the characteristic surface movement and after reviewing all the data assign a P classification in accordance with AS2870: Residential slabs and footings - Construction. They then prepare a report to the client, including a description of the site, the extent and nature of the investigation, test results and bore logs and the site classification. Finally, all documentation relating to the project is filed and stored as a complete record in accordance with NATA, quality assurance and liability requirements. After review by the company manager, the results of the investigation are communicated to the client.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of

RANGE STATEMENT	
	practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	• calibration and maintenance schedules
	• enterprise recording and reporting procedures
	• environmental legislation and regulations
	• equipment manuals
	• equipment startup, operation and shutdown procedures
	• industry codes of practice
	• material, production and product specifications
	• National Association of Testing Authorities (NATA) documents regarding construction materials testing
	• occupational health and safety (OHS) national standards and codes of practice
	• production and laboratory schedules
	• quality manuals
	• standard operating procedures (SOPs)

Tools and equipment	Tools and equipment used may include: • hand and power augers • hand tools, including shovels, scoops, spanners, wrenches and tape measures • consumables, including sample bags, labels and thin-walled sampling tubes • documentation, including maps, plans and worksheets • field test equipment, including pocket penetrometer, dynamic cone penetrometers and

RANGE STATEMENT	
	sand penetrometer • laboratory equipment, including balances, ovens, liquid limit apparatus, linear shrinkage troughs, vernier calipers, core swell testing cell, and psychrometer • camera and global positioning system (GPS) receiver • safety clothing and equipment, including helmet, boots, earmuffs and glasses
Typical problems	Typical problems may include: • delays in obtaining test results • damage to services • displaced, missing and inaccurate survey markers • misidentification of samples and sampling locations • equipment breakdown and breakage • environmental problems and issues, including site access, inclement weather, traffic, wildlife, vegetation, construction activities and contamination of stormwater
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL976002A Prepare plans and quality assurance procedures for environmental field activities

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to use a systematic planning process to develop plans and quality assurance procedures covering multiple environmental field monitoring or survey activities for a wide range of environmental systems. The unit covers both defining the purpose of the environmental field activities and establishing their overall requirements. These requirements will involve the collection of appropriate data, the monitoring/survey methodologies to be used and the design and documentation of a final overall implementation plan that includes budget, training and resource requirements. This unit of competency does not cover the development of monitoring or survey protocols.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory supervisors and managers working in the environmental industry sector. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL975011A	*Design and supervise complex environmental field surveys*
	MSL974007A	*Undertake environmental field-based monitoring*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Establish the overall requirements of the field activities	1.1. Identify key stakeholders along with their potential interests, sensitivities, roles and responsibilities 1.2. Clarify the purpose and general objectives of the field activities with stakeholders and the level/detail of information required 1.3. Identify and accurately interpret all statutory requirements that apply to the field activities 1.4. Identify and interpret all existing enterprise requirements associated with field monitoring and/or

ELEMENT	PERFORMANCE CRITERIA
	survey activities 1.5. Analyse drivers and constraints that may influence field activities 1.6. Refine and document the detailed objectives of the field activities with senior management and key stakeholders
2. Scope all requirements to collect appropriate data under field conditions	2.1. Identify the type, quantity and quality of data needed to meet the defined objectives 2.2. Identify sites or areas and resources required for all planned field activities 2.3. Define data quality procedures that must be incorporated in all field activities 2.4. Identify risks, environmental and safety issues associated with field activities 2.5. Inspect all sites or areas and assess them against defined requirements and any standards that apply to the field activities 2.6. Refine and document all requirements necessary to collect appropriate field data
3. Select and adapt field protocols covering the field activities	3.1. Identify field protocols that may be suitable for the defined field activities 3.2. Review and select the most appropriate field protocol for the defined field activities 3.3. Develop and document detailed methodologies, risk management plans and general time schedules covering all the planned field activities
4. Design and document a detailed implementation plan	4.1. Define all staff tasks, roles and responsibilities and the overall staff work program 4.2. Identify and list all resources needed to undertake all planned field activities and associated pre- and post-field activities 4.3. Design and document an overall implementation plan covering all enterprise field activities 4.4. Meet with all staff involved and clearly outline the objectives, field methodologies and data quality procedures covered in the implementation plan
5. Prepare a financial budget and staff training and work programs	5.1. Develop a detailed budget, including contingencies covering all planned field activities 5.2. Develop detailed staff work programs for individual field activities in the context of the implementation plan

ELEMENT	PERFORMANCE CRITERIA
	5.3. Identify competencies required to undertake all field activities and, if appropriate, develop appropriate training programs for all staff involved in field activities

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- designing and documenting field work plans
- emergency planning
- project management
- negotiation and conflict resolution techniques
- communicating effectively and efficiently with clients, stakeholders and other relevant parties
- identifying and interpreting policy and statutory requirements
- analysing enterprise field procedures and drivers
- identifying type, quality and quantity of data needed for defined field activities
- reviewing literature to identify existing and relevant field protocols
- developing and documenting the enterprise's field monitoring/survey procedures and practices
- reviewing enterprise databases
- developing detailed budgets, work programs, resource requirements and staff training needs
- developing data quality procedures
- undertaking reconnaissance and evaluation of field sites
- developing and documenting overall implementation plan
- responding effectively to changes or unforeseen circumstance
- negotiating effectively with stakeholders on multiple issues and, in general, reaching satisfactory agreements
- leading, supporting and mentoring junior staff

Required knowledge

Required knowledge includes:

- general field monitoring and survey protocols

REQUIRED SKILLS AND KNOWLEDGE
• specific field monitoring and survey practices and techniques • correct terminology relevant to defined field activities • staff training procedures • current developments in field instrumentation, communication equipment and data storage/analysis systems • environmental planning and assessment procedures • data quality procedures • rights and responsibilities of employers and employees in terms of relevant legislation, such as occupational health and safety (OHS), environmental impact assessment and environmental protection

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can:
	• demonstrate understanding of the purpose of the activity, including:
	  • information and analysis required
	  • end users of information
	  • significance of outcomes for broader programs
	• communicate effectively and efficiently with clients, stakeholders and other relevant parties
	• document the objectives of field activities accurately and clearly
	• identify and interpret policy and statutory requirements accurately
	• analyse enterprise field procedures and drivers
	• identify type, quality and quantity of data needed for defined field activities
	• review literature to identify existing and relevant field protocols
	• develop and document enterprise's field monitoring/survey procedures and practices
	• review enterprise databases

EVIDENCE GUIDE	
	• develop detailed budgets, work programs, resource requirements and staff training needs • develop data quality procedures • undertake reconnaissance and evaluation of field sites • develop and document overall implementation plan • respond effectively to changes or unforeseen circumstance • negotiate effectively with stakeholders on multiple issues and, in general, reaching satisfactory agreements • lead, support and mentor junior staff.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL916002A Manage and develop teams* • *MSL916005A Manage complex projects*. Resources may include: • legislation, regulations, policies, codes of practice, enterprise procedures and field protocols.
Method of assessment	The following assessment methods are suggested: • review of the design of monitoring/survey plans, quality assurance procedures, field implementation plan and budget prepared by the candidate • feedback from stakeholders that their input was sought and considered • feedback from staff and supervisors that plans were clear, comprehensive and able to be implemented effectively • oral and written questions to assess underpinning knowledge of statutory and enterprise requirements for field activities, relevant policies, procedures, protocols and codes of practice • simulation exercises to assess contingency planning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and

EVIDENCE GUIDE	
	disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Environmental** A large national industrial company has prepared an environmental management plan (EMP) covering all its national locations. Given that 'monitoring' is a major component of any EMP, the environmental manager has been instructed to prepare an annual plan covering all environmental field activities so that the company has an integrated, standardised and non-overlapping monitoring plan covering all of its locations. The environmental manager establishes a planning team to develop plans and quality assurance procedures covering all environmental field monitoring or survey activities required during the year. The committee produces a strategic implementation plan which is forwarded to the Board for review and approval. **Construction materials testing** A laboratory supervisor for a large mining company was asked to prepare a proposal outlining the resources necessary to produce an annual state of the environment (SOE) report covering the mine site and surrounding land. Given that the report and associated field data would become a public document, the supervisor was also asked to prepare quality assurance procedures covering all environmental field activities undertaken by the company as part of the proposal. They began by identifying and documenting all existing and future field activities and analysing the drivers and constraints that could influence this work in the future. The supervisor then clarified which activities would impact on the SOE report and prepared an implementation plan covering the time schedule, resources, budget and management of risks, safety and emergencies along with a detailed

EVIDENCE GUIDE	
	description of the data quality requirements and field protocols involved. They circulated the draft proposal to relevant staff for comment. The company management then refined the draft for consideration by the Board.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • access to land (e.g. Aboriginal reserves) • animal care and ethics regulations • availability of required services • captured animal welfare and ethics code of practice • consultation (for example, with traditional owners) • emergency procedures, data quality procedures, and safety and survival aspects • environmental audits • environmental impact assessment procedures • environmental protection and/or conservation legislation and regulations • equipment and field instrument operating instructions, calibration procedures, instrument fault finding procedures, and general maintenance and repair procedures • field sampling plans, field monitoring or survey plans, industry based sampling and/or monitoring protocols

RANGE STATEMENT	
	• field test procedures (validated and authorised) • fieldwork procedures and standard operating procedures (SOPs) • national environment protection measures • OHS national standards and codes of practice • permits and/or licences to undertake field activities (e.g. animal trapping) • safety and accident/injury plans, emergency plans and risk management plans • sampling procedures • site locations • specific environmental standards (e.g. air, water and noise) • staff travel arrangements and accommodation conditions • waste management policies and legislation
Environmental field activities	Environmental field activities may include: • meteorology, geology, hydrology and ecology • water quality, industrial waste streams, air quality, noise and vibration • soils, flora, weeds, native fauna, exotic or pest species and threatened species • land use and cultural sites
Clients and stakeholders	Clients and stakeholders may include: • fee-for-service clients • Commonwealth, state/territory and local government agencies • enterprises with monitoring and/or survey responsibilities • private companies • regulatory authorities • environment protection agencies • developers
The purpose or objectives of environmental field activities	The purpose or objectives of environmental field activities will define/target information needs and may include: • part of enterprise environmental management plan • statutory requirements • general environmental monitoring or surveys

RANGE STATEMENT	
	• research studies
Drivers and constraints	Drivers and constraints may include: • political agendas, social and economic issues • new monitoring protocols • recent environmental impact assessments or audits • media or public concerns • recent judicial decisions • field safety or accident issues • competencies and availability of staff • time available to plan and implement field activities
Staff field tasks and roles	Staff field tasks and roles may include: • team or project leader and survey coordinator • field sampling officer, field monitoring officer and data management officer • safety and/or environmental officer • field camp supervisor, field assistant or field-hand • driver • any combination of the above
Field resources	Field resources may include: • sampling equipment • monitoring instruments and associated equipment • survey equipment • first aid and/or survival kits and equipment • navigation and communication equipment (e.g. compass, maps, global positioning system (GPS), two-way radio and mobile phone) • transportation systems (e.g. vehicles, boats and aircraft)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any

RANGE STATEMENT	
	time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL976003A Evaluate and select appropriate test methods and/or procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to evaluate and select test methods and/or procedures that are relevant to the current and evolving scope of the laboratory's operations. Selection of test methods and/or procedures may involve the appraisal of new and emerging technologies and may inform decision making about possible extension of the laboratory's scope. Alternatively, it may relate to existing testing requirements, 'one-off' tests, client's special requirements or new tests required to satisfy new legislative, accreditation, licensing or regulatory requirements.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, technical specialists and laboratory supervisors working in all industry sectors. They are required to demonstrate wide ranging, highly specialised technical skills. They are expected to execute sound judgement in the selection of appropriate methodology under the broad guidance of scientists/medical staff/engineers. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine sample characteristics and testing requirements	1.1. Confirm drivers for evaluation and selection of test methods and/or procedures 1.2. Examine sample documentation and/or consult with sample supplier to determine nature of samples 1.3. Identify sample characteristics which may affect testing requirements 1.4. Determine testing requirements and their compatibility with existing standard operating procedures (SOPs)

ELEMENT	PERFORMANCE CRITERIA
2. Evaluate possible test methods and/or procedures	2.1. Identify appropriate standards, reference materials, test methods and/or procedures which may be applicable 2.2. Assess suitability of available standards, reference materials, test methods and/or procedures against testing requirements 2.3. Identify environmental and occupational health and safety (OHS) risks 2.4. Identify the need for specific equipment, instrumentation, and/or specialised facilities 2.5. Estimate materials, personnel and possible training requirements
3. Recommend appropriate test methods and/or procedures	3.1. Select appropriate test methodology consistent with testing requirements and resource availability 3.2. Identify any changes to SOPs required prior to implementation of selected method and/or procedure 3.3. Recommend selected method and/or procedure to appropriate personnel and seek authorisation to proceed
4. Confirm and document selected methods and/or procedures	4.1. Obtain standards and/or reference materials for the method and/or procedure 4.2. Conduct tests to verify the performance of the method and/or procedure, standards and reference materials 4.3. Analyse the measurements and estimate uncertainties 4.4. Determine if legal traceability is required and develop appropriate chain of custody procedures 4.5. Document all safety, sample preparation, testing, data handling and reporting procedures 4.6. Submit all documentation to appropriate personnel for review and approval

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills

REQUIRED SKILLS AND KNOWLEDGE

Required skills include:

- evaluating and selecting appropriate test methods and/or procedures to satisfy the range of testing situations normally encountered in the laboratory
- identifying reference standards or SOPs appropriate to testing requirements of the laboratory
- identifying standards that support compliance with regulatory and/or licensing requirements
- applying enterprise procedures to select appropriate standards
- using method performance analysis measures, such as accuracy, precision, uncertainty, linearity, selectivity, range, limit of detection and matrix characteristics in method selection
- documenting method selection procedures
- maintaining records of published methods
- following OHS procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- principles, concepts and enterprise/regulatory requirements related to method selection
- regulatory/licensing testing requirements
- relative advantages/disadvantages of test methods for a range of testing situations
- cost advantages/disadvantages of enterprise test methods
- scientific/technical principles underpinning test method and their application to selection of testing methods for different materials
- metrological principles
- significance of normal, physiological or reference ranges
- enterprise and/or legal requirements for traceability
- enterprise/regulatory requirements regarding recording and reporting
- relevant health, safety and environment requirements

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Biomedical, biotechnology and food processing:

- effects of biologically inert or active chemicals, such as food and drug metabolites in test selection, testing and test data interpretation

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • evaluate and select appropriate test methods and/or procedures to satisfy the range of testing situations normally encountered in the laboratory • identify reference standards or SOPs appropriate to testing requirements of the laboratory • identify standards that support compliance with regulatory and/or licensing requirements • apply enterprise procedures to select appropriate standards • use method performance measures, such as accuracy, precision, uncertainty, linearity, selectivity, range, limit of detection and matrix characteristics in method selection • clearly document method selection procedures • maintain records of published methods • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925002A Analyse measurements and estimate uncertainties* • *MSL916003A Supervise laboratory operations in work/functional area*. Resources may include: • standard laboratory equipped with appropriate equipment and reagents • SOPs and test methods • appropriate Australian and international regulatory standards.
Method of assessment	The following assessment methods are suggested: • completion of selection brief or selection proficiency test

EVIDENCE GUIDE	
	• review of records completed by the candidate over a period of time to confirm consistency in method selection • feedback from peers and supervisors • oral questioning to establish basis of selection of test methods and/or procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biotechnology** The choice of analytical method for protein assay is influenced by the amount of protein likely to be present and the impurities present. During an extraction procedure, the yield of protein is monitored. At any stage there will be a range of substances used in the extraction. When the extraction is complete and the protein required has been isolated, the amount of protein recovered could range from bulk or gram quantities down to microgram quantities. The technical officer will check through the available methodologies and select procedures that will take account of the above problems. The Biuret assay is used for bulk assay protein, but will require reagent blanks to compensate for the impurities. At later stages of the monitoring, the Bradford reagent will be chosen because of its greater sensitivity and detection of smaller concentrations. It will be chosen over the Folins reagent because the Bradford reagent is not affected by buffer

EVIDENCE GUIDE	
	reagents and detergent. **Biomedical** A technician is asked to detect, identify and quantify a blood group antibody using a range of physical, chemical and immunological tests. During the test evaluation and selection process he/she identifies performance parameters, such as test tolerance, sensitivity, specificity and reproducibility along with the effect of possible interfering serum pigments, such as dissolved haemoglobin and bilirubin. The technician prepares a report for the supervising scientist that explains the selection rationale, reports the performance test results and cites product information and recent literature to validate the test results and substantiate his/her conclusions and recommendations. **Food processing** A technician working in a food company must be able to select test methods appropriate to requirements. For example, if a quick determination of unsaturation in an oil mixture is required, the technician will probably use an appropriate method for determining the iodine value of the mix and compare this with specification. However, at a margarine manufacturing plant where the technician may be required to perform an analysis of fats and oils to determine the % saturated, % monounsaturated and % polyunsaturated components, then a gas chromatographic method would be run using appropriate computer software and the results checked against specification.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards,

RANGE STATEMENT	
	it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	• AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	• AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 and Import Guidelines
	• ethics committee requirements
	• gene technology regulations
	• intellectual property and copy right

RANGE STATEMENT	
	• material safety data sheets (MSDS) • material, production and product specifications • National Association of Testing Authorities (NATA) Accreditation programs requirements • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • OHS national standards and codes of practice • principles of GLP • quality manuals, equipment and procedures manuals • Therapeutic Goods Regulations 1009
Tests and procedures	Tests and procedures may be: • routine • infrequent • 'one-off' • quantitative or qualitative • identification or quantification of biological, chemical or physical activity • gross characteristics of a sample, including in vitro and in vivo • detection of chemical, physical or biological characteristics, features, markers or responses
Drivers for the evaluation and selection of test methods and/or procedures	Drivers for the evaluation and selection of test methods and/or procedures may include the: • new or amended legislation, regulation and licensing, accreditation requirements • public, political and commercial pressures • 'one-off' testing of potentially hazardous or contaminated materials following an environmental emergency or incident • introduction of new reference standards, new or modified equipment and instruments • introduction of commercial products that are potentially hazardous • control of new, or changed, starting materials, in-process materials and products • troubleshooting of production, environmental and public health issues

RANGE STATEMENT	
	• environmental monitoring of new sites • investigation of customer's complaints • specialised testing of forensic, medical or veterinary samples • need to meet customer specific or changed requirements • development of new products
Factors which may influence method evaluation and selection	Factors which may influence method evaluation and selection • quantity and nature of sample available for testing • levels of detection required • type of matrix, possible contaminants and resulting interference • safety • availability of suitable equipment, instruments and availability of trained staff • cost • selectivity of method, range, accuracy, precision and acceptable uncertainty • whether it is appropriate/ethical to perform the test • balancing customer, enterprise and/or regulatory/licensing requirements
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977001A Contribute to the development of products and applications

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to evaluate a product/application brief and to contribute to the development of products and applications to meet the requirements of the brief.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	

Prerequisite units		
	MSL976003A	*Evaluate and select appropriate test methods and/or procedures*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Scope the development project	1.1. Confirm details of new product/application brief 1.2. Specify new product/application requirements 1.3. Analyse existing products (internal and external to enterprise) to determine if they meet customer need 1.4. Interpret and apply relevant Acts, regulations and codes of practice 1.5. Prepare product development plan 1.6. Obtain approval for development plan from appropriate personnel
2. Set scope of project	2.1. Estimate resource requirements, including staffing, equipment and materials needed to undertake the project 2.2. Identify roles and responsibilities of project team

ELEMENT	PERFORMANCE CRITERIA
	members 2.3. Identify quality requirements and quality standards 2.4. Prepare project timelines taking into account any constraints
3. Develop new product formulation	3.1. Prepare documentation for new product pilot batch 3.2. Evaluate/recommend materials for new product/application 3.3. Calculate required quantities of materials and adjust for properties as appropriate 3.4. Develop/modify products in pilot batch scale in accordance with enterprise and regulatory requirements 3.5. Arrange for product evaluation against development brief 3.6. Modify product/application to meet evaluation recommendations 3.7. Edit documentation and issue to appropriate personnel 3.8. Recommend and evaluate packaging for new product/application 3.9. Prepare protocol for stability (shelf) testing of new product/application
4. Assist in preparation of quality/regulatory compliance procedures/materials	4.1. Develop in-process and laboratory testing protocols 4.2. Prepare product labelling and submit for approval 4.3. Assist in product and analytical method validation 4.4. Implement an effective plant hygiene and asepsis program, if applicable 4.5. Develop good manufacturing principles for medicinal products (GMP)/principles of good laboratory practice (GLP) protocols for approval by appropriate personnel 4.6. Prepare standard operating procedures (SOPs) for quality and laboratory related procedures 4.7. Prepare occupational health and safety (OHS) procedures for the laboratory and manufacturing environment and submit for approval
5. Document and report project outcomes	5.1. Document and report project outcomes 5.2. Complete project reporting requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- interpreting and explaining sections of legislation, codes, regulations and Australian standards that apply to the tasks undertaken in developing products and applications
- evaluating a product/application brief and contributing to the development of products and applications to meet the requirements of the brief
- interpreting a brief to determine product/application development requirements
- applying theoretical knowledge of starting material and formulation principles to develop product/applications
- using appropriate procedures to research alternative formulations
- using environment friendly strategies for formulations
- making formulation recommendations for pilot batch manufacture
- manufacturing pilot batches
- evaluating pilot batches against project brief
- evaluating product/application stability
- evaluating the OHS requirements to be observed for each ingredient during manufacture of product/application
- evaluating the OHS suitability of each ingredient for use in the formulation
- ensuring that product/application meets regulatory requirements
- following enterprise procedures to document development process

Required knowledge

Required knowledge includes:

- theoretical and practical aspects of product/application development
- physical and chemical aspects of product/application development
- principles and practices of operation of a range of pilot batch equipment
- uses, characteristics and limitations of formulation starting materials
- formulation development procedures
- performance outcomes expected and key indicators
- enterprise and regulatory development, quality and stability testing requirements
- business goals and the impact of their projects on these goals
- operating budgets and plans for work area
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • evaluate a product/application brief and contribute to the development of products and applications to meet the requirements of the brief • interpret a brief to determine product/application development requirements • apply theoretical knowledge of starting material and formulation principles to develop product/applications • use appropriate procedures to research alternative formulations • use environment friendly strategies for formulations • make formulation recommendations for pilot batch manufacture • manufacture pilot batches • evaluate pilot batches against project brief • evaluate product/application stability • evaluate the OHS requirements to be observed for each ingredient during manufacture of product/application • evaluate the OHS suitability of each ingredient for use in the formulation • ensure that product/application meets regulatory requirements • follow enterprise procedures to document development process.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL977002A Troubleshoot equipment and/or production processes* • *MSL977003A Contribute to the validation of test methods* • *MSL977004A Develop or adapt analyses and*

