Manufacturing Learning Australia

PML04
Laboratory Operations Training Package

Part 2 — Competency standards

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PMLDATA200A Record and present data

UNIT DESCRIPTOR

This unit of competency covers the ability to record and store data, perform basic calculations of scientific quantities and present information in tables and graphs. The unit requires personnel to solve predictable problems using clear information or known solutions. Where alternatives exist, they are limited or apparent.

This unit of competency is based on, but is not equivalent to, the unit *PMLDATA300A Process and record data* in PML99.

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 statistical values of given data, including mean, median, mode and standard deviation
	2.2 Calculate scientific quantities using given formulae and data
	2.3 Ensure calculated quantities are consistent with estimations and expectations
	2.4 Report all calculated quantities with appropriate precision and units

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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 data	4.1	File and store data in accordance with enterprise procedures
		4.2	Maintain enterprise confidentiality standards.

RANGE STATEMENT

The range of variables (Range Statement) relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Data may be recorded on worksheets or entered into spreadsheets or databases linked to information