EVIDENCE GUIDE	
	procedures. Resources may include: • standard laboratory equipped with appropriate pilot batch manufacturing and testing equipment • online data search facilities • starting material and product formulation information • scheduling charts and project plans • appropriate SOPs and enterprise guidelines.
Method of assessment	The following assessment methods are suggested: • review of development work completed by the candidate • review of development briefs completed by the candidate over time to ensure that they were implemented consistently within the required timeframe • feedback from supervisors and/or clients • oral or written questioning to assess development and problem solving approaches. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Technical specialists who formulate cosmetics products must apply theoretical and practical knowledge during each stage of the formulation process. This is illustrated

EVIDENCE GUIDE	
	during the perfuming stage of the product development process for a product range consisting of soap, talc and a water-in-oil emulsion. For example, soaps are alkaline and the selected perfume must be stable under alkaline conditions. Perfumes consist of a large number of components, and any preferential adsorption of some of these components on the surface of the talc will alter the odour. When perfuming an emulsion, the components of the perfume will partition between the water and oil phases of the emulsion, altering the odour reaching the consumer. To get the three products smelling the same after manufacture requires attention to these theoretical concepts. Stability studies must be planned and carried out to ensure that the products are stable in the chosen packs and smell the same throughout their lifetime. When perfuming this rather small range of products, the technical specialists must apply a wide range of theoretical and practical knowledge to satisfy the product brief. **Food processing** Technical specialists in food research laboratories evaluate product briefs provided by marketing. They then develop products to meet the requirements of the brief and convert the brief into a marketable product. After the product is successfully introduced, technical specialists must continue to upgrade the quality and desirability of products because of shortened product life cycles. As part of their role technical specialists may be required to apply technical knowledge to: • reduce ingredient costs of existing formulation • standardise existing formulations and processes for quality and cost control • identify solutions to existing problems, such as product quality or shelf life • develop consumer preparation instruction methods • develop labelling or packaging information • formulate new or improve existing products • locate and evaluate new packaging alternatives to meet a range of requirements • assist in compliance with regulatory standards • assess consumer preferences • prepare pilot batches of new products • assist in scale up of pilot batches to full scale

EVIDENCE GUIDE	
	production batches • test product's shelf life. This requires an in-depth knowledge of how to select and use various ingredients for specific applications, as well as the chemistry, technology and regulatory aspects of their job.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	• AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set

RANGE STATEMENT	
	• ISO 5725 Accuracy (trueness and precision) of measurement methods and results • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • Australia New Zealand Food Standards (ANZFS) Code • Association of Analytical Communities International (AOAC International) Official methods of analysis • ICH Q2A: Validation of Analytical Procedures - Guideline for industry • Australian code of good manufacturing practice for medicinal products (GMP) • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 and Import Guidelines • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment and quality manuals • gene technology regulations • intellectual property and copyright • maintenance and confidentiality of records • material safety data sheets (MSDS) • material, production and product specifications • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • OHS national standards and codes of practice • principles of good laboratory practice (GLP) • product formulation documentation • SOPs • suppliers of raw material catalogues • Therapeutic Goods Regulations 1009

RANGE STATEMENT	
Product/application briefs	Product/application briefs may be provided by: • external customers • internal customers • marketing • production
Materials used to manufacture products/applications	Materials used to manufacture products/applications may include: • solvents • emulsifiers • thickeners • surfactants • disintegrants • fillers • moisturising materials • colouring materials • flavours • perfumes • opacifiers • propellants • sunscreens
Calculations	• Calculations may be required to adjust properties, such as: • assay/potency • viscosity • application payload • hardness • moisture content • colour
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied

RANGE STATEMENT	
	• where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977002A Troubleshoot equipment and/or production processes

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers ability to apply technical, instrumental and equipment knowledge and skills to troubleshoot testing equipment and testing issues related to production processes, identify problems and recommend corrective action.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Troubleshooting is the process of using technical knowledge and skills to investigate abnormal performance and assay results. This unit of competency includes troubleshooting testing equipment and testing issues related to production processes. In the case of chromatography, for example, these problems may be related to materials, such as laboratory solvents, procedures or equipment components, such as columns, injectors, pumps and detectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL976003A	*Evaluate and select appropriate test methods and/or procedures*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify abnormal equipment and/or process performance	1.1. Determine whether testing equipment is operating to manufacturer's specifications 1.2. Recognise whether equipment outputs are consistent with normal operation 1.3. Identify signs of equipment degradation and impending failure 1.4. Inspect equipment outputs to determine nature of the problem 1.5. Define nature of substandard performance
2. Identify causes of	2.1. Select appropriate technical process for

ELEMENT	PERFORMANCE CRITERIA
substandard performance	investigation 2.2. Identify causes using fact-finding processes, including interviews with appropriate personnel 2.3. Review maintenance records to ensure that system doesn't need simple maintenance 2.4. Review calibration records to ensure system is within calibration 2.5. Verify that the appropriate test procedure, materials and equipment were used 2.6. Conduct performance tests as appropriate to investigation 2.7. Analyse equipment and/or testing variables to develop list of possible causes 2.8. Isolate causes using appropriate elimination techniques
3. Recommend corrective action	3.1. Propose and trial corrective action based on investigation 3.2. Monitor trial data to ensure outputs are consistent with normal operation 3.3. Review trial results to confirm validity of corrective action 3.4. Maintain workplace records as required 3.5. Submit report summarising investigation and recommendations

Required Skills and Knowledge

Required skills include:

- troubleshooting testing equipment and testing issues related to production processes
- identifying causes of faulty or substandard performance
- proposing adjustments/rectifications/modifications
- testing results of adjustments/rectifications/modifications
- locating, interpreting and applying relevant information
- maintaining relevant workplace records
- identifying and safely handling products and materials
- applying safety precautions appropriate to the task

Required knowledge

Required knowledge includes: • theoretical and practical aspects of laboratory equipment and processes • principles and procedures of testing equipment operation • characteristics, capabilities and limitations of testing equipment and its components • troubleshooting procedures for testing equipment • possible effects of matrix and impurities on analytical method • troubleshooting procedures for production processes • regulatory and licensing/testing requirements • mathematical/statistical procedures for evaluation of test data • enterprise requirements for problem investigation and reporting • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • troubleshoot testing equipment and testing issues related to production processes to identify causes of problems and recommend corrective action • identify causes of faulty or substandard performance • propose adjustments/ rectifications/ modifications • test results of adjustments/rectifications/modifications • locate, interpret and apply relevant information • maintain relevant workplace records • identify and safely handle products and materials • apply safety precautions appropriate to the task.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL977001A Contribute to development of products and applications* • *MSL977003A Contribute to validation of test*

EVIDENCE GUIDE	
	methods. • *MSL977004A Develop or adapt analyses and procedures*. Resources may include: • standard laboratory equipped with appropriate equipment, samples, reagents and test methods • laboratory procedures and SOPs.
Method of assessment	The following assessment methods are suggested: • completion of a troubleshooting brief or a troubleshooting proficiency test • review of workplace troubleshooting briefs completed by the candidate • feedback from supervisors and/or clients • oral or written questioning to assess underpinning knowledge of equipment operation, troubleshooting procedures and problem solving techniques • simulated equipment failure scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Emission spectroscopy is a technique often used by technicians to troubleshoot problems resulting from contamination. For example, a sample of stainless steel that showed signs of corrosion was submitted to a

EVIDENCE GUIDE	
	chemical technician for analysis. The technician subjected the sample to a spark and compared the spectra of the composite steel to spectra of a control sample of stainless steel. The technician concluded that the vanadium concentration in the sample was higher than that of the control sample. After doublechecking the work, the technician passed the results back to the engineering staff who were able to find the source of error and correct the manufacturing problem. **Biomedical** The immuno-analyser has become non-functional. The senior technical officer notifies the laboratory manager and then checks out the instruction sequence for that assay, checks the diagnostics for the detection unit, and reagent and sample lines, and then runs the diagnostic check program provided by the company. The officer concludes that the fault is due to instrument failure. **Food processing** A food company received a large number of customer complaints regarding the taste of its flavoured yoghurt product. The technician asked their sales representative to collect samples of the product from sales outlets while she/he collected retained reference samples with the same batch number/expiry date for examination. The technician developed a strategy for troubleshooting the production process and followed the following steps: • analysis of the returned product and reference samples indicated that the sugar concentration was above specification in both, suggesting that an error occurred during manufacturing or packaging • examination of batching sheets with the appropriate product code indicated that the correct formula and quantities of raw materials were used • retention samples were re-analysed and indicated that all were within specification • discussions with operators did not uncover any cause for the defect • observation of the process indicated that a non-standard batching drum was being used • discussions with the operator revealed that the tared standard drum used for weighing raw materials had been damaged and a lighter non-standard drum was being used with the original tare weight.

EVIDENCE GUIDE	
	Analysis of the sugar content in the yoghurt indicated that the increased sugar content was due to the incorrect tare weight.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

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	• Australian and international standards, such as:
	• AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	• AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	• AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and

RANGE STATEMENT	
	results • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • Australia New Zealand Food Standards (ANZFS) Code • Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • gene technology regulations • material safety data sheets (MSDS) • material, production and product specifications • National Association of Testing Authorities (NATA) Accreditation programs requirements • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • standard operating procedures (SOPs) • Therapeutic Goods Regulations 1009
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard

RANGE STATEMENT	
	precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977003A Contribute to validation of test methods

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to validate test methods following defined protocols to ensure that they are based on sound scientific principles and are fit for the purpose for which they are to be used.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. All operations are performed in accordance with laboratory and/or enterprise procedures. Validation includes all those procedures which ascertain a method's technical soundness, performance and suitability for its intended use. Validation is a documented program which provides a high degree of assurance that a specific testing method will consistently produce a reliable result. The nature of the testing method may be physical, chemical, microbiological or a combination of these. The quality of the test method is built in during its design stage, validated in its development stage, and confirmed in its 'use' stage. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL976003A	*Evaluate and select appropriate test methods and/or procedures*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Confirm equipment, including computer systems, has been qualified and validated	1.1. Confirm that latest editions of manufacturer's specifications and operating instructions are present 1.2. Confirm that equipment is installed according to manufacturer's specifications 1.3. Confirm that equipment operating instructions exist and conform to manufacturer's specifications 1.4. Confirm that equipment operates according to manufacturer's design specifications

ELEMENT	PERFORMANCE CRITERIA
	1.5. Verify that equipment calibration complies with appropriate standards 1.6. Confirm equipment/computer systems are validated 1.7. Confirm method has an acceptable level of uncertainty
2. Validate test method according to defined protocol	2.1. Develop validation test protocol in consultation with appropriate personnel 2.2. Ensure protocol is authorised by appropriate personnel 2.3. Validate test method according to validation protocol
3. Evaluate and record results	3.1. Evaluate validation results to confirm suitability of testing method 3.2. Obtain approval for evaluation recommendations from appropriate personnel 3.3. Record and file validation records 3.4. Issue validated method according to enterprise procedures 3.5. Evaluate staff training needs and record appropriately 3.6. Recommend update of relevant documentation as a result of the validation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • validating test methods as fit for purpose following a validation protocol established in consultation with appropriate personnel • conducting literature searches on background chemistry/physics/biology/immunology of materials to be evaluated, including likely impurities and degradation products • starting up, setting up/optimising, calibrating and operating equipment to manufacturer's specifications • preparing test samples and standards for validation • carrying out validation tests according tothe validation protocol

REQUIRED SKILLS AND KNOWLEDGE
• applying theoretical knowledge and appropriate statistics to interpret validation data and reach correct conclusions • recording results and communicating recommendations according to enterprise procedures • arranging large amounts of data into logical format so other technical personnel can review and reach the same valid conclusions • followingoccupational health and safety (OHS) and environmental management procedures and principles of good laboratory practice (GLP)
Required knowledge
Required knowledge includes: • principles, concepts and enterprise/regulatory requirements related to method validation • traceability, including legal requirements for traceability • principles and procedures of testing equipment operation • characteristics, capabilities and limitations of equipment • variables which should be validated and criteria for choice • mathematical/statistical evaluation of results and present data and results in appropriate formats • enterprise/regulatory requirement regarding validation and reporting • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • validate test methods as fit for purpose following a validation protocol established in consultation with appropriate personnel • conduct literature searches on background chemistry/physics/biology/immunology of materials to be evaluated, including likely impurities and degradation products • start up, set up/optimise, calibrate and operate

EVIDENCE GUIDE	
	equipment to manufacturer's specifications • prepare test samples and standards for validation • carry out validation tests according tothe validation protocol • apply theoretical knowledge and appropriate statistics to interpret validation data and reach correct conclusions • record results and communicate recommendations according to enterprise procedures • arrange large amounts of data into logical format so other technical personnel can review and reach the same valid conclusions • follow OHS and environmental management procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL977001A Contribute to the development of products and applications* • *MSL977002A Troubleshoot equipment and production processes* • *MSL977004A Develop or adapt analyses and procedures* • *MSL925002A Analyse measurements and estimate uncertainties*. Resources may include: • standard laboratory equipped with appropriate equipment, reagents, samples and test methods • validation protocol.
Method of assessment	The following assessment methods are suggested: • completion of validation brief or validation proficiency test • review of workplace validation briefs completed by the candidate • feedback from supervisors and/or clients • oral or written questioning to assess underpinning knowledge of equipment operation, methods and procedures, and problem solving techniques. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those

EVIDENCE GUIDE	
	aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A technical specialist was developing a method for testing samples taken while monitoring a workplace for glutaraldehyde, a toxic chemical. The samples were collected in air monitoring cassettes and on glass fibre filters impregnated with 2,4-dinitrophenylhydrazine. The filters were desorbed with acetonitrile and the DNPH derivative analysed by highperformance liquid chromatography (HPLC) at 365nm. The new method was validated by checking and documenting factors, such as selectivity, linearity, range, limit of detection, accuracy, precision, recovery and ruggedness. Although this involved considerable work, the specialist was confident that the testing method would deliver reliable results after completing the validation. **Biomedical** A number of pituitary hormone assays are to be converted from radioimmunoassay (RIA) to enzyme linked immunosorbent assay (ELISA). Both configurations of assays are available in kit form but the laboratory manager would like the new procedures validated. The task has been given to a senior technical officer. The project involves comparison of the average and variance of results obtained for a number of quality control sera. The variance and precision of the signal output (counts per minute for RIA, absorbance for

EVIDENCE GUIDE	
	ELISA) are examined as well as sensitivity estimates for both assays. All investigations are documented and reported in the laboratory notes for accreditation audit purposes. **Food processing** A food research laboratory uses the following instrumental techniques: • ultraviolet-visible (UV-VIS) spectrometer for colour analysis • HPLC for food preservative analysis • inductively coupled plasma-atomic emission spectrometry and flame atomic absorption analysis for metal contaminant analysis. Each of the above methods is validated to assure that it is based on sound scientific principles and will deliver results appropriate to requirements. Factors, such as accuracy, linearity, range, limit of detection, precision, recovery, ruggedness and selectivity are evaluated and documented. This investigation provides confidence that methods are used within their limits of detection, are linear and selective over the required range, and deliver suitable accuracy and precision. The investigation is documented, according to enterprise requirements, and provides detailed reference for accreditation, audit and future laboratory use.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures**	Standards, codes, procedures and/or enterprise

RANGE STATEMENT	

and/or enterprise requirements	requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 1000-1998 The international system of units (SI) and its application
	  • AS ISO 10013-2003 Guidelines for quality management system documentation
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
	  • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • ISO 5725 Accuracy (trueness and precision) of measurement methods and results
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• *Guidelines for collaborative study procedures to validate characteristics of a method of analysis*, Fourth (Final) Draft; J. of Anal. Chem., Vol 72, No 4, 694-704
	• ICH Q2A: Validation of Analytical Procedures - Guideline for industry
	• United States Pharmacopoeia (USB) General chapter - Validation of Compendial Methods (1225)
	• OHS national standards and codes of practice
	• principles of good laboratory practice (GLP)
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of Good Manufacturing

RANGE STATEMENT	
	Practice for medicinal products (GMP) • Australian Dangerous Goods Code • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 and Import Guidelines • gene technology regulations • maintenance and confidentiality of records • National Association of Testing Authorities (NATA) Accreditation programs requirements • national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • Therapeutic Goods Regulations 1009
Test methods requiring validation	Test methods requiring validation may include: • identification and impartial resolution of ethical issues, such as conflict of interest • ethical decision making • provision of products and services which match the operational and financial needs of stakeholders, including realistic quotes for work • accurate representation of skills, services, knowledge and qualifications of individuals and the organisation • acknowledgment of services and products developed by others, intellectual property and copyright • provision of unbiased, accurate and appropriately qualified information results

Validation protocols include:	Validation protocols include:
	• those checks which should be considered to ensure performance characteristics of test method are scientifically sound
	• examples of checks include:
	  • selectivity
	  • linearity
	  • range
	  • sensitivity
	  • limit of detection

RANGE STATEMENT	
	• limit of quantitation • accuracy • precision • recovery • ruggedness • an assessment of the clarity and completeness of the description of the method
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977004A Develop or adapt analyses and procedures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to develop or adapt analyses and procedures to meet enterprise and/or regulatory requirements. New analyses and associated procedures may be required to meet a customer's brief, analyse new products or raw materials, improve laboratory efficiency or meet changing regulatory requirements.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. The work may involve developing new testing methods or adapting existing methods to satisfy a testing need. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL976003A	*Evaluate and select appropriate test methods and/or procedures*

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine gaps and deficiencies in present analyses and/or procedures	1.1. Identify opportunities to improve analyses and/or procedures 1.2. Identify requirements for new analyses and procedures to meet testing briefs 1.3. Define the scope of analysis required by the improvement or new testing brief 1.4. Establish that existing enterprise test methods/procedures do not meet requirements 1.5. Prepare development proposal 1.6. Confirm development requirements and development proposal with appropriate personnel 1.7. Obtain authorisation to proceed

ELEMENT	PERFORMANCE CRITERIA
2. Research and propose alternatives	2.1. Source relevant documented methods/procedures 2.2. Review relevant documented methods/procedures according to enterprise procedures 2.3. Consult with relevant technical personnel regarding project development issues 2.4. Evaluate resource requirements for proposed methods/procedures 2.5. Ensure that methods/procedures meet occupational health and safety (OHS), environmental, regulatory and enterprise requirements 2.6. Document development requirements, timelines and proposed methods/procedures 2.7. Obtain authorisation to proceed
3. Evaluate alternatives, develop analyses and recommend methods and procedures	3.1. Investigate possible alternative methods and procedures and choose appropriate method/procedure 3.2. Develop and/or adapt analytical method or test procedure to meet requirements 3.3. Trial method/procedure against test method/procedure requirements 3.4. Validate method/procedure 3.5. Maintain records to substantiate and justify chosen method/procedure
4. Document and report new method/ procedure	4.1. Prepare and/or update analytical method/procedure and associated standard operating procedures (SOPs) 4.2. Obtain final approval for new method/procedure 4.3. Withdraw, document and archive superseded method/procedure 4.4. Issue new method/procedure according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include:

REQUIRED SKILLS AND KNOWLEDGE
• developing or adapting analyses and procedures to meet requirements • interpreting a brief to determine testing requirements • applying theoretical concepts and practical principles to develop or adapt methods • evaluating existing testing procedures against new testing requirements • using method performance analysis measures, such as accuracy, precision, uncertainty, linearity, selectivity, range, limit of detection and matrix characteristics • researching alternative methods • making recommendations for modification of existing procedures or development of new procedures • following enterprise procedures to document and circulate new procedures
Required knowledge
Required knowledge includes: • detailed knowledge of theoretical and practical basis of test/analysis • principles and practices of operation of a range of testing equipment • characteristics, capabilities and limitations of equipment • relative advantages/disadvantages of different analytical methods • theoretical procedures for method development • method validation requirements • enterprise and regulatory testing requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • develop or adapt analyses and procedures to meet requirements • interpret a brief to determine testing requirements • apply theoretical concepts and practical principles to develop or adapt methods to meet requirements • evaluate existing testing procedures against new

EVIDENCE GUIDE	
	testing requirements • use appropriate procedures to research alternative methods • use method performance measures, such as accuracy, precision, uncertainty, linearity, selectivity, range, limit of detection and matrix characteristics • make recommendations for modification of existing procedures or development of new procedures based on sound principles • follow enterprise procedures to document and circulate new procedures.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL925002A Analyse measurements and estimate uncertainties* • *MSL977001A Contribute to the development of products and applications* • *MSL977002A Troubleshoot equipment and production processes* • *MSL977003A Contribute to validation of test methods*. Resources may include: • standard laboratory equipped with appropriate equipment, reagents, samples and test methods • online data search facilities.
Method of assessment	The following assessment methods are suggested: • review of development or adaptation of methods completed by the candidate • review of workplace development briefs completed by the candidate • feedback from supervisors and/or clients • oral or written questioning to assess underpinning knowledge of analyses, instrument operation, procedures and problem solving techniques. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly Where applicable, reasonable adjustment must be made

EVIDENCE GUIDE	
	to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** Technical specialists often have to apply their practical and theoretical knowledge of laboratory instrumentation to adapt or develop methods to solve specific problems. For example, a technical specialist in a consulting laboratory was asked to determine why heat-sealing bags were not sealing properly. Using infrared spectroscopy, the specialist ran spectra on several samples and noticed a difference in the coating on the bags which didn't seal compared with the coating on bags which sealed correctly. The spectra indicated that the coatings were different polymers. The technical specialist notified the supplier of the sealing problem and new bags were forwarded. To ensure that the problem didn't occur again, an infrared spectroscopy test method was developed to ensure that the correct polymer coating was on the new bags. As a result, production flowed smoothly when bags were delivered to the production line. **Biomedical** A laboratory manager determined that there is sufficient demand for a particular enzyme activity assay. Currently, this assay is performed manually by kinetic assay using a spectrometer. A senior technical officer has been given the task of converting the method to one that can be run on an automated biochemical analyser. The method will be translated to instructions regarding wavelength, absorbance increase or decrease, time of reading and intervals of the readings, sequence of addition of the reagents and sample, ratio of the volumes (they will be reduced in the automated procedure) and incubation

EVIDENCE GUIDE	
	conditions. **Food processing** The water activity of food is affected by temperature. The measurement of water activity takes considerable time, due in part to the time required for the sample to reach the specified test temperature in the instrument. A technician suggested that the test time could be reduced if the samples were presented to the instrument at the test temperature, rather than room temperature. She/he also raised concerns about water loss which could occur while raising the sample to test temperature. The technician planned an investigation and ran tests using standard Greenspan salts to compare results from normal testing with testing using pre-warm samples. Pre-warm samples held for 30 minutes in a pre-warm cabinet gave different results from the normal test method samples. However, samples held for 15 minutes in the pre-warm cabinet did not. A test method was subsequently introduced with samples being held for a maximum of 10 minutes in a pre-warm cabinet prior to being loaded into the water activity instrument. This gave excellent statistical correlation with the normal method and provided increased throughput of samples.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include: • Australian and international standards, such as:

RANGE STATEMENT	
	• AS ISO 1000-1998 The international system of units (SI) and its application • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans • AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment • AS/NZS ISO 14000 Set:2005 Environmental management standards set • AS/NZS ISO 9000 Set:2008 Quality management systems set • ISO 5725 Accuracy (trueness and precision) of measurement methods and results • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • appropriate journals and Internet sites • Australia New Zealand Food Standards (ANZFS) Code • Australian code of good manufacturing practice for medicinal products (GMP) • Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982 and Import Guidelines • calibration and maintenance schedules • enterprise recording and reporting procedures • ethics committee requirements • gene technology regulations • intellectual property and copy right • material safety data sheets (MSDS) • material, production and product specifications • National Association of Testing Authorities (NATA) Accreditation programs requirements

RANGE STATEMENT	
	• national environment protection measures • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • OHS national standards and codes of practice • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • Therapeutic Goods Regulations 1009
New methods of analysis and related procedures	New methods of analysis and related procedures may be required to: • analyse raw materials • quality control or evaluate the stability of products • quality control or evaluate the stability of new formulations of existing products • use new technology • meet regulatory requirements • meet customer requirements • improve productivity • improve accuracy and precision
Analyses	Analyses may include: • non-instrumental methods, such as gravimetric, titrimetric and qualitative tests • spectrometric methods, such as ultraviolet-visible (UV-VIS), infra red (IR) (including fourier transform infra red (FTIR)), near infra red (NIR), atomic absorption (AA) and fluorescence • chromatographic methods, such as thin layer, paper, gas chromatography (GC), high performance liquid chromatography (HPLC), ion chromatography (IC) and electrophoresis • electrochemical methods, such as ion-selective electrodes and polarography • assays based on biological properties or cell properties for enzyme antibody activity
Procedures	Procedures are:

RANGE STATEMENT	
	• directions for conducting analyses • hard copy • online format
Concepts relating to method development	Concepts relating to method development include: • determining and defining development objectives • relating chemical and physical characteristic of sample to possible assay methods • evaluating criteria to choose appropriate analytical method • sample cleanup and preparation techniques • preparation, setup and calibration of testing equipment • choice of appropriate detection system ensuring accuracy/precision criteria are achieved • optimisation of analysis conditions • generating, recording and reporting data in format which assists procedure writing
Criteria for choice of method	Criteria for choice of method may include: • economic factors • safety considerations • resource factors, including equipment and personnel • regulatory, accreditation and registration considerations
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and

RANGE STATEMENT	
	State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977005A Integrate data acquisition and interfacing systems

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to automate experimental processes for instrument control and the acquisition and communication of data, particularly the integration of laboratory processes with computer systems.

Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. This unit of competency covers only the interconnection, not the design and construction, of scientific equipment or laboratory computer systems. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL924002A	*Use laboratory application*

Prerequisite units		
		software

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Transform physical data into an electronic form	1.1. Determine operational constraints 1.2. Select suitable transducer or sensor for electronic data 1.3. Transform physical phenomena into electronic data stream
2. Convert electronic data for acceptance by computerised system	2.1. Determine digitisation requirements 2.2. Condition electronic signals for digital data transformation 2.3. Configure computer systems for acquisition of experimental data 2.4. Transform electronic data stream to digital domain
3. Communicate data to, and between, computerised systems	3.1. Determine operational considerations 3.2. Prepare communication hardware 3.3. Configure hardware

ELEMENT	PERFORMANCE CRITERIA
	3.4. Implement software to automate laboratory and/or field systems
4. Document procedures and constraints	4.1. Prepare standard operating procedures (SOPs) for interfaced systems 4.2. Assist management in the specification of automated laboratory and/or field systems 4.3. Manage the implementation of automated laboratory and/or field systems

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- implementing and troubleshooting the interconnection of laboratory and field equipment
- collecting relevant information from manuals, specification sheets, diagnostic equipment and software
- constructing and correctly routing interconnections
- implementing successful data transfer
- managing data transfer
- documenting operational procedures and implementation details
- troubleshooting exiting data collection and communication between laboratory processes and computer systems
- capturing data from non-automated laboratory processes
- interconnecting laboratory and/or field equipment with computers using both serial and parallel digital communication
- integrating laboratory workstations into networked laboratory computer systems
- programming and interrogating stand alone monitoring equipment

Required knowledge

Required knowledge includes:

- appropriate technical terminology to communicate effectively with others
- relevant numbering systems (binary, decimal and hexadecimal)
- basic computer hardware and software concepts

REQUIRED SKILLS AND KNOWLEDGE
• integration of enterprise wide information systems • data types used in laboratory and field sciences • scientific concepts relevant to the application • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • collect relevant information from manuals, specification sheets, diagnostic equipment and software • construct and correctly route interconnections • implement successful data transfer • manage data transfer • document operational procedures and implementation details • troubleshoot exiting data collection and communication between laboratory processes and computer systems • capture data from non-automated laboratory processes • interconnect laboratory and/or field equipment with computers using both serial and parallel digital communication • integrate laboratory workstations into networked laboratory computer systems • program and interrogate stand alone monitoring equipment.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL977004A Develop or adapt analyses and*

EVIDENCE GUIDE	
	procedures. Resources may include: • workplace documents, such as manuals, specification sheets, laboratory notebooks and SOPs • relevant equipment and components, including computer network, suitable instruments and equipment, specimens and samples • equipment generated data.

Method of assessment	The following assessment methods are suggested:
	• integrated assessment based on a real or stimulated case study, for example:
	  • establish successful data acquisition (sensor selection, acquisition module installation and configuration, suitable signal conditioning and representative analog to digital conversion)
	  • troubleshooting defective data capture (covering problems, such as resolution and noise)
	  • establish successful two-way communication between laboratory or field equipment and a laboratory computer network
	  • troubleshoot defective digital communications (incorrect protocol parameters, incorrect hardware configuration)
	• oral and written questions associated with electronic data capture, digital communications and associated documentation and standards
	• feedback from peers and/or supervisors to confirm that workplace practices and procedures are consistently followed and that the results meet workplace requirements.
	In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly.
	Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
	Access must be provided to appropriate learning and/or assessment support when required.
	The language, literacy and numeracy demands of

EVIDENCE GUIDE	
	assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Manufacturing** A manufacturing plant was monitoring wastewater before discharging it from its treatment plant. A multi-probe capable of monitoring up to fifteen parameters, such as temperature, dissolved oxygen, pH, conductivity and redox potential was purchased to streamline the monitoring process. The technical specialist checked the documentation accompanying the probe. The documentation indicated that it was compatible with a variety of RS-232, RS-485, RS-422 and SDI-12 data-handling devices. After attaching the probe to the computer system using HyperTerminal in Windows, the 'Connect' and 'Direct to COM port' commands were selected to connect the multi-probe to the computer. The test data was received by the computer and saved and analysed using appropriate data analysis programs. **Biomedical** A senior technical officer works for a pathology laboratory that has just installed a new laboratory information management system (LIMS). As part of the purchase contract the LIMS vendor interfaced all currently operational automated equipment. The laboratory has an older electrolyte analyser, which it uses as a back-up unit. It has had frequent use lately. Because of the unit's age, the technical manuals have been misplaced. The officer has been asked to see if the old unit can be interfaced to the new LIMS to save on manual transcription. The analyser uses a serial interface, which appears to comply with RS-232. By inspection of the connectors and from knowledge of the RS-232 standard, the officer determines the analyser should be configured as for data terminal equipment (DTE). The officer then constructs a suitable cable and physically connects the analyser to a PC workstation. Using a simple terminal emulation program, the officer

EVIDENCE GUIDE	
	determines the correct communication parameters and basic commands to upload the results to the PC. Using the LIMS open database connectivity capability and a graphical programming language, such as Labview, the officer semi-automates data transfer from the analyser to the PC then to the LIMS. The report on the success of the interconnect prompts management to contract a professional programmer to fully automate the interface in liaison with the officer.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Information sources	Information sources may include: • Australian and international standards, such as: • AS/NZS ISO 9000 Set:2008 Quality management systems set • data format and management standards (e.g. National Pathology Accreditation Advisory Council's Laboratory Assessment Checklist: Computer Services Section and Analytical Data Interchange Protocols) • environment, safety and emergency procedures • hardware interface standards (e.g. EIA RS232, IEEE 488 or IEEE 1394) • maintenance agreements with suppliers • national and international standards covering hardware and software • National Association of Testing Authorities (NATA) Accreditation programs requirements

RANGE STATEMENT	
	• operation manuals for computer ware, laboratory instruments and field equipment • safe operation requirements for computers and equipment used • specifications of laboratory instruments and field equipment • specifications of laboratory instruments and field equipment
Equipment, **materials and systems**	Equipment, materials and systems may include: • suitable scientific equipment and instruments • array of sensors and transducers • data acquisition and digital communication interfacing modules • simple troubleshooting equipment (multimeter and breakout boxes) • protocol analysis tools (software or hardware) • turnkey and programmable data acquisition and control software • temperature, pressure, light displacement and stress sensors • representative laboratory and field equipment (e.g. pH meters, balances, spectrometers or data loggers)
Occupational health and safety (**OHS**) **and environmental management requirements**	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977006A Apply specialised knowledge of gas chromatography techniques to analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using advanced gas chromatography (GC) instruments including GC-MS. The unit also includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical instrument and procedure problems and perform routine instrument maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as forensic science (e.g. fire debris, toxicology and explosives), biomedical (e.g. isotopic labelling of metabolites), environmental monitoring (e.g. organics), food and beverage processing (e.g. aromatics, pesticide residues) and pharmaceuticals (e.g. active ingredient) testing. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine sample characteristics and appropriate analytical methods	1.1. Interpret client request and/or identify sample characteristics that may affect sample preparation and/or analysis 1.2. Liaise with client or sample provider to review client needs, testing requirements and sample history. if necessary 1.3. Identify analytical standards, reference materials, test methods and enterprise procedures that may be applicable 1.4. Select the most appropriate standard test method that

ELEMENT	PERFORMANCE CRITERIA
	is consistent with testing requirements and instrument availability 1.5. If no standard method exists, adapt or modify a test method to suit the sample characteristics 1.6. If necessary, seek advice from supervisor about any proposed variations and document all approved changes to test methods 1.7. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Log sample into instrument software 2.2. Obtain a representative analytical portion of the laboratory sample 2.3. Prepare sample in accordance with selected test method 2.4. Prepare validation checks and/or calibration standards for analytical portions 2.5. Use specialised procedures for ultra trace sample and standard preparation as required
3. Set up instrument and perform trial analysis	3.1. Configure the gas flow, injector, column, oven and detector sub-systems according to the selected test method 3.2. Perform pre-use, calibration and safety checks using enterprise procedures 3.3. Set instrumental parameters in accordance with those specified in selected test method 3.4. Check and optimise each instrument sub-system 3.5. Select an appropriate internal standard, if required 3.6. Conduct performance tests using (internal standards), standards and samples 3.7. Assess instrument performance in terms of response, resolution and run-time
4. Optimise instrument performance	4.1. Apply an understanding of analyte and column chemistry, temperature control and gas flow rate to determine strategies for enhancing separation and detection of required species 4.2. Adjust instrumental parameters in a logical and efficient sequence to optimise performance 4.3. When optimum separation is achieved, check that the detector and system software can correctly identify and quantify the required species
5. Perform analysis	5.1. Measure analyte (and internal standard) response for standards, validation checks and samples using

ELEMENT	PERFORMANCE CRITERIA
	optimised instrument settings 5.2. Conduct sufficient measurements to obtain reliable data 5.3. Regularly check for calibration drift and take appropriate action as necessary 5.4. Use system software to produce calibration graphs, chromatographs and/or mass spectra, confirm data quality and calculate uncertainties 5.5. Check that results are consistent with estimations and expectations 5.6. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.7. Return instrument to standby or shutdown condition in accordance with enterprise procedures 5.8. Report results with the appropriate accuracy, precision, uncertainty and units
6. Perform routine maintenance and troubleshoot instruments	6.1. Regularly check the condition of gas cylinders, filters and traps and replace as necessary 6.2. Regularly check that the injector, column and detector sub-systems are clean/undamaged and replace consumable items as necessary 6.3. Change columns in accordance with manufacturer's instructions and ensure that the system is free of leaks and properly conditioned before re-use 6.4. Investigate possible causes for the absence of peaks and presence of ghost peaks, split peaks or distorted peak shapes and apply recommended remedial actions 6.5. Investigate possible causes for baseline instability and non-reproducible retention times and apply recommended remedial actions 6.6. Identify the need for repairs or servicing and determine whether local repair/maintenance is technically possible and economic 6.7. Arrange for repair or servicing from an accredited agent or other appropriate personnel in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Identify risks, hazards, safety equipment and control measures associated with sample handling/preparation and test method 7.2. Use personal protective equipment and safety

ELEMENT	PERFORMANCE CRITERIA
	procedures specified for test method and materials to be tested 7.3. Minimise the generation of wastes and environmental impacts 7.4. Ensure the safe collection/disposal of laboratory wastes 7.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
8. Maintain laboratory records	8.1. Enter approved data and results into laboratory information management system (LIMS) 8.2. Maintain logs of instrument calibration checks, use and maintenance in accordance with enterprise procedures 8.3. Maintain security, integrity and traceability of samples, results and documentation 8.4. Communicate results to appropriate personnel in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- establishing client needs for routine and non-routine samples
- interpreting client requests, test methods and procedures accurately
- selecting, adapting and modifying standard test methods for unknown samples (including consideration of suitable stationary phase, support, solvent, temperature, flow rate, column type, column length and detection)
- preparing samples and standards, optimising procedures and equipment to suit sample/test requirements
- setting up, starting up and shutting down equipment
- checking the calibration/qualification status of equipment
- selecting, configuring, checking and optimising instrument sub-systems
- performing routine instrument maintenance and replacement of consumables
- obtaining valid and reliable data

REQUIRED SKILLS AND KNOWLEDGE

- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognising atypical data/results and troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- assessing risks, applying specified control measures and working safely
- minimising waste and ensuring safe collection and disposal of waste materials
- applying relevantprinciples of good laboratory practice (GLP) procedures
- maintaining technical knowledge by accessing journals, technical updates, suppliers' product notes and test methods

Required knowledge

Required knowledge includes:

- scope of samples that can be tested using gas chromatography GC techniques
- sample preparation procedures including specialised techniques such as:
  - handling unstable/hazardous chemicals and samples, and fragile/labile biological material
  - liquid-liquid extraction, solid-phase micro-extraction, derivatisation and diluting/concentrating
- GC principles for separation of analytes such as:
  - separation modes, chemical structure of stationary phase and its interaction with the analyte
  - order of elution based on analyte volatility and polarity
  - predicting effect of condition changes
- chromatography concepts and calculations involving:
  - retention times, peak widths, peak asymmetry, capacity factor k' and resolution
  - column selectivity, column efficiency (plates/m), optimum flow rate, minimum theoretical plate height, Van Deemter and related equations
  - limit of detection, limit of quantitation and their application to quality control procedures
- types of gases and requirements for purity and pre-treatment of gases, such as drying, use of oxygen/moisture/hydrocarbon traps and filters
- operation, construction, typical applications, troubleshooting and routine maintenance of injectorssuch as:
  - head space sampling
  - hot direct
  - split/splitless
  - solid phase micro-extraction (SPME)
  - program temperature vaporisation (PTV)

REQUIRED SKILLS AND KNOWLEDGE

- gas desorption
- purge and trap
- on column
- choice, use and maintenance of syringes

- operation, construction, selectivity, sensitivity, linear range, typical applications, troubleshooting and routine maintenance of GC systems, including details such as:
  - packed columns
  - capillary columns including megabore
  - column conditioning and replacement
  - gas inlets, septum, septum purge, injector insert, heater block, tubing materials, column connection, split valve and vent and compatibility of connectors
  - checking for leaks and system conditioning
- operation, construction, selectivity, sensitivity, linear range, typical applications, troubleshooting and routine maintenance of GC detectors such as:
  - thermal conductivity detectors (TCD)
  - flame ionisation detectors (FID)
  - electron capture detector (ECD)
  - flame photometric detector (FPD)
  - mass spectrometry (GC-MS) (GC-MS-MS) using full scan or selective ion monitoring (SIM)
- routine quality control procedures such as use of manual/computer calibration charts and/or standards
- computer control software for operating and optimising instrument (peak detection and integration, drift parameters, baseline correction and instrument/integrator zero)
- procedures for optimising instrument performance such as:
  - investigation of elution order
  - optimising separation by changing injection technique, sample size and sample preparation
  - effects on instrumental outputs and analytical results by fine tuning injection temperature, gas flow rate, column pressures and changing column type and detector type
  - use of temperature, flow gradient and pressure programming
- steps in identifying and quantifying analytes, including relative retention data, peak area normalisation and response factors, internal standards and spiking
- calculation steps (e.g. dilution steps) to give results in appropriate units and precision
- troubleshooting and maintenance procedures recommended by instrument manufacturer
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • select, operate and maintain a variety of GC injectors, columns and detectors • install injectors and columns • safely set up, start up and shut down instrument using enterprise procedures • prepare samples and calibration standards in accordance with test method • check calibration/qualification status of equipment • optimise instrument sub-systems and procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data • use software to identify analytes and calculate concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL976003A Evaluate and select appropriate test methods and procedures* • *MSL977003A Contribute to the validation of test*

EVIDENCE GUIDE	
	methods • *MSL977004A Develop or adapt analyses and procedures*. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results/calibration graphs obtained by the candidate over time to ensure accuracy, validity, precision and timeliness of results • inspection of results and technical records (e.g. maintenance schedules and quality controllogbooks) completed by the candidate • observation of candidate using GC instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant gas chromatography concepts, chemical principles underpinning sample preparation and separation of species,instrument design and optimisation, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting.

EVIDENCE GUIDE	
	Environmental testing A laboratory routinely analyses samples of foodstuffs for pesticide residues. Traditionally, they have used GC combined with ECD and FID detectors to quantify one or two classes at a time. Recently, the laboratory has commissioned a new GC-MS instrument that is capable of quantifying low level pesticides using the SIM mode while simultaneously performing quantification of higher concentrations using full-scan (SIFI single ion and full ion) acquisition. The technician sets up for a typical run of samples. He/she uses the programmable split/splitless injector to provide 1µL samples. The injection port temperature is set at 275°C (isothermal) and the capillary column uses a phase specifically designed for separation of pesticides. The helium carrier gas is programmed with a constant velocity of 30 cm/s. The oven temperature program is initially set to 80°C with no hold and ramped to 290°C at 20°C/min with a hold of 4.5 min. The total oven program is 15 min, with an injection to injection time of less than 20 min. The MS method contains multiple SIM functions overlapped by a *m/z 40* to *m/z 450* full scan function and the mass spectrometer transfer line and ion source are heated to 275°C. **Pharmaceutical testing** A laboratory technician working for a major cosmetics company is given a retail sample of a competitor's perfume and asked to determine its composition. He/she has to start somewhere and decides to use one of the laboratory's GC-MS instruments to simplify the identification process and to avoid the need for multiple spikes. The GC-MS is already set up to measure the company's own perfume and so the technician uses standard instrumental parameters as a starting point. However, he/she finds that many peaks are not resolved and some take a long time to elute. The technician realises that he/she should either modify the temperature and/or pressure programming or change columns. Sensibly, the technician chooses to modify the easiest parameter (i.e. temperature) before changing the column. This overcomes the problem of slow elution but does not resolve all peaks. He/she then varies the pressure programming which provides better resolution but does not completely separate all peaks. The technician then uses the instrument's spectral matching software to identify as many peaks as possible, including the ones

EVIDENCE GUIDE	
	that overlap.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • ASTM E355 Standard practice for gas chromatography terms and relationships
	  • ASTM E516 Standard practice for testing thermal conductivity detectors used in gas chromatography
	  • ISO 6889 Natural gas rapid analysis by gas chromatography
	  • BS 5443 Recommendations for standard layout for methods of chemical analysis by gas chromatography
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the

RANGE STATEMENT	
	expression of uncertainty in measurement (GUM) • Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement • National Association of Testing Authorities (NATA) supplementary requirements for the field of testing • Australian code of good manufacturing practice (GMP) • principles of good laboratory practice (GLP) • material safety data sheets (MSDS) • national measurement regulations and guidelines • enterprise procedures, standard operating procedures (SOPs) and operating manuals • quality manuals, equipment and procedure manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise recording and reporting procedures • material, production and product specifications • production and laboratory schedules • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures
GC instruments and techniques	GC instruments and techniques may include: • sample introduction, such as:

RANGE STATEMENT	
	• micro-syringe, split/splitless • head space analysis • thermal desorption • purge and trap • on column injection • packed columns, capillary columns, support coated open tubular (SCOT), wall coated (WCOT) and porous layer (PLOT) types • ovens including temperature stability and temperature programming capability • detectors, such as: • thermal conductivity (TCD) • flame ionisation (FID) • electron capture (ECD • atomic emission (AED) • flame photometric (FPD) • photo ionisation (PID) • fourier transform infra red (FTIR) • 'hyphenated' mass spectrometry (GC-MS) (GC-MS-MS) • ionisation - chemical, plasma/glow discharge, electron impact, electro spray, electric field and laser ionisation • design layout - ion cyclotron resonance fourier transform, ion trap, magnetic-sector, quadrupole and time of flight • ion detectors - channeltron, Daly, electron multiplier tube and micro-channel plate • full scan or selective ion monitoring (SIM) • replaceable items, such as gas inlets, septum, septum purge, injector insert, heater block, tubing materials, column connectors, split valve and vent, and lamps • data systems such as recorders, electronic integrators, and software packages for peak detection and integration
Testing that uses GC instruments	Testing that uses GC instruments may include: • forensic testing, such as toxicology of biological samples, identification of fire and

RANGE STATEMENT	
	explosive residues • medical testing, such as using isotopic labelling of metabolic compounds • testing of athletes for performance enhancing drugs • environmental cleanup and monitoring of pollution in air, water or soil (e.g. organochloride pesticides) • control of starting materials, in-process materials and final products in a wide range of industry sectors (pharmaceuticals, biotechnology, petroleum and manufacturing) • multi-analyte determination • testing for contaminants in food and beverages • analysis of flavour and fragrance
Sample characteristics that may affect analysis	Sample characteristics that may affect analysis may include: • presence of non-volatiles, such as carbohydrates
Sample preparation	Sample preparation may include: • conversion to small volumes (1ÂµL) • derivatisation • identification of any hazards associated with the samples and/or analytical chemicals • grinding, dissolving, extraction, filtration, refluxing, centrifuging, evaporation, washing and drying • solid-phase micro-extraction • determination of, and if appropriate, removal of any contaminants or impurities or interfering substances • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware

Instrumental parameters	Instrumental parameters may include
	• GC parameters:
	  • injection mode (direct, split/splitless, on column)
	  • manual/auto sample (injector volume, speed and time)

RANGE STATEMENT	
	• pre- and post-sample washes • gas flow controls • isothermal versus temperature programming • isobaric versus pressure programming • detector/source parameters and single/split system • MS parameters: • vacuum pressures and gas flows • nebuliser gas flow • ionisation control • interface cone alignment • ion lens voltage • mass analyser control • solvent delay • scan, mass start/end, scan time and inter-scan delay • selective ion monitoring (SIM)
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • system leaks • syringe blockage or incorrect type and inappropriate septum • column overloading • contamination of sample, gas or solvents, lines or other system elements and out gassing of traps • overcoming problems with interfering substances by using SIM • lack of suitable reference standards • poor separation due to inappropriate selection of column or operating parameters (temperature and flow) • poor sensitivity • absence of peaks and presence of ghost peaks, split peaks or distorted peak shapes and broad solvent peaks • baseline instability and non-reproducible retention times
Hazards	Hazards may include:

RANGE STATEMENT	
	• electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • hot surfaces • flammable liquids and gases • fluids under pressure sources of ignition • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977007A Apply specialised knowledge of liquid chromatography techniques to analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using advanced liquid chromatography (LC/HPLC) instruments including (LC-MS). The unit includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical instrument and procedure problems and perform routine instrument maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as forensic science (e.g. toxicology, dyes and inks), environmental monitoring (e.g. herbicides and pesticides), chemical, biomedical (e.g. structural analysis of complex molecules and protein identification), food (e.g. pesticide residues and nutrition supplements) and pharmaceuticals testing (e.g. pharmacokinetics). Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine sample characteristics and appropriate analytical methods	1.1. Interpret client request and/or perform presumptive tests to identify sample characteristics that may affect analysis 1.2. Liaise with client or sample provider to review client needs, testing requirements and sample history, if necessary 1.3. Identify analytical standards, reference materials, test methods and enterprise procedures that may be applicable 1.4. Select the most appropriate standard test method that

ELEMENT	PERFORMANCE CRITERIA
	is consistent with testing requirements and instrument availability 1.5. If no standard method exists, adapt or modify a test method to suit the sample characteristics 1.6. If necessary, seek advice from supervisor about any proposed variations and document all approved changes to test methods 1.7. Schedule analysis using enterprise procedures
2. Prepare samples, standards and mobile phase	2.1. Log sample into instrument software 2.2. Obtain a representative analytical portion of the laboratory sample 2.3. Prepare sample in accordance with selected test method 2.4. Prepare mobile phase in accordance with selected test method using buffers and other additives to enhance separation and ionisation, concentrate analytes and prevent build up of salts, as necessary 2.5. Filter and degas mobile phase 2.6. Prepare validation checks and/or calibration standards for analytical portions 2.7. Use specialised procedures for ultra trace sample and standard preparation as required
3. Set up instrument and perform trial analysis	3.1. Configure the injector, column, solvent delivery and detector sub-systems according to the selected test method 3.2. Prime the pump, flush the system and monitor pressures and baseline to ensure the system is fully equilibrated 3.3. Perform other pre-use, calibration and safety checks using enterprise procedures 3.4. Set instrumental parameters in accordance with those specified in selected test method 3.5. Check and optimise each instrument sub-system 3.6. Conduct performance tests using standards and samples 3.7. Assess instrument performance in terms of response, resolution and run-time
4. Optimise instrument performance	4.1. Apply an understanding of analyte and column chemistry, temperature control and varying mobile phase composition to determine strategies for enhancing separation and detection of required

ELEMENT	PERFORMANCE CRITERIA
	species 4.2. Adjust instrumental parameters in a logical and efficient sequence to optimise performance 4.3. When optimum separation is achieved, check that the detector and system software can correctly identify and quantify the required species
5. Perform analysis	5.1. Measure analyte response for standards, validation checks and samples using optimised instrument settings 5.2. Conduct sufficient measurements to obtain reliable data 5.3. Use system software to produce calibration graphs, chromatographs and/or mass spectra, confirm data quality and calculate uncertainties 5.4. Check that results are consistent with estimations and expectations 5.5. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Return instrument to standby or shutdown condition in accordance with enterprise procedures 5.7. Report results with the appropriate accuracy, precision, uncertainty and units
6. Perform routine maintenance and troubleshoot instruments	6.1. Flush and store the column with the recommended solvent to protect the stationary phase during downtime 6.2. Regularly check that the pump, lines, valves, injector, column and detector sub-systems are clean/undamaged and replace consumable items as necessary 6.3. Change columns and detectors in accordance with manufacturer's instructions and ensure that the system is free of leaks and properly conditioned before re-use 6.4. Investigate possible causes for the absence of peaks and presence of ghost peaks, split/distorted peaks, band broadening and apply recommended remedial actions 6.5. Investigate possible causes for baseline instability and non-reproducible retention times and apply recommended remedial actions 6.6. Identify the need for repairs or servicing and

ELEMENT	PERFORMANCE CRITERIA
	determine whether local repair/maintenance is technically possible and economic 6.7. Arrange for repair or servicing from an accredited agent or other appropriate personnel in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Identify risks, hazards, safety equipment and control measures associated with sample handling/preparation and test method 7.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 7.3. Minimise the generation of wastes and environmental impacts 7.4. Ensure the safe collection/disposal of mobile phase and other laboratory wastes 7.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
8. Maintain laboratory records	8.1. Enter approved data and results into laboratory information management system (LIMS) 8.2. Maintain logs of instrument calibration checks, use and maintenance in accordance with enterprise procedures 8.3. Maintain security, integrity and traceability of samples, results and documentation 8.4. Communicate results to appropriate personnel in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include: • establishing client needs for routine and non-routine samples • interpreting client requests, test methods and procedures accurately • selecting, adapting and modifying standard test methods for unknown samples

REQUIRED SKILLS AND KNOWLEDGE

(including consideration of suitable polar/non-polar stationary and mobile phases, solvent composition, compatibility of sample solvent with mobile phase, buffer, sample loop volume, temperature, flow rate, column type, column length and detection)
- preparing samples and standards, optimising procedures and equipment to suit sample/test requirements
- setting up, starting up and shutting down equipment
- checking the calibration/qualification status of equipment
- selecting, configuring, checking and optimising instrument sub-systems
- performing routine instrument maintenance and replacement of consumables
- obtaining valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognising atypical data/results and troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- assessing risks, applying specified control measures and working safely
- minimising waste, ensuring safe collection and disposal
- applying relevant principles of good laboratory (GLP) procedures
- maintaining technical knowledge by accessing journals, technical updates, suppliers' product notes and test methods

Required knowledge

Required knowledge includes:

- sample preparation procedures including specialised techniques such as:
  - handling unstable/hazardous chemicals and samples, fragile/labile biological material
  - liquid-liquid extraction, solid-phase micro extraction, derivatisation, filtering and dilution/concentration
- principles for separation of analytes such as:
  - chemical composition of stationary and mobile phases and their types of interaction
  - selection of solvents based on polarity, viscosity, ultraviolet (UV) cut-off
  - requirements for solvent purity and pre-treatment including filtration, degassing, buffering and modifying solvents
  - isocratic and gradient elution flow programming (linear, concave and convex gradients and step)
  - recovery and recycling of solvents
- separation by polarity:
  - normal phase systems and hydrophilic (interaction chromatography)

REQUIRED SKILLS AND KNOWLEDGE

- reverse phase systems and hydrophobic (interaction chromatography)
- order of elution in normal and reverse phase systems

- separation by charge:
  - ion exchange chromatography(IEC) and ion chromatography (IC)
  - ion suppression and ion pairing techniques
  - non-suppressed systems
- separation based on molecular size:
  - size exclusion chromatography (SEC)
  - gel-permeation chromatography (GPC)
  - relationship between retention time and molecular mass
- bioaffinity chromatography principles
- chromatography concepts and calculations involving:
  - retention times, peak widths, peak asymmetry, capacity factor k' and resolution
  - column selectivity, column efficiency (plates/m), optimum flow rate, minimum theoretical plate height, Van Deemter and related equations
  - limit of detection, limit of quantitation and their application to quality control procedures
- operation, construction, selectivity, typical applications, troubleshooting and routine maintenance of LC columns including:
  - (semi) preparation columns, packed columns and capillary columns
  - column oven (role of temperature in achieving close separations)
  - checking for leaks, changing of columns, lines and valves
  - system flushing and conditioning and storage of columns
- operation, construction, selectivity, typical applications, troubleshooting and routine maintenance of LC sample introduction systemsincluding:
  - manual and auto-injection, injector valves, solvent reservoirs, selector valves, gradient programmer, mixing manifolds and column switching
  - pump designs such as reciprocating piston or diaphragm, pressures, flow rates
- operation, construction, selectivity, sensitivity, linear range, typical applications, troubleshooting and routine maintenance of LC detectors including:
  - UV fixed wavelength and dispersion/diode array multi-wavelength detectors
  - conductivity detector (ECD)
  - electrochemical detector (ECD)
  - fluorescence detectors
  - refractive index (RI)
  - evaporative light scattering (ELSD)
  - mass spectrometry (LC-MS) (LC-MS-MS) using full scan or selective ion monitoring (SIM)
  - flow splitting, tandem detectors (e.g. UV and MS)

REQUIRED SKILLS AND KNOWLEDGE

• routine quality control procedures such as use of manual/computer calibration charts and/or standards
• computer control software for operating and optimising instrument (peak detection and integration, drift parameters, baseline correction and instrument/integrator zero)
• procedures for optimising instrument performance such as:
  • optimising separation by changing solvent composition including use of mobile phase gradient computer control programs
  • investigation of elution order in normal and reverse phase systems
  • effects on instrumental outputs and analytical results by fine tuning injection, mobile phase flow rate, column pressures and changing column type or detector
  • aligning MS interface cones
• steps in identifying and quantifying analytes including relative retention data, peak area normalisation and response factors
• calculation steps to give results in appropriate units and precision
• troubleshooting and maintenance procedures recommended by instrument manufacturer
• enterprise and/or legal traceability requirements
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • select, operate and maintain a variety of LC sample valves, solvent delivery components, pumps, columns and detectors • install injectors, solvent delivery systems and columns • safely set up, start up and shut down instrument using enterprise procedures • prepare samples and calibration standards in

EVIDENCE GUIDE	
	accordance with test method • check calibration/qualification status of equipment • optimise instrument sub-systems and procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data • use software to identify analytes and calculate concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL976003A Evaluate and select appropriate test methods and procedures* • *MSL977003A Contribute to the validation of test methods* • *MSL977004A Develop or adapt analyses and procedures*. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results/calibration graphs obtained by the candidate over time to ensure accuracy, validity, precision and timeliness of results • inspection of results and technical records (e.g. maintenance schedules and quality control logbooks) completed by the candidate • observation of candidate using LC instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant LC concepts,

EVIDENCE GUIDE	
	chemical principles underpinning sample preparation and separation of species, instrument design and optimisation, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food and beverage processing** A technician is measuring phosphate levels in samples of a popular cola drink by ion chromatography. Using a standard method, he/she notes that there is a long retention time and obtains a broad asymmetric peak because the recommended flow rate could not be obtained with the laboratory's instrument. He/she then decides that the simplest way to speed up the elution time is to modify the mobile phase by increasing the % of methanol. The technician was pleased to obtain a well resolved analyte peak despite the faster eluting peaks now being unresolved. However, this was of no consequence to the analysis as the client only required the phosphate concentration. **Education and training** An experienced technician sets up and runs some pre-use checks for an LC instrument that is used by several laboratory personnel with periods of downtime in between. To his/her dismay, the initial standard produces one broad peak instead of three pronounced UV

EVIDENCE GUIDE	
	absorbance peaks as expected. He/she checks that the column has not been changed and that the mobile phase composition and flow rates are correct. He/she then checks each sub-system carefully and then waits for the system to equilibrate again. After re-running the standard, the result is the same and so he/she then suspects something is wrong with the stationary phase. The technician notices that when the instrument was last used, the mobile phase had a high percentage of water. He/she now suspects that there is bacterial growthin the column because it has been stored incorrectly. After trying to regenerate the column unsuccessfully, the technician installs a new one and then flushes and conditions the instrument in accordance with the laboratory procedures. He/she then adds the following information to the instrument logbook: • Store columns in 50/50 methanol/water without any acid. • If you are using a salt, unlikely in LC-MS, wash the entire system, solvent bottles, LC, solvent lines, and column, in a non-salt containing solvent. (Otherwise salt may precipitate out and plug your LC or column or may cause corrosion.) • Flush with pure water first and then leave the system in 50/50 methanol/water mixture. (Some salts may precipitate out in high organics so an initial water wash is advised.The 50/50 methanol/water solution helps to stop bacterial growth which can muck up the system!

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • AS 3741 Recommended practice for chemical analysis by ion chromatography
	  • BS EN 12916 Petroleum products - Determination of aromatic hydrocarbon types in middle distillates - HPLC method with refractive index detection.
	  • DIN EN 12630 Fruit and vegetable juices - Determination of glucose, fructose, sorbitol and sucrose - Method by HPLC.
	  • ISO 10304 set Water quality - Determination of dissolved anions by LC of ions
	  • ISO 20481 Coffee and coffee products - Determination of caffeine content using HPLC
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• NATA supplementary requirements for the field of testing
	• Australian code of good manufacturing practice (GMP)
	• principles of good laboratory practice (GLP)

RANGE STATEMENT	
	• material safety data sheets (MSDS) • national measurement regulations and guidelines • enterprise procedures, standard operating procedures (SOPs) and operating manuals • quality manuals, equipment and procedure manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise recording and reporting procedures • material, production and product specifications • production and laboratory schedules • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures

LC instruments and techniques	LC instruments and techniques may include:
	• analytical and (semi) preparative columns
	• sample and solvent introduction systems such as:
	  • sample valves, sub ÂµL, ÂµL and mL
	  • sample loop design
	  • solvent selector valves, mixing manifolds, binary/quaternary pumps and control program
	• LC detectors such as:
	  • UV absorbance
	  • conductivity detector (ECD)

RANGE STATEMENT	
	• electrochemical detector (ECD) • fluorescence • refractive index (RI) • evaporative light scattering (ELSD) • 'hyphenated' mass spectrometry (LC-MS) (LC-MS-MS) • fraction collectors • replaceable items, such as sample injection valves, (high pressure) tubing and fittings, column connectors and lamps • data systems such as recorders, electronic integrators, and software packages for peak detection and integration
Testing that uses LC instruments	Testing that uses liquid chromatography instruments may include: • determination of the molecular weight distribution for large molecules such as proteins and polymers • therapeutic drug analysis • diagnostic pathology tests • forensic testing of samples (e.g. toxicology, dyes and inks) • environmental monitoring of pollution in air, water or soil (e.g. herbicides, pesticides, nitrates and phosphates) • control of starting materials, in-process materials and final products in the food, beverage and pharmaceutical industry sectors
Presumptive tests	Presumptive tests may include: • pH • sample solubility in water/methanol mix (free of precipitates and miscible in one phase) • colour test • compatibility of sample solvent and mobile phase
Sample preparation	Sample preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • derivatisation • grinding, dissolving, extraction, filtration,

RANGE STATEMENT	
	refluxing, centrifuging, evaporation, washing and drying • solid-phase micro-extraction • determination of, and if appropriate, removal of any contaminants or impurities or interfering substances • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware • on column concentration

Instrumental parameters	Instrumental parameters may include
	• LC parameters:
	  • manual/auto sample; injector volume, pre- and post-sample washes
	  • fixed or variable solvent ratios
	  • solvent flow rate
	  • column temperature
	• detector/source parameters, single/split system
	• MS parameters:
	  • vacuum pressures and gas flows
	  • nebuliser gas flow
	  • ionisation control
	  • interface cone alignment
	  • ion lens voltage
	  • mass analyser control
	  • solvent delay
	  • scan, mass start/end, scan time and inter-scan delay
	  • selective ion monitoring (SIM)

Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • system leaks • efficiency of roughing pump (oil and bearing wear) and turbo/molecular pumps • irregular sample or solvent delivery • contamination of sample, solvents, lines or other system elements • dead volume • bubbles in system

RANGE STATEMENT	
	• build up of salts/dissolved solids in sample valves, injectors, MS spray chamber and/or cones • lack of suitable reference standards • poor separation due to inappropriate selection of column or operating parameters solvent mix and flow • poor sensitivity • absence of peaks and presence of ghost peaks, split peaks or distorted peak shapes and broad solvent peaks • baseline instability and non-reproducible retention times
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • hot surfaces • flammable liquids and gases • fluids under pressure and sources of ignition • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment such as gloves, safety glasses, coveralls • use of fumehoods, direct extraction of vapours, gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental	OHS and environmental management

RANGE STATEMENT	
management requirements	requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977008A Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using instruments that use inductively coupled plasmas to produce excited atoms and ions that can be analysed using mass spectrometry (ICP-MS) or optical/atomic emission spectroscopy (ICP-OES or ICP-AES). The unit includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical instrument and procedure problems and perform routine instrument maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as biomedical and forensic science (toxicology), environmental monitoring (soil and water), industrial analysis (cement, glasses, ceramics, metals and oil), geological analysis (ores, rocks, minerals and petroleum products) and food and beverage (trace metals) testing. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine sample characteristics and appropriate analytical methods	1.1. Interpret client request and/or perform presumptive tests to identify sample characteristics that may affect analysis 1.2. Liaise with client or sample provider to review client needs, testing requirements and sample history, if necessary 1.3. Identify analytical standards, reference materials, test methods and enterprise procedures that may be applicable

ELEMENT	PERFORMANCE CRITERIA
	1.4. Select the most appropriate standard test method that is consistent with testing requirements and instrument availability 1.5. If no standard method exists, adapt or modify a test method to suit the sample characteristics 1.6. If necessary, seek advice from supervisor about any proposed variations and document all approved changes to test methods 1.7. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Log sample into instrument software 2.2. Obtain a representative analytical portion of the laboratory sample 2.3. Prepare sample in accordance with selected test method 2.4. Prepare validation checks and/or calibration standards for analytical portions 2.5. Use specialised procedures for ultra-trace sample and standard preparation as required
3. Set up instrument and perform trial analysis	3.1. Configure the sample introduction, torch and detector sub-systems according to the selected test method 3.2. Check vacuum pressures, gas flow and torch cooling before igniting torch and allow the system to fully equilibrate 3.3. Perform other pre-use, calibration and safety checks using enterprise procedures 3.4. Set instrumental parameters in accordance with those specified in selected test method 3.5. Check and optimise each instrument sub-system 3.6. Conduct performance tests using standards and samples 3.7. Assess instrument performance in terms of response and resolution
4. Optimise instrument performance	4.1. Apply an understanding of analyte chemistry, plasma reactions and interferences to determine strategies for enhancing detection of required species 4.2. Adjust instrumental parameters in a logical and efficient sequence to optimise performance
5. Perform analysis	5.1. Measure analyte response for standards, validation checks and samples using optimised instrument settings

ELEMENT	PERFORMANCE CRITERIA
	5.2. Conduct sufficient measurements to obtain reliable data 5.3. Use system software to produce calibration graphs, optical/emission or mass spectra, confirm data quality and calculate uncertainties 5.4. Check that results are consistent with estimations and expectations 5.5. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Return instrument to standby or shutdown condition in accordance with enterprise procedures 5.7. Report results with the appropriate accuracy, precision, uncertainty and units
6. Perform routine maintenance and troubleshoot instruments	6.1. Regularly check the condition of pumps, gas cylinders, filters and traps and service/replace as necessary 6.2. Regularly check the condition of sample/waste tubing on peristaltic pump lines and replace as necessary 6.3. Regularly clean the sample/nebuliser tips, injector tubes, spray chamber, torch, sample/skimmer cones and ion lenses as appropriate 6.4. Replace user serviceable components as necessary and ensure that the system is free of leaks and properly conditioned before re-use 6.5. Investigate possible causes for response and resolution problems and apply recommended remedial actions 6.6. Investigate possible causes for instability and non-reproducible data and apply recommended remedial actions 6.7. Identify the need for repairs or servicing and determine whether local repair/maintenance is technically possible and economic 6.8. Arrange for repair or servicing from an accredited agent or other appropriate personnel in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Identify risks, hazards, safety equipment and control measures associated with sample handling/preparation and test method 7.2. Use personal protective equipment and safety

ELEMENT	PERFORMANCE CRITERIA
	procedures specified for test method and materials to be tested 7.3. Minimise the generation of wastes and environmental impacts 7.4. Ensure the safe collection/disposal of laboratory wastes 7.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
8. Maintain laboratory records	8.1. Enter approved data and results into laboratory information management system (LIMS) 8.2. Maintain logs of instrument calibration checks, use and maintenance in accordance with enterprise procedures 8.3. Maintain security, integrity and traceability of samples, results and documentation 8.4. Communicate results to appropriate personnel in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- establishing client needs for routine and non-routine samples
- interpreting client requests, test methods and procedures accurately
- selecting, adapting and modifying standard test methods for unknown samples
- preparing samples and standards, optimising procedures and equipment to suit sample/test requirements
- setting up, starting up and shutting down equipment
- checking the calibration/qualification status of equipment
- selecting, configuring, checking and optimising instrument sub-systems
- performing routine instrument maintenance and replacement of consumables
- obtaining valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units

REQUIRED SKILLS AND KNOWLEDGE

- recognising atypical data/results and troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- assessing risks, applying specified control measures and working safely
- minimising waste and ensuring safe collection and disposal of waste materials
- applying relevant principles of good laboratory practice (GLP) procedures
- maintaining technical knowledge by accessing journals, technical updates, suppliers' product notes and test methods

Required knowledge

Required knowledge includes:

- sample preparation procedures including specialised techniques such as:
  - handling unstable/hazardous chemicals and samples and fragile/labile biological material
  - treatment of samples with high dissolved solids or high viscosity
  - filtration or centrifugation to remove particulates
  - open and closed wet chemical digestion and microwave digestion
  - alkali fusion of geological samples
- contamination control and ultra-trace analysis requirements such as:
  - prevention of airborne contamination with filtered air systems and clean rooms
  - preparation of ultra pure acids and reagents
  - cleaning and storage of glass and plastic ware
  - prevention of personal contamination of samples by exposure to analyst
- atomisation and ionisation mechanisms within inductively coupled plasmas:
  - effects of plasma temperature and stability on atomisation, single/double ionisation, recombination and matrix decomposition
  - isobaric interferences due to combinations of isotopes of argon (plasma gas), oxygen (sample solution), or chloride (matrix components) with themselves or other elements
- calculations involving:
  - concentration and dilution
  - uncertainties
  - limit of detection, limit of quantitation and their application to quality control procedures
- operation, construction, selectivity, typical applications, troubleshooting and routine maintenance of ICP-AES/OES and ICP-MS systems including details such as:
  - design and operation of nebulisers and characteristics such as aerosol efficiency, dissolved solid tolerance and self-aspiration

REQUIRED SKILLS AND KNOWLEDGE

- laser ablation of solid samples into aerosol form
- design and operation of spray chambers and effects on sample flow, sensitivity, plasma loading from larger droplets
- design and operation of plasma torches (e.g. tube diameter, sampling depth, radio frequency (RF) source) and effects on energy transfer, plasma stability, aerosol flow and density, matrix decomposition, deposition on the interface, polyatomic ion interferences and implications for cleaning
- axial/radial torch configurations
- design of sample/skimmer cones at plasma-vacuum interface and effects on sensitivity, mass response, oxide and doubly charged ion formation and loading on vacuum system
- operation of rotary and turbo-molecular pumps and valves to provide high vacuum, typical pressures and flow rates
- design and operation of electrostatic ion 'lenses' to separate analyte ions from neutral species and photons (to minimise background signal)
- use of collision-reaction cells to remove interfering polyatomic ions
- atomic/optical emission spectroscopy detectors (AES or OES), transfer optics, diffraction gratings, monochromators and polychromators, photomultipliers and charge coupled devices
- MS (e.g. quadrupole, magnetic sector, sector field, ion trap and time of flight mass analysers, electron multipliers with pulse and/or analogue modes for ion detection, measurements including selective ion monitoring (SIM), time resolved analysis, isotope ratio measurements and full scan/multi-element analysis)

- sources of AES/OES spectral interferences such as:
  - viscosity of sample
  - spectral overlap
  - ionisation
- sources of MS spectral interferences such as:
  - isobaric interferences (e.g. $^{58}Fe^{+}$ and $^{58}Ni^{+}$)
  - polyatomic ions originating in gas, sample or matrix (e.g. $^{40}Ar^{35}Cl^{+}$ and $^{75}As^{+}$, $^{44}Ca^{16}O^{+}$ and $^{60}Ni^{+}$)
  - doubly charged ions such as Ba^{2+} interfering with $^{65}Cu^{+}$, $^{66}Zn^{+}$, $^{67}Zn^{+}$, $^{68}Zn^{+}$)
- computer control software for operating and optimising instrument
- procedures for optimising instrument (ICP-AES/OES or ICP-MS)performance such as:
  - effects of adjusting gas flow rates, torch residence time
  - investigation of plasma power/temperature on ionisation of analyte and interfering ions
  - optimising interface between ICP and MS detector (e.g. alignment of sample/skimmer cones and ion lens adjustment)

REQUIRED SKILLS AND KNOWLEDGE
• optimising plasma viewing height and for individual wavelengths for ICP-AES/OES • use of manual/computer calibration charts and/or standards to identify and quantify analytes such as: • external calibration with or without internal standardisation • method of standard additions • semi-quantitative analysis • isotope ratio measurements • isotope dilution • calculation steps to give results in appropriate units and precision • troubleshooting and maintenance procedures recommended by instrument manufacturer • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • select, operate and maintain sample introduction and detector sub-systems • install ICP instrument sub-systems such as torch, nebuliser and spray chamber • safely set up, start up and shut down instrument using enterprise procedures • prepare samples and calibration standards in accordance with test method • check calibration/qualification status of equipment • optimise instrument sub-systems and procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data

EVIDENCE GUIDE	
	• use software to identify analytes and calculate concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL976003A Evaluate and select appropriate test methods and procedures* • *MSL977003A Contribute to the validation of test methods* • *MSL977004A Develop or adapt analyses and procedures*. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results/calibration graphs obtained by the candidate over time to ensure accuracy, validity, precision and timeliness of results • inspection of results and technical records (e.g. maintenance schedules and quality control logbooks) completed by the candidate • observation of candidate using ICP instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant ICP spectroscopy concepts, chemical principles underpinning sample preparation and separation of species, instrument design and optimisation, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by

EVIDENCE GUIDE	
	questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food processing** A technician is analysing trace metals in red wine. He/she knows from experience that the ethanol in the wine will extinguish the torch even under standard operating conditions. The technician has four possible remedies: 1. Dilute the sample solution 2. Boil the ethanol off 3. Adjust the torch operating conditions 4. Change the sample introduction equipment. He/she considers factors such as the number of samples to be analysed and the likely analyte concentrations and searches the literature for recommended remedial actions. The technician decides to start by increasing the torch power from 1.0 to 1.3 KW and tuning the gas flow rates through the torch until the plasma is stable with normal sample introduction. **Environmental testing** (**1**) A technician receives a series of stream water samples from a client to test for elemental arsenic (As). The client advises the laboratory that they have acidified the samples as per the standard method to preserve the integrity of the sample during transit. Assuming that the client has used HNO_3 to bring the pH of the samples

EVIDENCE GUIDE	
	down to 1, the technician proceeds with the ICP-MS analysis. However, the technician soon realises that the client has used HCl because there is overwhelming interference between $^{40}Ar^{35}Cl^{+}$ and $^{75}As^{+}$. The clean up takes a considerable time and to prevent a recurrence of the problem, the laboratory now conducts rapid tests for chlorides in all water samples before ICP-MS analysis. **Environmental testing** (**2**) A technician receives a telephone call from a client requesting more information about the laboratory's ability to provide ICP-AES multi-element analysis of dry plant material as listed on the company website. The technician explains how the laboratory uses a dry ash method and requires about 500-1000 mg of sample. The technician briefly outlines how the samples are ashed in a silica crucible that is covered to prevent any contamination. The ash is then equilibrated with 5mL of 20% HCl at room temperature for 30 minutes before having 5mL of deionised water added, gently swirled and then allowed to settle for three hours. The solution is then decanted into 15mL plastic disposable tubes for direct determination by ICP-AES. The client mentions that they are particularly interested in the presence of Fe, Al and Cr and the technician notes that in this case, the laboratory usually refluxes the ash in 20% HCl to improve the recovery of these elements. The technician also advises the client that the laboratory reports elemental determinations as ppm on a weight element/dry sample weight basis and that ICP values are expressed on an atomic weight basis, not as any other molecular species.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

RANGE STATEMENT	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • AS 4873 Set: 2005 Recommended practice for inductively coupled plasma mass spectroscopy (ICP-MS)
	  • ISO 22036: 2008 Soil quality - Determination of trace elements in extracts of soil by inductively coupled plasma atomic emission spectroscopy (ICP-AES)
	  • ISO 11885: 2007 Water quality - Determination of selected elements by inductively methods coupled plasma optical emission spectroscopy (ICP-OES) methods
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• NATA supplementary requirements for the field of testing
	• Australian code of good manufacturing practice (GMP)
	• principles of good laboratory practice (GLP)
	• material safety data sheets (MSDS)
	• national measurement regulations and guidelines
	• enterprise procedures, standard operating

RANGE STATEMENT	
	procedures (SOPs) and operating manuals • quality manuals, equipment and procedure manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise recording and reporting procedures • material, production and product specifications • production and laboratory schedules • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures

ICP instruments and techniques	Inductively coupled plasma instruments and techniques may include:
	• peristaltic sample pumps
	• nebulisers (e.g. cross-flow, V-groove, C spray, concentric, micro-concentric and ultrasonic)
	• spray chambers (temperature and pressure control)
	• alternative sample introduction systems such as:
	  • laser ablation of solid samples
	  • electrothermal vaporisation (ETV)
	  • flow injection for samples high in total dissolved solids
	  • chromatography (e.g. liquid and ion)
	  • hydride generation
	  • cold vapour mercury generation

RANGE STATEMENT	

	• plasma torch (RF generation and cooling), radial/axial alignment
	• plasma gas controls
	• interface (sample and skimmer cones) and ion lens
	• mass analysers such as:
	  • quadrupole (peak jump mode, scan mode and single ion monitoring mode)
	  • magnetic sector
	  • time of flight
	• optical spectrum analysers (diffraction grating)
	• ion detectors (channeltron, electron multiplier tube and micro channel plate)
	• photon detectors (photomultiplier tubes and charge coupled devices)
	• replaceable items, such as valves, tubing and fittings, lamps, vacuum oil and argon gas
	• data systems, such as recorders, electronic integrators, and software packages for peak detection and integration

Testing that uses ICP spectroscopy	Testing that uses inductively coupled plasma spectroscopy may include:
	• medical (toxicology) testing of whole blood, urine, plasma, serum, packed red blood cells for:
	  • exposure to heavy metals
	  • metabolic function
	• forensic testing to establish elemental 'fingerprint' and possible source of scene of crime samples
	• environmental monitoring of pollution in air, water or soil
	• monitoring of waste water, sludges and trade effluents
	• control of starting materials, in-process materials and final products in a wide range of industry sectors (e.g. semi-conductor purity and ultra purity chemical reagents)
	• materials analysis (e.g. engine wear and oil analysis)
	• trace elements in food and wine
	• pharmaceuticals analysis (e.g. metal elements

RANGE STATEMENT	

	in drug products)
	• geological testing:
	  • characterisation of rocks and minerals
	  • analysis of mineral/ore samples during exploration, ore processing, final product quality
	  • geochronology isotope ratio measurements

Presumptive tests	Presumptive tests may include: • pH • sample solubility in water and salinity • total dissolved solids • colour test • possible interferences and ion suppressants in sample matrix (e.g. presence of chlorides and chlorates)
Sample and standard preparation	Sample and standard preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding, dissolving, extraction, filtration, refluxing, centrifuging, evaporation, washing and drying • digestion in nitric acid or aqua regia or hydrogen fluoride for geological samples • microwave digestion • determination of, and if appropriate, removal of any contaminants or impurities or interfering substances • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware • preparation of internal standards, such as Indium and/or Gallium
Pre-use, **calibration and safety checks**	Pre-use, calibration and safety checks may include: • cleanliness of sample/skimmer cones, spray chamber and sample injection/nebuliser orifices • cleanliness of RF coils and quartz tubes • condition of sample and waste tubing on peristaltic pump lines • alignment of torch central tube with sample

RANGE STATEMENT	
	cone • initial mass calibrations (e.g. He isotopes in air, argon or other gases) • resolution checks • use of Rhodium levels, Cerium/oxide ratios and de-ionised water blanks to test sensitivity and alignment

Instrumental parameters	Instrumental parameters may include:
	• ICP parameters:
	  • manual/auto sample, pump program, pre- and post-sample washes
	  • sample introduction rate and sample uptake rate
	  • nebuliser/water flow rates
	  • torch gas flow rates
	  • adjustment of plasma temperature to optimise ionisation and minimise interferences (e.g. oxide)
	• OES/AES detector/source control parameters:
	  • wavelength choice for element sensitivity and/or interference
	  • photomultiplier and charge coupled device
	• MS parameters:
	  • vacuum pressures and gas flows
	  • sample and skimmer cone alignment
	  • sampling depth (distance between torch and sampling cone tip)
	  • ion optics voltage
	  • mass analyser control
	  • detector settings, such as discriminator voltage, detector high voltage, dead time correction and dual mode/extended range detector calibration
	  • scan, mass start/end, scan time and inter-scan delay
	  • selective ion monitoring (SIM)

Common analytical procedure problems and remedies	Common analytical procedure problems and remedies may include: • lack of suitable reference standards

RANGE STATEMENT	

	• poor sensitivity
	• overlapping spectra
	• nebuliser interferences, such as changes in sample delivery rate, nebuliser efficiency and droplet size
	• MS polyatomic interferences, reduced by:
	  • cooling the spray chamber to 2-5^{0}C
	  • desolvating the aerosol using a condenser and/or semi-permeable membrane
	  • using alternative sample introduction methods
	  • reducing chlorides by using nitric acid digests
	  • adding gases such as H_2, N_2 and CH_4 to the inner, intermediate or outer gases
	  • adding ethanol to the sample to reduce $ArCl^+$
	  • using spectral line fitting software
	  • using cold plasma conditions
	  • using correction equations
	  • using a collision or reaction cell
	• MS non-spectral (matrix) interferences, reduced by:
	  • matrix matching of calibration and sample solutions
	  • equilibrating test sample solutions to room temperature
	  • removal of dissolved gases from sample solutions
	  • dilution of sample solution
	  • using internal standards (i.e. reference elements)
	  • analyte additions
	  • isotope dilution

Common equipment problems	Common equipment problems may include: • system leaks • efficiency of rotary pump (oil and bearing wear) and turbo/molecular pumps • flat spots in sample/peristaltic pump tubing causing irregular sample or solvent delivery

RANGE STATEMENT	
	• contamination of sample, solvents, lines or other system elements • build up of salts/dissolved solids in sample valves, torch, MS spray chamber and/or cones
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • flammable liquids and gases • fluids under pressure, sources of ignition • disturbance or interruption of services • toxic fumes and ozone (plasma exhaust) • non-ionising radiation (UV and RF)
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard

RANGE STATEMENT	
	precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977009A Apply advanced ultraviolet, visible and near infra red spectroscopic techniques to analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using specialist techniques and modern accessories that extend the capability of ultraviolet, visible and near infra red (UV/VIS/NIR) spectrometers. The unit includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical instrument and procedure problems and perform routine instrument maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as biomedical and forensic science (e.g. identification of paints), environmental monitoring (pollutants in air, soil and water), agricultural and mineral testing, industrial analysis (paints, inks, dyes, paper and petrochemical products), pharmaceutical products (active ingredients) and food and beverage (colour, rapid protein and moisture analysis). Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section This competency in practice.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine sample characteristics and appropriate analytical methods	1.1. Interpret client request and/or perform presumptive tests to identify sample characteristics and determine the most appropriate UV/VIS/NIR spectroscopic technique 1.2. Liaise with client or sample provider to review client needs, testing requirements and sample history, if necessary 1.3. Identify analytical standards, reference materials, test methods and enterprise procedures that may be applicable

ELEMENT	PERFORMANCE CRITERIA
	1.4. Select the most appropriate standard test method that is consistent with testing requirements and instrument availability 1.5. If no standard method exists, adapt or modify a test method to suit the sample characteristics 1.6. If necessary, seek advice from supervisor about any proposed variations and document all approved changes to test methods 1.7. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Log sample into instrument software 2.2. Obtain a representative analytical portion of the laboratory sample 2.3. Prepare sample in accordance with selected test method 2.4. Prepare validation checks and/or calibration standards for analytical portions
3. Set up instrument and perform trial analysis	3.1. Configure the appropriate instrument accessories to perform the selected test method 3.2. Perform other pre-use, calibration and safety checks using enterprise procedures 3.3. Set instrumental parameters in accordance with those specified in selected test method 3.4. Check and optimise each instrument sub-system 3.5. Measure analyte response for standards, validation checks and samples 3.6. Assess instrument performance in terms of response and resolution
4. Optimise instrument performance	4.1. Adjust instrumental parameters in a logical and efficient sequence to optimise performance 4.2. When optimisation is achieved, check that the detector and system software can correctly identify and quantify the required species
5. Perform analysis	5.1. Measure analyte response for standards, validation checks and samples using optimised instrument settings 5.2. Conduct sufficient measurements to obtain reliable data 5.3. Use system software to produce calibration graphs, spectra, confirm data quality and calculate uncertainties 5.4. Check that results are consistent with estimations

ELEMENT	PERFORMANCE CRITERIA
	and expectations 5.5. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Return instrument to standby or shutdown condition in accordance with enterprise procedures 5.7. Report results with the appropriate accuracy, precision, uncertainty and units
6. Perform routine maintenance and troubleshoot instruments	6.1. Regularly check the spectral and photometric performance of the instrument 6.2. Regularly check and replace sample/waste tubing on peristaltic pump lines as appropriate 6.3. Replace lamps and confirm optical matching for cell pairs as necessary 6.4. Identify the need for repairs or servicing and determine whether local repair/maintenance is technically possible and economic 6.5. Arrange for repair or servicing from an accredited agent or other appropriate personnel in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Identify risks, hazards, safety equipment and control measures associated with sample handling/preparation and test method 7.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 7.3. Minimise the generation of wastes and environmental impacts 7.4. Ensure the safe collection/disposal of laboratory wastes 7.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
8. Maintain laboratory records	8.1. Enter approved data and results into laboratory information management system (LIMS) 8.2. Maintain logs of instrument calibration checks, use and maintenance in accordance with enterprise procedures 8.3. Maintain security, integrity and traceability of samples, results and documentation 8.4. Communicate results to appropriate personnel in

ELEMENT	PERFORMANCE CRITERIA
	accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- establishing client needs for routine and non-routine samples
- interpreting client requests, test methods and procedures accurately
- selecting appropriate UV/VIS/NIR techniques and installing instrument accessories
- selecting, adapting and modifying standard test methods for unknown samples
- preparing samples and standards and optimising procedures and equipment to suit sample/test requirements
- setting up, starting up and shutting down equipment
- checking the calibration/qualification status of equipment
- selecting, configuring, checking and optimising instrument sub-systems
- performing routine instrument maintenance and replacement of consumables
- obtaining valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognising atypical data/results and troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- assessing risks, applying specified control measures and working safely
- minimising waste, ensuring safe collection and disposal
- applying relevant principles of good laboratory practice (GLP) procedures
- maintaining technical knowledge by accessing journals, technical updates, suppliers' product notes and test methods

Required knowledge

Required knowledge includes:

- criteria for determining which UV/VIS/NIR technique (e.g. cell, accessory) is best suited to which type of sample (e.g. gas, liquid, bulk solid, fibre, film and small quantity)
- sample preparation procedures including specialised techniques such as:

REQUIRED SKILLS AND KNOWLEDGE

- handling unstable/hazardous chemicals and samples, fragile/labile biological material
- dilution without causing chromaphoric shifts
- filtration or centrifugation to remove particulates
- prevention of personal contamination of samples by exposure to analyst

- cleaning and/or handling of optical elements:
  - cleaning techniques and handling of cells and flow cells
  - cleaning of reflectance standards and liquid standards
  - alignment techniques for source mirrors and accessories
- UV/VIS/NIR spectroscopic terms and concepts such as:
  - excitation, absorption, absorbance, transmittance, reflectance and fluorescence
  - electronic transitions during absorption/fluorescence and relationship to chemical properties, interference and quenching
  - concepts such as Beer's Law, Bouguer or Lambert's Law and molar absorptivity
  - deviations from Beers Law, polychromatic radiation and chemical reactions
  - chromaphores and auxochhromes
  - conjugation effects in organic molecules
  - pH effects in ionised samples
  - solvent effects
  - spectral resolution, spectral bandwidth and linear dispersion
  - limit of detection, limit of quantitation and their application to quality control procedures
  - derivative spectra
  - multi-component analysis
  - analysis of reaction kinetics
- calculations and data processing involving:
  - concentration and dilution
  - spectral matching
  - first and higher derivatives of spectra
  - multi-component quantitation
- operation, construction, selectivity, typical applications, troubleshooting and routine maintenance of UV/VIS/NIR systems including details such as:
  - sources, such as deuterium and tungsten filament
  - monochromators, such as prisms, gratings and filters
  - sample holders, such as quartz, glass and plastic cuvettes, cells and fibre optic dip probes
  - detectors, such as photomultipliers, photodiode, diode arrays, charge coupled devices, and semiconductor devices for NIR (e.g. PbS and InGaAs)
  - accessories that extend capabilities, such as autosamplers, thermostat controlled

REQUIRED SKILLS AND KNOWLEDGE

cell holders, multi-cell transports and diffuse and specular reflectance units
• calibration procedures for:
  • accuracy of wavelength and absorbance using hydrogen/deuterium, holmium oxide glass filters and holmium perchlorate solution
  • stray radiation using recommended liquids for each spectral range
  • photometric accuracy using potassium dichromate solution
  • zero absorbance baseline flatness
• sources of spectral interferences such as:
  • particulates
  • fluorescence from heavy metals
  • interfering chromaphores
  • masking by chelating agents
• computer control software for operating and optimising instrument
• procedures for optimising instrument performance such as:
  • alignment of sub-systems (e.g. source mirror) and accessories
  • adjustment of slit and signal-noise ratio to obtain satisfactory spectral resolution
• use of manual/computer calibration charts and/or standards to identify and quantify analytes such as:
  • external calibration with or without internal standardisation
  • multi-component analysis
  • semi-quantitative analysis
  • library searching for spectral matching
  • derivative spectrum analysis
• calculation steps to give results in appropriate units and precision
• troubleshooting and maintenance procedures recommended by instrument manufacturer
• enterprise and/or legal traceability requirements
• relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	

EVIDENCE GUIDE	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • replace standard UV/VIS/NIR instrument consumables, such as lamps and purge gases • install UV/VIS/NIRaccessories such as optical fibre probes, microscopes and reflectance units • safely set up, start up and shut down instrument using enterprise procedures • prepare samples and calibration standards in accordance with test method • check calibration/qualification status of equipment • optimise instrument sub-systems and procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data • use software to identify analytes and calculate concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL976003A Evaluate and select appropriate test methods and procedures* • *MSL977003A Contribute to the validation of test methods* • *MSL977004A Develop or adapt analyses and procedures*. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.

EVIDENCE GUIDE	
Method of assessment	The following assessment methods are suggested: • review of test data/results/calibration graphs obtained by the candidate over time to ensure accuracy, validity, precision and timeliness of results • inspection of results and technical records (e.g. maintenance schedules and quality control logbooks) completed by the candidate • observation of candidate using UV/VIS/NIR instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant UV/VIS/NIR spectroscopy concepts, chemical principles underpinning sample preparation and separation of species, instrument design and optimisation, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplacesetting. **Forensic science** A forensic science team is examining some fibre samples taken from a crime scene and a suspect. After a careful microscopic examination of the two sets of samples, one technician determines that both contain blue polyester fibres. Because of the problems associated with extracting dyes from fibres, the team decides to first use a non-destructive analytical technique. This involves

EVIDENCE GUIDE	
	obtaining the UV/VIS absorption spectra of single fibres using micro-spectrophotometry. Each fibre is mounted between a quartz slide and cover slip and examined in transmission. The laboratory's instrument enables the technician to obtain a several spectra from a 2µ x 2µ spot for a wavelength range of 190 nm to 900 nm. The repeat spectra for each fibre are first compared for internal consistency by overlaying the spectra in pairs. The spectra for each fibre are then compared with those obtained for the other fibres and with the reference spectra for a large number of known blue polyester fibres in an international spectral library. To provide enhanced discrimination, derivative spectra are used to reveal subtle inflections and changes of gradient in the broad convoluted absorption peaks. However, because of the spatial variations in dye uptake within any one fibre, these derivative spectra could not be relied on to provide conclusive identification. The team then attempted to measure each fibre's birefringence using a polarising microscope and employed a variety of FTIR transmission and reflectance techniques to shed more light on the chemical properties of the two sets of fibres. **Food processing** A laboratory technician's manager asks him/her to determine the concentration of Vitamin C in a sample of clear apple juice. The technician is very familiar with the analytical methods used for determining Vitamin C in bulk pharmaceutical preparations but soon realises that these methods do not give a reliable result in this case. He/she considers alternative spectroscopic methods. The technician is aware that the laboratory has a modern UV-VIS spectrometer with an advanced spectrum calculator capable of producing up to 4th order derivative spectra. After finding a suitable method, the technician determines the Vitamin C content by using the instrument's derivative capability to produce sharp peaks and overcome the broad UV absorption bands usually obtained with this kind of sample.

Range Statement

RANGE STATEMENT

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	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • AS3753-2001 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry
	  • ISO 22891:2007 Paper - Determination of transmittance by diffuse reflectance measurement
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement -Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• National Association of Testing Authorities (NATA) supplementary requirements for the field of testing
	• Australian code of good manufacturing practice (GMP)
	• principles of good laboratory practice (GLP)
	• material safety data sheets (MSDS)
	• national measurement regulations and

RANGE STATEMENT	
	guidelines • enterprise procedures, standard operating procedures (SOPs) and operating manuals • quality manuals, equipment and procedure manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise recording and reporting procedures • material, production and product specifications • production and laboratory schedules • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures
UV/VIS/NIR instruments and techniques	UV/VIS/NIR instruments and techniques may include: • peristaltic sample pumps for flow injection analysis and sipper cells • single/double beam instruments and single/double/triple monochromators • discrete analysers for specific analytes • gas, liquid and thermally jacketed cells • fibre optic probes to measure fluorescence from rocks, gems and minerals • diffuse reflectance, (variable angle) specular reflectance accessories • double aperture accessories • rear beam attenuators

RANGE STATEMENT	
	• tablet dissolution accessories • data systems such as recorders, electronic integrators, and software packages for peak detection and spectra manipulation
Testing that uses UV/VIS/NIR spectroscopy	Testing that uses UV/VIS/NIR spectroscopy may include: • medical (pathology) testing of whole blood and urine (e.g. phosphates, nitrates and creatine) • forensic testing to establish analyte 'fingerprint' and possible source of scene of crime samples (e.g. paint by specular reflectance) • environmental monitoring of pollution in air, water or soil (e.g. colour and oxidisable organics) • control of starting materials, in-process materials and final products in a wide range of industry sectors (e.g. paper) • food and beverage (e.g. colour and organic compounds), tri-stimulus analysis(determination of food components such as moisture and protein) • pharmaceuticals (e.g. limit tests for active ingredients) • geological testing (e.g. characterisation of rocks, gems and minerals by fluorescence)
Presumptive tests	Presumptive tests may include: • source of sample • type and quantity of sample • assessing suitability of sample and specified preparation for spectroscopic technique • presence of interfering substances • stability of chromophore
Sample and standard preparation	Sample and standard preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding, dissolving, extraction, filtration, refluxing, centrifuging, evaporation, washing and drying • determination of, and if appropriate, removal of any contaminants or impurities or

RANGE STATEMENT	
	interfering substances
Pre-use, **calibration and safety checks**	Pre-use, calibration and safety checks may include: • cleanliness of cells and dip/or probes • cell positioning • cell matching • checking integrity and alignment of accessories • wavelength accuracy • detector signal to noise ratio • stray light levels • baseline flatness • spectral bandwidth (sharpness of peak, peak intensity and resolution of adjacent peaks)
Instrumental parameters	Instrumental parameters may include: • spectral lamp selection • measurement mode (i.e. absorption and emission) • wavelength range and start/finish • spectral bandwidth (slit width and signal to noise ratio) • scan speed/fixed wavelength • temperature control for kinetic studies
Common analytical procedure problems and remedies	Common analytical procedure problems and remedies may include: • cell cleanliness • mismatched optical cell pairs • poor selectivity • alignment of external attachments • photo-degeneration and sample instability
Common equipment problems	Common equipment problems may include: • adjustment of optical elements such as mirrors and lamps • alignment of external accessories • cleanliness/optical matching of cells
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms

RANGE STATEMENT	
	and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • flammable liquids and gases • fluids under pressure, sources of ignition • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977010A Apply advanced infra red spectroscopic techniques to analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using specialist techniques and modern accessories that extend the capability of fourier transform infra red (IR or FTIR) spectrometers. The unit includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical instrument and procedure problems and perform routine instrument maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as biomedical (e.g. bacterial screening), forensic science (e.g. fingermark residues, paints and fibres), environmental monitoring (pollutants in air, soil and water), industrial analysis (textile fibres, polymers, lubricant condition, defect and surface contamination), pharmaceutical products (drug analysis) and food (e.g. nutrition supplement analysis). Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section This competency in practice.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Determine sample characteristics and appropriate analytical methods	1.1. Interpret client request and/or perform presumptive tests to identify sample characteristics and determine the most appropriate IR spectroscopic technique 1.2. Liaise with client or sample provider to review client needs, testing requirements and sample history, if necessary 1.3. Identify analytical standards, reference materials, test methods and enterprise procedures that may be applicable 1.4. Select the most appropriate standard test method that

ELEMENT	PERFORMANCE CRITERIA
	is consistent with testing requirements and instrument availability 1.5. If no standard method exists, adapt or modify a test method to suit the sample characteristics 1.6. If necessary, seek advice from supervisor about any proposed variations and document all approved changes to test methods 1.7. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Log sample into instrument software 2.2. Obtain a representative analytical portion of the laboratory sample 2.3. Prepare sample in accordance with selected test method 2.4. Prepare validation checks and/or calibration standards for analytical portions
3. Set up instrument and perform trial analysis	3.1. Configure the appropriate instrument accessories to perform the selected test method 3.2. Perform other pre-use, calibration and safety checks using enterprise procedures 3.3. Set instrumental parameters in accordance with those specified in selected test method 3.4. Check and optimise each instrument sub-system 3.5. Conduct performance tests using standards and samples 3.6. Assess instrument performance in terms of response, resolution and number of scans required
4. Optimise instrument performance	4.1. Adjust instrumental parameters in a logical and efficient sequence to optimise performance 4.2. When optimisation is achieved, check that the detector and system software can correctly identify and quantify the required species
5. Perform analysis	5.1. Measure analyte response for standards, validation checks and samples using optimised instrument settings 5.2. Conduct sufficient measurements to obtain reliable data 5.3. Use system software to produce calibration graphs, spectra, confirm data quality and calculate uncertainties 5.4. Check that results are consistent with estimations and expectations

ELEMENT	PERFORMANCE CRITERIA
	5.5. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Return instrument to standby or shutdown condition in accordance with enterprise procedures 5.7. Report results with the appropriate accuracy, precision, uncertainty and units
6. Perform routine maintenance and troubleshoot instruments	6.1. Regularly check the spectral and photometric performance of the instrument 6.2. Regularly clean sample cell and/or reflectance crystal faces and replace consumables as appropriate 6.3. Confirm optical matching for cell pairs as necessary 6.4. Identify the need for repairs or servicing and determine whether local repair/maintenance is technically possible and economic 6.5. Arrange for repair or servicing from an accredited agent or other appropriate personnel in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Identify risks, hazards, safety equipment and control measures associated with sample handling/preparation and test method 7.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 7.3. Minimise the generation of wastes and environmental impacts 7.4. Ensure the safe collection/disposal of laboratory wastes 7.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
8. Maintain laboratory records	8.1. Enter approved data and results into laboratory information management system (LIMS) 8.2. Maintain logs of instrument calibration checks, use and maintenance in accordance with enterprise procedures 8.3. Maintain security, integrity and traceability of samples, results and documentation 8.4. Communicate results to appropriate personnel in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- establishing client needs for routine and non-routine samples
- interpreting client requests, test methods and procedures accurately
- selecting appropriate IR techniques and installing instrument accessories
- selecting, adapting and modifying standard test methods for unknown samples
- preparing samples and standards, optimising procedures and equipment to suit sample/test requirements
- setting up, starting up and shutting down equipment
- checking the calibration/qualification status of equipment
- selecting, configuring, checking and optimising instrument sub-systems
- performing routine instrument maintenance and replacement of consumables
- obtaining valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognising atypical data/results and troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- assessing risks, applying specified control measures and working safely
- minimising waste, ensuring safe collection and disposal
- applying relevant principles of good laboratory practice (GLP) procedures
- maintaining technical knowledge by accessing journals, technical updates, suppliers' product notes and test methods

Required knowledge

Required knowledge includes:

- criteria for determining which IR technique (e.g. cell and accessory) is best suited to which type of sample (e.g. gas, liquid, bulk solid, fibre, film, small quantity)
- sample preparation procedures including specialised techniques such as:
  - handling unstable/hazardous chemicals and samples, fragile/labile biological material and hygroscopic samples
  - filtration or centrifugation to remove particulates
  - prevention of personal contamination of samples by exposure to analyst
- cleaning and/or handling of optical elements:
  - cleaning techniques and handling of transmission cells and flow cells

REQUIRED SKILLS AND KNOWLEDGE

- cleaning of reflectance crystals and solid/liquid standards
- alignment techniques for source mirrors and accessories

- IR spectroscopic terms and concepts such as:
  - absorption, absorbance, transmittance, diffuse and specular reflectance and attenuated total reflectance
  - fourier transform of interferograms to produce spectra
  - fast fourier transform (FFT)
  - Fourier Transform advantages (Jacquinot, Felgett, Connes)
  - electronic, vibronic, vibrational and rotational transitions during absorption and relationship to chemical properties
  - concepts such as Beer's Law, Bouguer or Lambert's Law and molar absorptivity
  - deviations from Beers Law, polychromatic radiation and chemical reactions
  - spectral resolution, spectral bandwidth and linear dispersion
  - limit of detection, limit of quantitation and their application to quality control procedures
  - derivative spectra
  - multi-component analysis
  - analysis of reaction kinetics
- calculations and data processing involving:
  - baseline correction and spectral smoothing
  - Kubelka-Munk conversion (to linearise diffuse reflectance data)
  - Kramer-Kronig transformation (to remove refraction effects)
  - Concentration and dilution
  - spectral matching
  - spectral subtraction and spectral deconvolution
  - first and higher derivatives of spectra
  - multi-component quantitation techniques such as Classic Least Squares (CLS), Inverse Least Squares (ILS), Partial Least Squares (PLS), Principal Component Regression (PCR)
- operation, construction, selectivity, typical applications, troubleshooting and routine maintenance of IR systems including details such as:
  - scan settings (source/detector/beam-splitter combination, number of scans, scan range, scan mode, aperture, resolution, apodisation, zero filling, optical alignment, sensitivity, threshold, optical path difference and velocity)
  - sources (e.g.tungsten-halogen, ceramic, mercury arc, glow bars and Nernst glowers)
  - interferometer components (e.g. beam splitters (KBr, CsI, Mylar and metal mesh) and mirrors
  - sample transmittance (KBr, ZnSe and CsI cells), sample reflectance mounts and troughs, fibre optic probes and microscope attachments

REQUIRED SKILLS AND KNOWLEDGE

- mid IR detectors (e.g. HgCdTe or MCT, DLaTGS), far IR detectors (e.g. DLaTGS, liquid helium cooled Si bolometers)
- IR sensitive charge coupled array devices and focal plane array detectors for imaging

- operation, construction, typical applications, troubleshooting and routine maintenance of IR accessories such as:
  - attenuated total reflectance, single and multi-reflection unit and grazing angle
  - specular and diffuse reflectance units
  - single point microscope and spectrochemical imaging microscope
  - photoacoustic spectroscopy (PAS)
  - thermogravimetric analysers (TGA-IR)
  - polariser
- calibration procedures for:
  - accuracy of wavelength using transmission and reflectance standards, such as polystyrene, germanium and rare earth oxide glasses such as holmium oxide
  - photometric accuracy using for example, polystyrene or polyethylene terephthalate and potassium dichromate
  - zero absorbance baseline flatness
- sources of spectral interferences such as:
  - water and carbon dioxide
  - strongly absorbing matrix components
- computer control software for operating and optimising instrument
- procedures for optimising instrument performance such as:
  - alignment of sub-systems (e.g. source mirror and beam splitter) and accessories
  - adjustment signal to noise ratio to obtain satisfactory spectral resolution
- use of manual/computer calibration charts and/or standards to identify and quantify analytes such as:
  - external calibration
  - multi-component analysis
  - semi-quantitative analysis
  - library searching for spectral matching
  - derivative spectrum analysis
- calculation steps to give results in appropriate units and precision
- troubleshooting and maintenance procedures recommended by instrument manufacturer
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • replace standard IR/FTIR instrument consumables such as lamps, desiccants and purge gases • install IR/FTIR accessories, such as sample cells/probes, microscope and reflectance units • safely set up, start up and shut down instrument using enterprise procedures • prepare samples and calibration standards in accordance with test method • check calibration/qualification status of equipment • optimise instrument sub-systems and procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data • use software to identify analytes and calculate concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL976003A Evaluate and select appropriate test methods and procedures* • *MSL977003A Contribute to the validation of test methods* • *MSL977004A Develop or adapt analyses and*

EVIDENCE GUIDE	
	procedures. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results/calibration graphs obtained by the candidate over time to ensure accuracy, validity, precision and timeliness of results • inspection of results and technical records (e.g. maintenance schedules and quality control logbooks) completed by the candidate • observation of candidate using IR/FTIR instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant IR/FTIR spectroscopy concepts, chemical principles underpinning sample preparation and separation of species, instrument design and optimisation, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Forensic science** A forensic science team is examining some motor

EVIDENCE GUIDE	
	vehicle paint samples taken from a crime scene. After a careful microscopic examination of the topcoat and undercoat layers, one technician narrows the sample's origin down to a small range of possible vehicle makes, models and years of manufacture. To aid identification, another technician prepares a small paint chip for examination in the laboratory's FTIR spectrometer. After referring to the recommended analytical methods, he/she decides to use a transmittance technique because all the sampling wavelengths are subjected to the same path lengths and most of the reference data for paints, binders, pigments and additives consist of transmittance spectra. The technician cuts a cross-section sample with a microtome to expose an edge of the multi-layered sample and then mounts it using the microscope accessory. He/she adjusts the microscope aperture to minimise stray light and diffraction effects before obtaining spectra for each layer. After comparing his/her results with the spectral library data for binders, pigments and additives used by the manufacturers of interest, the origin of the paint is identified. Some weeks later, confirmation is obtained when samples taken from a suspect's vehicle match the physical and chemical features and spectra determined from the crime scene samples and diffuse reflectance measurements on the two sets of samples show identical weathering and surface contamination.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Standards, **codes**, **procedures**	Standards, codes, procedures and/or enterprise

RANGE STATEMENT	

and/or enterprise requirements	requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • ASTM E168 - 06 Standard practices for general techniques of infra red quantitative analysis
	  • ASTM E334 - 01(2007) Standard practice for general techniques of infra red microanalysis
	  • ASTM E573 - 01(2007) Standard practices for internal reflection spectroscopy
	  • ASTM E2224 - 02 Standard guide for forensic analysis of fibers by infra red spectroscopy
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• National Association of Testing Authorities (NATA) supplementary requirements for the field of testing
	• Australian code of good manufacturing practice (GMP)
	• principles of good laboratory practice (GLP)
	• material safety data sheets (MSDSs)
	• national measurement regulations and guidelines
	• enterprise procedures, standard operating procedures (SOPs) and operating manuals
	• quality manuals, equipment and procedure manuals
	• equipment startup, operation and shutdown

RANGE STATEMENT	
	procedures • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise recording and reporting procedures • material, production and product specifications • production and laboratory schedules • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures
IR/FTIR instruments and techniques	IR/FTIR instruments and techniques may include: • grating or interferometer as the dispersive element • gas sampling cells • liquid autosamplers and flow cells • beam condensers for micro-samples • reflection/transmission holders for FTIR microscopes • specialised infra red windows for FTIR microscopes • attenuated total reflectance ATR units (e.g. variable pressure, horizontal HATR trough plates, multiple internal reflectance MIR, single reflection ATR units and universal UATR units) • fixed/variable angle specular reflectance units • polarisers • single point microscopes and array-based imagers • discrete analysers (e.g. oil and SO_2)

RANGE STATEMENT	
	• data systems such as recorders, electronic integrators, and software packages for peak detection and spectra manipulation • spectral library matching
Testing that uses IR/FTIR spectroscopy	Testing that uses IR/FTIR spectroscopy may include: • medical (pathology) testing (e.g. bacterial screening) • forensic testing to establish analyte 'fingerprint' and possible source of scene of crime samples (e.g. paint layers by specular reflectance, fingermark residues by ATR and fibres by polarisable ATR) • environmental monitoring of pollution in air, water or soil (e.g. multi-organic components in industrial emissions) • control of starting materials, in-process materials and final products in a wide range of industry sectors (e.g. surface defects in polymers, semiconductor contamination and quantitation of biodiesel components) • materials testing (e.g. lubricant condition) • food testing (e.g. moisture and protein determination in grain) • pharmaceuticals (e.g. drug testing of athletes) • geological testing (e.g. oil inclusions in rocks by grazing angle ATR)
Presumptive tests	Presumptive tests may include: • source of sample • type and quantity of sample • assessing suitability of sample and specified preparation for spectroscopic technique (e.g. pH and aqueous content)
Sample and standard preparation	Sample and standard preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding, mulling and preparation of disks • dissolving, extraction, centrifuging, evaporation, washing and drying • determination of, and if appropriate, removal of any contaminants or impurities or interfering

RANGE STATEMENT	
	substances
Pre-use, calibration and safety checks	Pre-use, calibration and safety checks may include: • cleanliness of cells and dip/or probes • condition of desiccant packs and purge gas flows • detector coolant • optical alignment (e.g. beam splitter alignment, mirrors and accessories) • cell positioning and cell matching • checking integrity and alignment of accessories • wavelength accuracy using polystyrene • amplifier gain adjustment, signal to noise ratio • stray light levels • 100% transmittance baseline flatness • spectral bandwidth (sharpness of peak, peak intensity and resolution of adjacent peaks)
Instrumental parameters	Instrumental parameters may include: • spectral lamp selection • measurement mode (i.e. transmittance, reflectance) • wavelength range, start/finish • spectral bandwidth (slit width and signal to noise ratio) • scan speed/fixed wavelength • number of scans • temperature control for kinetic studies
Common analytical procedure problems and remedies	Common analytical procedure problems and remedies may include: • cell cleanliness • mismatched optical cell pairs and incorrect cell path length • alignment of external attachments • full scale absorption and too much sample • non-homogeneity of samples • air gap between solid sample and reflectance crystal
Common equipment problems	Common equipment problems may include: • system leaks • adjustment of optical elements such as mirrors

RANGE STATEMENT	
	and lamps • alignment of external accessories • cleanliness/optical matching of cells and cell window degradation • cell blockages • contamination of reflectance crystal
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • flammable liquids and gases • fluids under pressure and sources of ignition • disturbance or interruption of services
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard

RANGE STATEMENT	
	precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

MSL977011A Contribute to the selection, commissioning and maintenance of analytical instruments

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to identify appropriate instrumentation to meet specific analytical needs, determine the suitability of available instruments, commission instruments, develop maintenance schedules, maintain relevant records and train staff to operate instruments correctly.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as forensic science, environmental monitoring, chemical, biomedical, mineral, food and manufacturing testing. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Recommend a suitable instrument	1.1. Confirm the scope of analysis for which instrumentation is required 1.2. Research information about the specifications and features of instruments that may be suitable and their suppliers 1.3. Research information about the environmental operating conditions and services that instruments require 1.4. Liaise with suppliers and/or conduct tests to compare the stated performance of available instruments against enterprise specifications 1.5. Seek advice/assistance with evaluating instruments if beyond own technical competence 1.6. Assist senior staff to select the most suitable

ELEMENT	PERFORMANCE CRITERIA
	instrument 1.7. Develop a thorough understanding of the selected instrument's operation, installation requirements, routine instrument checks and maintenance requirements
2. Establish a suitable operating environment for an instrument	2.1. Select a suitable instrument location 2.2. Confirm required services for instrument using the supplier's specifications 2.3. Arrange for necessary connection of services
3. Commission a new instrument	3.1. Liaise with supplier to arrange delivery and installation as appropriate 3.2. Ensure that the supplier fully explains the instrument's operation and maintenance requirements during installation 3.3. Ensure that full qualification of the instrument's performance is completed prior to instrument handover 3.4. Conduct in-house checks of accessories and test measurements to confirm instrument performance for the full scope of intended use 3.5. Liaise with supplier to resolve any performance issues, clarify aspects of instrument operation or provide additional training 3.6. Enter all required information about the new instrument into the enterprise information management system 3.7. Assess any new risks to instrument operators, other laboratory personnel and the environment 3.8. Develop and document clear procedures for safely operating and maintaining the instrument and recording its use
4. Train, or arrange training for, instrument operators	4.1. Identify the knowledge and skills required to operate the instrument safely and reliably in the workplace and to evaluate the data obtained 4.2. Develop, or access, an appropriate training program for instrument operators 4.3. Ensure that each operator can use the instrument competently for the required analytical methods 4.4. Record all training outcomes in accordance with the enterprise procedures 4.5. Audit operator's use of instruments at regular

ELEMENT	PERFORMANCE CRITERIA
	intervals to ensure their ongoing competence

Required Skills and Knowledge

Required skills

Required skills include:

- establishing enterprise requirements for a specific analytical instrument from a consideration of client test requests, routine and non-routine samples, applicable test methods and cost/benefits
- locating, interpreting and comparing information about analytical instruments used by the enterprise
- recommending suitable instruments by analysing factors such as:
  - scope of intended use (fixed/portable and laboratory/field) and robustness
  - range of appropriate analytes and test methods, and limitations
  - detection method, detection limit, accuracy, precision/reproducibility, sensitivity, linearity and response time
  - software applications
  - ease of use
  - purchase price, operating costs and level of supplier support
  - facility to upgrade and add accessories
  - generation of waste
- conducting pre-use and calibration checks, troubleshooting common faults, conducting basic repairs and maintaining analytical instruments used in job role
- safely operating analytical instruments used in job role to obtain reliable data
- processing and analysing measurement data, quantifying analytes and applying established corrections
- interpreting manuals and writing operating instructions for analytical instruments used in enterprise
- seeking advice and further directions when faced with unforeseen circumstances or situations that may require decisions or response actions beyond technical competence

Required knowledge

Required knowledge includes:

- concepts and principles such as:
  - absorption, reflection, emission, fluorescence, reflectance, scattering, refraction, polarisation, diffraction, dispersion and spectra
  - ionisation, re-combination, photoelectric effect, and interaction of ions with

Required skills
electric and magnetic fields • electromagnetic induction, and generation of electromagnetic radiation and plasmas • common instrument layout (sample introduction, energy source, single/multi-beam, dispersive/analyte separation components and path, detection, signal conditioning, computer control, data processing and display, power supply, vacuum and pump systems) • terms and concepts, such as operating voltage, accuracy, response time, sensitivity, detection limit, linearity, resolution and spectral bandwidth • characteristics, capabilities, advantages/limitations, function of key components and operating principles for analytical instruments used in enterprise such as: • gas chromatographs (GC, GC-MS) • liquid chromatographs (LC, LC-MS) • instruments using inductively coupled plasma (ICP) linked to atomic (AES) or optical (OES) emission spectrometers or mass spectrometers (MS) • fourier transform infra red spectrophotometers (IR/FTIR) and attachments (e.g. microscope and reflectance) • ultraviolet/visible/near infra red spectrophotometers (UV/VIS/NIR) and attachments (e.g. microscope and reflectance) • atomic absorption spectrometers (AAS) including vapour generation and electrothermal atomisation accessories • role and importance of regular calibration and pre-use checks and maintenance • common instrument faults, troubleshooting, recommended remedial actions and repairs • common instrument operator errors • guidelines and safety procedures for working with (non) ionising radiation, high voltages, radio frequency (RF) fields, hazardous samples, chemicals and waste • health, safety and workplace emergency response procedures relevant to job role

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate	Assessors should ensure that candidates can:

EVIDENCE GUIDE	
competency in this unit	• select analytical instruments that will satisfy enterprise needs and specifications • confirm that an analytical instrument is performing to specification • develop operating procedures, usage logs and maintenance schedules for analytical instruments • keep accurate and complete records relevant to job role
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • oral/written tests and calculations involving analytical quantities, setup, calibration, operation and basic maintenance of analytical instruments • review of records of instrument selection, use and maintenance generated by the candidate • review of instrument training materials/records generated by the candidate • observation of the candidate checking, using and maintaining analytical instruments. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of

EVIDENCE GUIDE	
	competency and to show its relevance in a workplace setting. **Laboratory operations** A technician has been requested by the laboratory manager to help develop the laboratory's capability to conduct testing for trace metals in water samples. He/she searches for relevant Australian standards, technical publications and supplier's brochures on the Internet and identifies two techniques that appear to suit the laboratory's testing requirements and constraints. The two techniques involve inductively coupled plasma mass spectrometry (ICP-MS) and anodic stripping voltammetry (ASV). The technician carefully assesses of the performance of each type of instrument, the services and operating environment required, the purchase price and operating costs and the level of support that each supplier is prepared to provide. The technician decides that the ASV instrument is probably the most appropriate choice. He/she then provides a boiler water sample to several suppliers for analysis by ASV and discusses the results obtained in each case with his/her manager. The manager agrees with the technician's recommendation and notes that the ASV instrument will provide a much more favourable return on investment that the ICP-MS. The technician then contacts the supplier to confirm the purchase and arranges for the utilities, services and accommodation arrangements to be completed prior to instrument delivery.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards,

RANGE STATEMENT	
	it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• Australian code of good manufacturing practice (GMP)
	• principles of good laboratory practice (GLP)
	• material safety data sheets (MSDS)
	• national measurement regulations and guidelines
	• enterprise procedures, standard operating procedures (SOPs) and operating manuals
	• quality manuals, equipment and procedure manuals
	• equipment startup, operation and shutdown procedures
	• calibration and maintenance schedules
	• cleaning, hygiene and personal hygiene requirements
	• data quality procedures
	• enterprise recording and reporting procedures
	• material, production and product specifications
	• production and laboratory schedules
	• quality system and continued improvement processes
	• safety requirements for equipment, materials

RANGE STATEMENT	
	or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures
Analytical instruments	Analytical instruments may include: • gas chromatographs, specialised sampling devices and detectors • liquid chromatographs, specialised sampling devices and detectors • inductively coupled plasma spectrometers ICP-AES/OES or ICP-MS • UV-VIS spectrophotometers and accessories • IR/FTIR spectrophotometers and accessories • fluorimeters • Raman spectrometers • atomic absorption spectrometers, specialised sampling devices (graphite furnace) and detectors • X-ray fluorescence (XRF) and diffraction (XRD) • electrometric instruments (e.g. anodic stripping voltammetry)
Specifications and features of instruments	Specifications and features of instruments may include: • suitability for analytes of interest and sample requirements • suitability for specific test methods • working/dynamic range, sensitivity and detection limits • response time • linearity and estimated uncertainty for each range • single or multi-species analysis • interfacing with data loggers and computers • power and battery requirements

RANGE STATEMENT	
	• size and weight • use under environmental conditions (thermal/ mechanical stress and magnetic/electrostatic fields) • use of consumables • generation of wastes • hazards • ease of use • run time and throughput of samples • purchase price and operating costs
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • flammable liquids and gases • fluids under pressure and sources of ignition • disturbance or interruption of services • toxic fumes • ionising (X-ray, neutron) non-ionising radiation (UV, radio frequency (RF) and laser)
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental	OHS and environmental management requirements:

RANGE STATEMENT	
management requirements	• all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

HLTPAT317A Operate effectively within a pathology testing environment

Modification History

Unit Descriptor

This unit of competency describes the skills and knowledge required by workers in a pathology laboratory who perform work that reflects an understanding of the structure and profile of the industry, the roles and relationships within and across the industry and key issues facing the industry

Application of the Unit

The application of knowledge and skills described in this competency unit relates to functions necessary for working within a Pathology laboratory

Work at this level may be undertaken independently or under guidance and/or supervision

Licensing/Regulatory Information

Pre-Requisites

Employability Skills Information

The required outcomes described in this unit of competency contain applicable facets of Employability Skills

The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements

Elements and Performance Criteria Pre-Content

Elements define the essential outcomes of a unit of competency.

The Performance Criteria specify the level of performance required to demonstrate achievement of the Element. Terms in italics are elaborated in the Range Statement.

Elements and Performance Criteria

Elements and Performance Criteria

Element	**Performance Criteria**

1	Demonstrate an understanding of the structure and profile of the pathology industry	1.1 Describe the organisation of the pathology industry
		1.2 Explain the relationships between the different occupations and **modes of practice** within pathology.
		1.3 Observe and describe the operation of a typical laboratory.
		1.4 Identify **current legislation** that impacts on pathology laboratories
2	Develop a knowledge of different sectors and roles within a pathology laboratory	2.1 Identify the roles and responsibilities of **different workers** within a pathology laboratory
		2.2 Identify the **role and responsibilities of pathology assistants** including when and from whom to seek advice
		2.3 Develop an understanding of the **different sections** within a pathology laboratory
3	Develop an understanding of **specimen** processing	3.1 Adopt **recommended safety precautions** when handling biologically hazardous specimens
		3.2 Follow organisation guidelines in the handling of **urgent samples**
		3.3 Follow organisation guidelines in the handling of **non-replaceable samples**
		3.4 Ensure sample labelling complies with organisation policies
		3.5 Store and transport pathology samples in line with **organisation policies and procedures** and legal and regulatory guidelines
		3.6 Perform **specimens** preparation or separation and storage according to test requirements
4	Document client information	4.1 Use accepted protocols to document information in line with organisation requirements
		4.2 Use appropriate terminology to document identified problems related to application specimen testing
		4.3 Ensure that confidentiality of client information is

		maintained.
5	Work within organisation policies and procedures	5.1 Access and follow organisation guidelines, policies and procedures
		5.2 Follow organisation administrative practices and procedures
		5.3 Access and follow legal and regulatory guidelines
		5.4 Document relevant information in accordance with organisation policies and procedures.

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit.

Essential knowledge:

Laboratory policy and procedure manual

OHS requirements

Infection control requirements

Medical terminology

Biohazard nature of specimens handled in the laboratory

Essential skills:

Ability to:

Comply with relevant policies, protocols, guidelines and procedures of the organisation

Effectively communicate with internal and external clients

Follow instructions

Use basic computer skills

Handle hazardous chemicals

Use time management strategies to set priorities

Demonstrate understanding of work lists and their role in preparation of samples for testing

Comply with organisation policies and procedures including those of OHS and infection control, and current standards

Use reading and writing skills-literacy competence required to fulfil job roles in a safe manner and as specified by the organisation. The level of skill required involves reading and documenting clinical information and understanding complex policy and procedure manuals.

Use oral communication skills-language competence required to fulfil job roles in a safe manner and as specified by the organisation. Assessors should look for skills in asking questions, providing clear information, listening to and understanding workplace instructions, and clarifying workplace instructions when necessary. Effective verbal and non verbal communication skills with a range of internal and external persons are essential. Organisation may require competence in English or a community language, depending on client group

Use numeracy skills ranging from the ability to complete basic arithmetic calculations, recording stock levels and statistical information

Use problem solving skills required including an ability to use available resources

Deal with conflict

Work with others within a team

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate this competency unit:	The assessee must provide evidence of specified essential knowledge as well as skills Observation of workplace performance is essential for assessment of this unit Consistency of performance should be demonstrated over the required range of situations relevant to the workplace Where, for reasons of safety, space, or access to equipment and resources, assessment takes place away from the workplace, the

	assessment environment should represent workplace conditions as closely as possible
Context of and specific resources for assessment:	Equipment Laboratory policy and procedure manual Occupational health and safety requirements Infection control manual
Method of assessment	Observation in the work place (if possible) Written assignments/projects or questioning should be used to assess knowledge Case study and scenario as a basis for discussion of issues and strategies to contribute to best practice. Clinical skills involving direct client care are to be assessed initially in a simulated clinical setting (laboratory). If successful, a second assessment is to be conducted during workplace application under direct supervision.
Access and equity considerations:	All workers in the health industry should be aware of access and equity issues in relation to their own area of work All workers should develop their ability to work in a culturally diverse environment In recognition of particular health issues facing Aboriginal and Torres Strait Islander communities, workers should be aware of cultural, historical and current issues impacting on health of Aboriginal and Torres Strait Islander people Assessors and trainers must take into account relevant access and equity issues, in particular relating to factors impacting on health of Aboriginal and/or Torres Strait Islander clients and communities

Range Statement

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Modes of practice may include:	Specimen reception Specimen set up Sample identification and processing as per organisation requirements Loading analysers
Current legislation may include	Relevant Commonwealth, State or Territory Acts and Regulations specific to Pathology Other relevant Acts and regulations including: OH&S Privacy Discrimination NATA and ISO accreditation
Workers within a pathology laboratory may include but is not limited to:	Pathologist Scientist Laboratory technician Pathology assistant Phlebotomist Ancillary staff

Roles and responsibilities of pathology assistants may include	Specimen reception Data entry Specimen separation and storage Sample Identification and confirmation Labelling of aliquots Preparing samples for processing Loading analysers Making stains Staining slides Cleaning instrumentation Temperature monitoring
Specimens may include:	Blood Cultures Urine Faeces Swabs Tissue samples Sputum Body fluids CSF pleural aspirates Slides Environmental samples (including water, food etc)
Different sections within a pathology laboratory include:	Haematology Transfusion (Blood Bank) Serology / immunology Chemical pathology Microbiology Anatomical pathology / cytology

	Cytogenetics
	Molecular genetics
Specimens preparation includes:	Centrifugation
	Aliquoting
Recommended safety precautions may include:	Wearing gown, gloves, recommended eye protection and mask (if indicated by protocol)
	Wearing enclosed foot wear
Urgent samples may include	Samples received from emergency, ICU, CCU, SCN, oncology or as indicated by requesting Doctor or collection area.
	Samples for tissue typing for organ transplantation
	CSF
	Blood gases,
	Ammonia levels
	Drug levels following an overdose
	Lactates
Non-replaceable samples may include:	Histology samples and slides
	Samples collected by invasive techniques (including CSF, aspirates)
	Swabs
	Specimens from a child under 2 years of age
Organisation policies and procedures may refer to::	Collection and documentation of client personal and clinical information
	Confidentiality of client information
	Preparation for specimen collection procedures

Performance of specimen collection procedures

Infection control

Occupational health and safety

Specimen preparation, labelling, storage and transport

Maintenance of specimen integrity

Documentation and recording keeping

Handling of waste

Cleaning and maintenance of equipment (centrifuges etc)

Monitoring temperatures of storage areas

Unit Sector(s)

HLTPAT419A Perform pathology tests

Modification History

Unit Descriptor

This unit of competency describes the skills and knowledge required by workers in pathology laboratories who perform duties that reflect an understanding of the structure and profile of the industry, the roles and relationships within and across the industry and key issues facing the industry.

Application of the Unit

The application of knowledge and skills described in this competency unit may relate to functions necessary for working within a pathology laboratory.

Work at this level may be undertaken independently or under guidance and/or supervision.

Licensing/Regulatory Information

Pre-Requisites

Employability Skills Information

The required outcomes described in this unit of competency contain applicable facets of Employability Skills

The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements

Elements and Performance Criteria Pre-Content

Elements define the essential outcomes of a unit of competency.

The Performance Criteria specify the level of performance required to demonstrate achievement of the Element. Terms in italics are elaborated in the Range Statement.

Elements and Performance Criteria

Elements and Performance Criteria

Element	Performance Criteria
1 Prepare to undertake basic	1.1 Ensure the specimen is appropriate for the test

	pathology tests	requested
		1.2 Prepare environment for undertaking tests
		1.3 Prepare **equipment, solutions and agar plates** and samples in accordance with organisation policies and procedures
		1.4 Use **personal protective equipment** in accordance with workplace health and safety policies
2	Perform handling or basic testing of samples	2.1 Accept or reject specimens based on identification, and specimen quality in accordance with **organisation policies and procedures**
		2.2 Identify **specimen additives** (anticoagulants etc) and select appropriate specimens based on additives
		2.3 Adopt **recommended safety precautions** when handling biologically hazardous specimens.
		2.4 Use **correct techniques to separate samples** for testing
		2.5 Use **recommended techniques** to prepare samples for testing
		2.6 Set up and complete **basic tests** and quality control procedures
		2.7 Prioritise specimen processing based on clinical history provided
		2.8 Take steps maximise test accuracy, validity and reliability
		2.9 Conduct a re-test if test or quality control results are unreliable
3	Document results	3.1 **Document test and control results** in recognised format.
		3.2 Recognise the importance of quality control
		3.3 Maintain confidentiality of client information
4	Maintain environment	4.1 Clean and store equipment in accordance with laboratory guidelines

4.2 Sterilise equipment as required

4.3 Dispose of contaminated waster in accordance with infection control protocols and legislative and regulatory requirements

4.4 Store chemicals in accordance with organisation policies and procedures

4.5 Clean and disinfect work area

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit.

Essential knowledge:

Knowledge of specimen additives (anticoagulants etc)

Knowledge of specimen acceptance and rejection criteria

Knowledge of laboratory precautions for handling biological materials

Knowledge of tests performed in a pathology laboratory

Knowledge of procedures involved in referral to another laboratory

Knowledge of the roles of professionals within the pathology industry

Knowledge of the relationships between the various occupations within the pathology industry

Knowledge of the different modes of practice including small and large laboratories

Knowledge of terminology used within a pathology laboratory

Knowledge of infection control with in a pathology laboratory

OHS requirements

Biohazard nature of specimens handled in the laboratory

Essential skills:

Ability to:

Use universal precautions when handling samples

Identify the range of pathology tests and their importance for client welfare

Identify, prioritise and prepare samples according to sample type and/or clinical data

Prepare specimens for analysis

Comply with relevant policies, protocols, guidelines and procedures of the organisation

Effectively communicate with internal and external clients

Follow instructions

Use basic computer skills

Handle of hazardous chemicals

Use time management strategies to set priorities

Perform basic tests within the scope of the laboratory (This may include point-of care or bed side testing of samples)

Recognise the need for performing and recording quality controls within the scope of the performed tests

Practise effective communication

Use reading and writing skills - literacy competence required to fulfil job roles in a safe manner and as specified by the organisation. The level of skill may range from the ability to understand symbols used in OHS signs, to reading workplace safety pamphlets or procedure manuals, to reading labels and handling chemicals. Literacy support available in the workplace may range from having access to support or assistance from expert/mentor/supervisor, to having no communication supports available. Literacy may be required in English or a community language.

Use oral communication skills and language competence required to fulfil job roles in a safe manner and as specified by the organisation. Assessors should look for skills in asking questions, providing clear information, listening to and understanding workplace instructions, and clarifying workplace instructions when necessary. Organisations may require competence in English or community language, depending on client group.

Use numeracy skills ranging from the ability to complete basic arithmetic calculations such as addition, subtraction, multiplication, division to recording numbers

Use problem solving skills required including ability to use available resources

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the

Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate this competency unit:	The assessee must provide evidence of specified essential knowledge as well as skills Observation of workplace performance is essential for assessment of this unit Consistency of performance should be demonstrated over the required range of situations relevant to the workplace Where, for reasons of safety, space, or access to equipment and resources, assessment takes place away from the workplace, the assessment environment should represent workplace conditions as closely as possible
Context of and specific resources for assessment:	Equipment Laboratory policy and procedure manual Occupational health and safety requirements Infection control manual
Method of assessment	Observation in the work place (if possible) Written assignments/projects or questioning should be used to assess knowledge Case study and scenario as a basis for discussion of issues and strategies to contribute to best practice Clinical skills involving direct client care are to be assessed initially in a simulated clinical setting (laboratory). If successful, a second assessment is to be conducted during workplace application under direct supervision
Access and equity considerations:	All workers in the health industry should be aware of access and equity issues in relation to their own area of work

All workers should develop their ability to work in a culturally diverse environment

In recognition of particular health issues facing Aboriginal and Torres Strait Islander communities, workers should be aware of cultural, historical and current issues impacting on health of Aboriginal and Torres Strait Islander people

Assessors and trainers must take into account relevant access and equity issues, in particular relating to factors impacting on health of Aboriginal and/or Torres Strait Islander clients and communities

Range Statement

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Equipment, **solutions**, **agar plates and samples may include**:

Analyser cartridges. Cassettes or strips

Analysers

Centrifuges

Pipettes

Pre-packaged test kits for direct antigen tests (eg RSV screens of NPA, HCG, IM or D-Dimer tests

Laboratory glassware

Stains

Solvents

Alcohol

	Specimens
Personal protective equipment may include but is not limited to:	Laboratory Gowns, Gloves, Eye protection Enclosed foot wear Masks if indicated by test protocol
Organisation policies and procedures includes"	Collection and documentation of client personal and clinical information Confidentiality of client information Preparation for specimen collection procedures Performance of specimen collection procedures Infection control Occupational health and safety Specimen preparation, labelling, storage and transport Maintenance of specimen integrity Documentation and recording keeping Handling of waste NATA and ISO accreditation
Specimen additives may include:	Acids Sodium Hydroxide Anticoagulants Preservatives including formalin Transport media
Recommended safety precautions include:	Washing hands Cleaning spills Cleaning and disinfection (using approved methods) of soiled areas Changing and discarding soiled gloves

	Using the correct methods to decant fluids from samples and equipment
	The consuming of food or beverages within a laboratory is prohibited as is smoking
Correct techniques to separate samples include:	Centrifugation
	Aspiration
	Pipetting
Recommended techniques include:	Pipetting
	Aliquoting
	Weighing of chemicals and samples
	Calculation of amount (volume or weight) of required additives
	Measuring pH (with litmus paper or meter)
	Reading test strip result
	Record test and QC results
Basic tests include	Specimen reception
	Direct antigen tests (HCG, RSVDGA, IM, D-Dimer)
	ESR
	pH urines
	Plating specimens in Microbiology
	Staining of slides
Document test and control results includes:	Record QC with results as per protocol
	Action to be taken if QC is unacceptable (and record any action taken)

Unit Sector(s)

MSAENV272B Participate in environmentally sustainable work practices

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This competency covers the outcomes required to effectively measure current resource use and carry out improvements including those reducing negative environmental impacts of work practices. This unit is based on the sustainability guideline standard GCSSUS01A Participate in environmentally sustainable work practices.

Application of the Unit

Application of the unit	This competency applies to operators/team members who are required to follow procedures so as to work in an environmentally sustainable manner. This ensures regulatory compliance and also aims at minimising environmental risks and maximises the environmental performance of the process and the organisation. It includes: • Resources used • Potential environmental hazards • Improving environmental performance (within scope of competency and authority). This competency applies to all sectors of the manufacturing industry and members of its value chain. It may also be applied to all sections of an organisation, including office, warehouse etc. This unit will need to be appropriately contextualised as it is applied across an

	organisation and across different industry sectors.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	This unit has **no** prerequisites	

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	**PERFORMANCE CRITERIA**
1. Identify current resource use and environmental issues.	1.1. Identify workplace ***environmental and resource efficiency issues***. 1.2. Identify resources used in own work role. 1.3. ***Measure*** and record current usage of resources using ***appropriate techniques***.

ELEMENT	PERFORMANCE CRITERIA
	1.4. Identify and report workplace environmental hazards to appropriate personnel.
2. Comply with environmental regulations.	2.1. Follow ***procedures*** to ensure ***compliance***. 2.2. Report environmental **incidents** to appropriate personnel.
3. Seek opportunities to improve environmental practices and resource efficiency.	3.1. Follow ***enterprise plans*** to improve environmental practices and resource efficiency. 3.2. Make ***suggestions*** for improvements to workplace practices in own work area.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include the ability to:

- report as required by procedures
- follow procedures and instructions and respond to change
- ask questions and seek clarifications relating to work requirements

Reading and writing is required in order to interpretrequired procedures and complete required workplace forms/reports.

Numeracy is required to interpret numeric workplace information, readings and measurements, handle data as required and complete numeric components of workplace forms/reports.

Required knowledge

Competency includes sufficient knowledge to:

- have a basic understanding of sustainability
- know the environmental hazards/risks, resource use and inefficiencies associated with own workplace (at an appropriate level)
- know the relevant environmental and resource efficiency systems and procedures for own work area
- know the impact of laws and regulations to a level relevant to the work context

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competence in this unit must be able to provide evidence of the ability to follow workplace procedures according to instructions given and to participate in the improvement of environmental and resource efficient work practices at own level of responsibility. Evidence must be strictly relevant to the particular workplace role.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability to: • identify and measure resources used in their job • identify situations likely to lead to an environmental incident • follow procedures related to environmental performance. Consistent performance should be demonstrated. For example, look to see that: • work is routinely to procedures • the minimum of resources is used consistent with the job requirements, good practice and the procedures.
Context of and specific resources for assessment	Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge. Depending on the selected methods of assessment access may be required to: • workplace procedures and plans • documentation in relation to production, waste, overheads, hazard control/management • reports from supervisors/managers • case study/scenarios
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed: • by demonstration in the workplace

EVIDENCE GUIDE	
	• using targeted questioning for appropriate portions • by use of a suitable simulation and/or a range of case studies/scenarios • by a combination of these techniques. In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or similar assessment.
Guidance information for assessment	Assessors need to be aware of any cultural issues that may affect responses to questions. Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Procedures	All operations are performed in accordance with procedures including all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Environmental and resource efficiency issues	Environmental and resource efficiency issues include minimisation of environmental risks and maximisation of opportunities to improve business environmental performance and to promote more efficient production and consumption of natural resources, for example by: • minimisation of waste, through implementation of the waste management hierarchy

RANGE STATEMENT	
	• efficient and effective use of energy and other resources • seeking alternative sources of energy • efficient use of materials and appropriate disposal of waste • use of controls to minimise the risk of environmental damage from hazardous substances • efficient water use • reducing emissions • life cycle analysis applied to issues such as energy supply, materials, transport, production
Measure	Measure should be interpreted in a manner consistent with the scope of the job and may include things like: • counting the number of items entering/leaving a work area • reading indicators in the work area • obtaining relevant information from support personnel • other simple means
Appropriate techniques	Appropriate techniques include: • material fed to/consumed by plant/equipment • plant meters and gauges • job cards including kanbans • examination of invoices from suppliers • measurements made under different conditions • examination of relevant information and data.
Compliance	Compliance includes meeting relevant federal, state and local government laws, by-laws, regulations and mandated codes of practice. It also includes any codes and standards that the enterprise applies voluntarily.
Incidents	Incidents include: • breaches or potential breaches of regulations • occurrences outside of standard procedure which may lead to lower environmental performance.
Enterprise plans	Enterprise plans include:

RANGE STATEMENT	
	• documented policies and procedures • work plans to minimise waste, increase efficiency of water/energy use, minimise environmental hazards
Suggestions	Suggestions include ideas that help to: • prevent and minimise environmental risks and maximise opportunities • reduce emissions of greenhouse gases • reduce use of non-renewable resources • improve energy efficiency • increase use of renewable, recyclable, reusable and recoverable resources • reduce waste • increasing the reusability/recyclability of wastes/products • reduce water usage and/or water wastage.

Unit Sector(s)

Unit sector	

Competency field

Competency field	Competitive manufacturing tools

Co-requisite units

Co-requisite units		

MSAENV472B Implement and monitor environmentally sustainable work practices

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This competency covers the outcomes required to effectively analyse the workplace in relation to environmentally sustainable work practices and to implement improvements and monitor their effectiveness. This unit is based on the sustainability guideline standard GCSSUS02A Implement and monitor environmentally sustainable work practices.

Application of the Unit

Application of the unit	This competency applies to those who have responsibility for a specific area of work or who lead a work group or team. It addresses the knowledge, processes and techniques necessary to implement and monitor environmentally sustainable work practices, including the development of processes and tools. It includes: • Identifying areas for improvement • Developing plans to make improvements • Implementing and monitoring improvements in environmental performance. This competency applies to all sectors of the manufacturing industry and members of its value chain. It may also be applied to all sections of an organisation, including office, warehouse etc. This unit will need to be appropriately contextualised as it is applied across an organisation and across different industry sectors.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	This unit has **no** prerequisites	

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Investigate current practices in relation to resource usage.	1.1 Identify environmental regulations applying to the enterprise. 1.2 Assess procedures for assessing ***compliance*** with environmental regulations. 1.3 Collect information on environmental and resource efficiency systems and procedures, and provide to the work group where appropriate. 1.4 Measure and record current resource usage by members of the work group.

ELEMENT	PERFORMANCE CRITERIA
	1.5 Analyse and record current purchasing strategies. 1.6 Analyse current work processes to access information and data and assist in identifying areas for improvement.
2. Set targets for improvements.	2.1 Seek input from stakeholders, key personnel and specialists. 2.2 Access external sources of information and data as required. 2.3 Evaluate alternative solutions to workplace environmental issues. 2.4 Set efficiency targets.
3. Implement performance improvement strategies.	3.1 Source ***techniques***/***tools*** to assist in achieving targets. 3.2 Apply continuous improvement strategies to own work area of responsibility and communicate ideas and possible solutions to the work group and management. 3.3 Integrate environmental and resource efficiency improvement plans for own work group with other operational activities and implement them. 3.4 Seek suggestions and ideas about environmental and resource efficiency management from stakeholders and act upon them where appropriate. 3.5 Implement costing strategies to fully value environmental assets.
4. Monitor performance.	4.1 Document outcomes and communicate reports on targets to key personnel and stakeholders. 4.2 Evaluate strategies. 4.3 Set new targets and investigate and apply new tools and strategies. 4.4 Promote successful strategies and reward participants where possible.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Required skills include:

REQUIRED SKILLS AND KNOWLEDGE
• using relevant environmental and resource efficiency systems, tools and procedures • applying quality assurance systems relevant to own work area • applying relevant supply chain procedures • measurement and calculation techniques • communication/consultation skills to ensure information is supplied to the work group Reading and writing is required to comprehend documentation and interpret environmental and energy efficiency requirements and to document and maintain records Numeracy is required to interpret numeric workplace information, readings and measurements, handle data as required and complete numeric components of workplace forms/reports.
Required knowledge
Required knowledge includes: • how to access and use relevant environmental and resource efficiency systems, tools and procedures • understanding of best practice approaches relevant to own area of responsibility • strategies to maximise opportunities and minimise impacts relevant to own work area • relevant environmental and resource efficiency issues specific to industry practices • methods for measuring and calculating resource usage

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competence in this unit must be able to provide evidence of the ability to implement and monitor integrated environmental and resource efficiency management policies and procedures within an organisation.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability to:

EVIDENCE GUIDE	
	• monitor and investigate current resource usage • develop plans to improve sustainability • implement environmental improvements. Consistent performance should be demonstrated. For example, look to see that: • environmental performance is routinely monitored and investigated • areas for improvements are followed through and the implemented changes are in turn monitored and investigated.
Context of and specific resources for assessment	This section should be read in conjunction with the range of variables for this unit of competency. Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required. Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed: • by demonstration in the workplace • using targeted questioning for appropriate portions • through use of specific project(s) • by use of a suitable simulation and/or a range of case studies/scenarios • by a combination of these techniques. In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or

EVIDENCE GUIDE	
	similar assessment.
Guidance information for assessment	Assessors need to be aware of any cultural issues that may affect responses to questions. Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Procedures	All operations are performed in accordance with procedures. Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.

Environmental and resource efficiency issues	Environmental and resource efficiency issues include:
	
	• addressing environmental and resource sustainability initiatives such as Environmental Management Systems, action plans, surveys and audits
	• reference to standards, guidelines and approaches such as:
	  • ISO 14001 Environmental Management Systems
	  • Life Cycle Analyses

RANGE STATEMENT	
	• Cradle to cradle • Global Reporting Initiative • Ecological footprinting • Triple Bottom Line reporting • Product Stewardship • determining enterprise's most appropriate waste treatment including waste to landfill, recycling, re-use and wastewater treatment • applying the waste management hierarchy in the workplace • initiating and/or maintaining appropriate enterprise procedures for operational energy consumption, including stationary energy and non stationary (transport) • efficient use of water • minimising greenhouse gas emissions • use of controls to minimise the risk of environmental damage from hazardous substances
Measure	Measuring techniques include: • material fed to/consumed by plant/equipment • plant meters and gauges • job cards including kanbans • examination of invoices from suppliers • measurements made under different conditions • examination of relevant information and data • others as appropriate to the specific industry contexts.
Techniques and tools	Techniques and tools may includeÂ : • visual workplace concepts • measurement, display and/or recording devices • changed work practices/procedures • competence development and awareness training • process and equipment items
Compliance	Compliance includes meeting relevant federal, state and local government laws, by-laws, regulations and codes of practice.
Incidents	Incidents include:

RANGE STATEMENT	
	• breaches or potential breaches of regulations • occurrences outside of standard procedure which may lead to lower environmental performance
Purchasing strategies	Purchasing strategies include: • influencing suppliers to take up environmental sustainability • selecting materials/components with a lower environmental profile.
Stakeholders, **key personnel and specialists**	Stakeholders, key personnel and specialists include individuals and groups both inside and outside the organisation that have some direct interest in the enterprise's conduct, actions, products and services, including: • employees at all levels of the organisation • customers • suppliers • other organisations • key personnel within the organisation, and specialists outside it who may have particular technical expertise
Suggestions	Suggestions includes ideas that help to: • prevent and minimise environmental risks and maximise opportunities • reduce emissions of greenhouse gases • reduce use of non-renewable resources • make more efficient use of energy, water and other resources • maximise opportunities to re use and recycle materials • identify strategies to offset or mitigate environmental impacts. e.g. purchasing of carbon credits • express purchasing power through the selection of suppliers with improved environmental performance. e.g. purchasing renewable energy and materials with lower embedded carbon • eliminate the use of hazardous and toxic materials increasing the reusability/recyclability of wastes/products.

Unit Sector(s)

Unit sector	

Competency field

Competency field	Competitive manufacturing tools

Co-requisite units

Co-requisite units		

MSAENV672B Develop workplace policy and procedures for environmental sustainability

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This competency covers the outcomes required to develop and implement a workplace sustainability policy, including the modification of the policy to suit changed circumstances. This unit is based on the sustainability guideline standard GCSSUS03A Develop workplace policy and procedures for sustainability.

Application of the Unit

Application of the unit	This competency applies to team leaders/supervisors/managers who are required to develop approaches to environmental sustainability within workplaces, including the development and implementation of policy. It includes: • Communicating with relevant stakeholders • Developing and monitoring sustainability policies • Reviewing and improving sustainability policies. This competency applies to all sectors of the manufacturing industry. It may also be applied to all sections of an organisation, including office, warehouse etc. This unit will need to be appropriately contextualised as it is applied across an organisation and across different industry sectors.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	This unit has **no** prerequisites	

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop workplace sustainability policy.	1.1 Define ***scope of sustainability policy***. 1.2 Identify and consult ***stakeholders*** as a key component of the policy development process. 1.3 Review environmental sustainability ***strategies*** relevant to all stages of work covered by the policy 1.4 Make recommendations for policy options based on likely effectiveness, timeframes and cost. 1.5 Develop policy is that reflects the organisation's commitment to sustainability as an integral part of the

ELEMENT	PERFORMANCE CRITERIA
	business planning and as a business opportunity. 1.6 Agree upon appropriate methods of implementation.
2. Communicate the policy.	2.1 Promote the policy, including its expected outcome to key stakeholders. 2.2 Inform those involved in implementing the policy as to outcomes expected, activities to be undertaken and responsibilities assigned.
3. Implement the policy.	3.1 Develop and communicate procedures to help implement the policy. 3.2 Implement ***strategies*** for continuous improvement in resource efficiency. 3.3 Establish record systems for tracking continuous improvements in sustainability approaches and assign responsibilities.
4. Review policy implementation	4.1 Record outcomes and provide feedback to key personnel and stakeholders. 4.2 Investigate success or otherwise of policy. 4.3 Monitor records to identify trends that may require remedial action, and use to promote continuous improvement of performance. 4.4 Modify policy and or ***procedures*** as required to ensure improvements are made.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- developing and implementing systems and procedures to aid in the achievement of sustainability in the workplace
- applying quality assurance systems relevant to own enterprise
- accessing and applying other relevant enterprise polices, procedures and protocols
- relevant industry competency
- interpreting business/strategic plans

This unit requires the ability to:

REQUIRED SKILLS AND KNOWLEDGE
• read and evaluate complex and formal documents such as policy and legislation • research, analyse and present information • prepare written reports requiring precision of expression and language and structures suited to the intended audience • adjust communication to suit different audiences • deal with different points of view and dissenting stakeholders.
Required knowledge
Required knowledge includes: • understanding of relevant policy development and implementation processes and practices • understanding of the principles, practices and available tools and techniques of sustainability management relevant to the particular industry context • best practice approaches relevant to own work area • equal employment opportunity, equity and diversity principles and occupational health and safety implications of policy/s being developed

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competence in this unit must be able to provide evidence of the ability to develop and implement integrated sustainability policies and procedures within an enterprise. The review of the policy after implementation will also need to be evidenced.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability to: • develop relevant policy and procedures that comply with the regulatory requirements and business plans • develop a workable implementation strategy • include measurable criteria for reviewing improvement. Consistent performance should be demonstrated. For

EVIDENCE GUIDE	
	example, look to see that: • policy implementation is reviewed • policy is developed to be become part of the routine practices of the organisation.
Context of and specific resources for assessment	This section should be read in conjunction with the range of variables for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required. Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
Method of assessment	Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge. A holistic approach should be taken to the assessment. Competence in this unit may be assessed: • by demonstration in the workplace • using targeted questioning for appropriate portions • through use of specific project(s) • by use of a suitable simulation and/or a range of case studies/scenarios • by a combination of these techniques. In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or similar assessment.
Guidance information for assessment	Assessors need to be aware of any cultural issues that may affect responses to questions. Assessment processes and techniques must be culturally

EVIDENCE GUIDE	
	appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Procedures	All operations are performed in accordance with procedures. Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.

Scope of sustainability policy	Scope of sustainability policy include:
	• The area/s of environmental sustainability to be targeted and whether social and economic sustainability will be incorporated
	• The parts of the enterprise to which it is to apply, including whether it is for the whole enterprise, one site, one work area or combinations of these
	• An investigation of the particular business and market context of the industry/ enterprise
	• Addressing sustainability initiatives through reference to standards, guidelines and approaches such as:
	  • ISO 14001 Environmental Management Systems
	  • Life Cycle Analyses

RANGE STATEMENT	
	• Cradle to grave/cradle to cradle • Global Reporting Initiative • Ecological Footprint Assessment • Triple Bottom Line reporting • Product Stewardship.
Stakeholders	Stakeholders include individuals and groups both inside and outside the organisation that have some direct interest in the enterprise's conduct, actions, products and services, including: • employees at all levels of the organisation • customers • suppliers • regulators • other organisations.
Strategies	Implementation strategies include: • awareness raising among stakeholders • training of staff in principles and techniques of sustainability • promotional activities. Continuous improvement strategies include ongoing measuring, improving and monitoring such as: • Plan, do, check, act cycles • Kaizen (continuous improvement) • Kaizen blitz (breakthrough improvement event) • Six sigma approaches Environmental sustainability strategies include: • reducing toxic material and hazardous chemical use • minimising resource use through changes in processes, facility design and management • supply chain and life cycle management approaches • sourcing renewable energy and low carbon footprint materials • reducing, re-using, recycling and waste

RANGE STATEMENT	
	reduction • product and process improvements • carbon offsets • reducing greenhouse gas and other emissions

Unit Sector(s)

Unit sector	

Competency field

Competency field	Competitive manufacturing tools

Co-requisite units

Co-requisite units		

TAADEL301C Provide training through instruction and demonstration of work skills

Modification History

Not applicable.

Unit Descriptor

This unit specifies the competency required to conduct individual and group instruction and demonstration of work skills.

Application of the Unit

Demonstration of work skills is typically provided by experienced workers or supervisors in the workplace. The focus of this instruction is usually on specific learner and organisation requirements, including workplace induction, learning how to operate new equipment and processes, developing new skills at work, improving efficiency and effectiveness, and meeting safety procedures. A range of delivery techniques should be used to enhance the experience for the learner.

This unit covers the skills required to provide instruction and demonstration of work skills using existing learning resources, in a safe and comfortable learning environment, and to determine the success of both the training provided and personal training performance.

The unit addresses the skills and knowledge required to organise and conduct the instruction and demonstration through a planned approach. It emphasises the training as being driven by the work process and context.

The training may be delivered to achieve competency standards/ units of competency prescribed by a Training Package, or may be delivered to meet organisational requirements.

Skills and knowledge relating to assessment are not covered in this unit. This is addressed in relevant units from the Assessment field of the **TAA04 Training and Assessment Training Package**.

This unit is not equivalent to **TAADEL401B Plan and organise group based delivery** and/or **TAADEL402B Facilitate group based learning** and cannot be assessed in place of either of these units.

This unit has been developed to support a wide range of applications across any workplace setting and therefore can be used by any organisation.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where **bold italicised** text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

Elements and Performance Criteria

Element	Performance Criteria
1 **Organise instruction and demonstration**	1.1 **Information about learner characteristics** and their learning needs is gathered
	1.2 A **safe learning environment** is confirmed
	1.3 **Instruction and demonstration objectives** are gathered and checked and assistance is sought if required
	1.4 Relevant **learning resources** and **learning materials** are accessed and reviewed for suitability and relevance and assistance sought to interpret the contextual application
	1.5 Access to necessary equipment or physical resources required for instruction and demonstration is organised
	1.6 Learners are engaged in the selection of the **delivery techniques** to be used
	1.7 Learners are notified of **details** regarding the implementation of the **learning program** and/or **delivery plan**

2	**Conduct instruction and demonstration**	2.1 **Interpersonal skills** are used to establish a safe and comfortable learning environment
		2.2 The **learning program** and/or **delivery plan** is followed to ensure all learning objectives are covered
		2.3 Learners are briefed on any **occupational health and safety (OHS) procedures** and requirements prior to and during training
		2.4 **Delivery techniques** are used to structure, pace and enhance learning
		2.5 **Coaching** techniques are applied to assist learning
		2.6 **Communication skills** are used to provide information, instruct learners and demonstrate relevant work skills
		2.7 Opportunities for practice are provided during instruction and through work activities
		2.8 Feedback on learner performance is provided and discussed to support learning
3	**Check training performance**	3.1 **Measures** are used to ensure learners are acquiring and can use new technical/generic skills and knowledge
		3.2 Learner progress and outcomes are monitored in consultation with the learner
		3.3 The relationship between the trainer/coach and the learner is reviewed and adjusted to suit the needs of the learner
4	**Review personal training performance and finalise documentation**	4.1 Personal performance in providing instruction and demonstration is **reflected** upon and strategies for improvement are developed.
		4.2 Learner records are maintained, stored and secured in accordance with legal/organisational requirements

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

verbal and non-verbal communication techniques, for example:
ask relevant and appropriate questions
provide explanations
organise and give demonstrations
use listening skills
provide information clearly
engage, motivate and connect with learners
provide constructive feedback
implement OHS requirements, by acting and responding safely in order to:
identify hazards
conduct pre-start up checks if required
observe and interpret learner behaviour which may put people at risk
time management, for example:
ensure all learning objectives are covered
pace learning
reflection skills in order to:
identify areas for improvement
maintain personal skill development
literacy skills to:
complete and maintain documentation
read and follow learning program/plan
read and analyse learner information
skills to operate audio-visual and technical equipment

interpersonal skills to:
maintain appropriate relationships
establish trust
use appropriate body language
maintain humour

demonstrate tolerance
manage a group
observation skills to:
monitor learner acquisition of new skills/knowledge/competency requirements
assess learner communication and interaction skills with others
identify learner concerns
recognise learner readiness to take on new skills/tasks
recognising and being sensitive to individual difference and diversity, for example:
being sensitive to and valuing culture
acting without bias/discrimination
responding to individuals with particular needs
recognising the importance of religion
using equipment for demonstration

Required knowledge

learner characteristics and needs
content and requirements of the relevant learning program and/or delivery plan
sources and availability of relevant learning resources and learning materials
content of learning resources/learning materials
training techniques which enhance learning and when to use them, e.g. using:
instruction and explanation
questioning
practice
written information
group/pair/team activities
individual activities
coaching skills
demonstration
learning principles (introductory), for example:
learning and experience are connected for meaning
adults need to know why they are learning
adults can self-evaluate
adults learn in different ways
different learning styles, (introductory), for example:

visual

audio

theoretical

activist

reflective

OHS, for example:

roles and responsibilities of key personnel in learning environment

responsibilities of learners learning environment

relevant policies and procedures including hazard identification, risk assessment, reporting requirements, safe use of equipment and emergency procedures

hazard identification and risk controls for the specific learning environment

organisational policies, systems of operation relevant to specific area of training, e.g. job roles, industrial relations requirements

Evidence Guide

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency	Evidence of the following is essential: a minimum of three training sessions involving demonstrating and instructing of particular work skills for different groups. Each session must address different learning objectives, a range of techniques and effective communication skills appropriate to the audience
Context of and specific resources for assessment	Assessment must ensure: access to an actual workplace whenever possible. Where no workplace is available, a simulated workplace must be provided assessment must be conducted at different points in time and, in a learning and assessment pathway, these must be separated by further learning and practice

Resources required include:

the necessary materials for instruction/demonstration

access to required technology for instruction/ demonstration

developed learning activities

Method of assessment

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate

analysis of responses to case studies and scenarios

analysis of responses for identifying processes for checking learning achievement

learner evaluations

analysis of responses for selecting learning techniques

peer evaluations

analysis of responses to the provision of practice opportunities for learners

questioning (oral or written)

analysis of responses to reasons for selecting learning resources and their organisation

review of testimony from team members, colleagues, supervisors or managers

tests of knowledge on sources of workplace diversity

video/observation of a demonstration/instruction

This unit can be assessed alone or as part of an holisitc assessment activity involving relevant units in the **TAA04 Training and Assessment Training Package** or any other Training Package. Suggested units include but are not limited to:

	TAADEL403B Facilitate individual learning.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. **Bold italicised** wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Information about learner characteristicsmay include:	language, literacy and numeracy levels learning styles past learning and work experiences specific needs workplace culture
Safe learning environmentmay include:	exit requirements personal protective equipment, if needed safe access use of equipment
Instruction and demonstration objectivesmay relate to:	competencies to be achieved generic and/or technical skills and may be: provided by the organisation developed by a colleague individual/group objectives learning outcomes
Learning resourcesmay be:	CDs and audio tapes commercially available support materials for Training Packages/courses competency standards as a learning resource learning resources and learning materials developed under the Workplace English Language and Literacy (WELL) program learning resources produced in languages

	other than English as appropriate to learner group and workplace manuals
	organisational learning resources
	record/log books
	references and texts
	Training Package noted support materials, such as:
	learner/user guides
	trainer/facilitator guides
	how to organise training guides
	example training programs
	specific case studies
	professional development materials
	assessment materials
	videos
Learning materialsmay include:	handouts for learners
	materials sourced from the workplace, e.g. workplace documentation, operating procedures, specifications
	prepared activity sheets
	prepared case studies
	prepared presentations and overheads
	prepared research tasks
	prepared role-plays
	prepared scenarios, projects, assignments
	prepared task sheets
	prepared topic/unit/subject information sheets
	worksheets
	workbooks
Delivery techniquesmay include:	case studies
	coaching
	demonstrations

	discovery activities explanations group/pair work problem solving providing opportunities to practise skills question and answer
Detailsmay include:	location outcomes of instruction/demonstration reason for instruction/demonstration who will be attending time of instruction/demonstration
Thelearning programincludes:	an overview of the content to be covered in each chunk/segment of the learning program assessment methods and tools to be used to collect evidence of competency, where assessment is required competencies or other criteria to be achieved delivery methods for each segment of the learning program identification of assessment points to measure learner progress learning resources, learning materials and activities for each chunk/segment of the learning program number and duration of training sessions/classes required and overall timelines OHS issues to be addressed in delivery specific learning outcomes derived from the criteria for each chunk or segment of the learning program
Thedelivery planis used by the trainer/facilitator to guide and manage delivery to a group and may include:	content of sessions as specified in the session plans individual/group learning objectives or outcomes for the segment of the learning program to be addressed identify delivery techniques to be used to

	cater for a range of learning styles
	learning resources, learning materials and learning activities to be used in sessions
	number of learners and their specific support requirements
	other resource requirements
	OHS considerations, including:
	incident or hazard reporting
	emergency procedures
	timelines/duration of activities within sessions
Interpersonal skillsmay include:	actively listening
	adjusting personal language to suit others' requirements
	communicating clearly and effectively
	engaging and motivating learners
	maintaining appropriate body language
	responding to learners appropriately and individually
Occupational health and safety (**OHS**) **proceduresmay include**:	emergency procedures
	hazards and their means of control
	incident reporting
	use of personal protective equipment
	safe working practices
	safety briefing
	site-specific safety rules
Coachingmay encompass:	acquisition of specific job skills and knowledge
	action learning arrangements
	less formal learning arrangements requiring immediate interaction and feedback
	on-the-job instruction and 'buddy' systems
	relationships targeting enhanced performance
	short-term learning arrangements

	working on a one-one basis
Communication skillsmay include:	asking clear and probing questions communicating with learners in the learning environment and training context providing constructive feedback providing explanations providing information coherently and clearly using legible writing
Measuresto ensure learners are acquiring new skills and knowledge may include:	informal review or discussion learner surveys on-the-job observation peer coaching systems questioning
Personal performance may bereflectedupon by:	critical questioning of personal performance discussions with other trainers/facilitators learner evaluations peer assessment or feedback personal reflection video recording of session

Unit Sector(s)

Not applicable.

Competency Field

Delivery and Facilitation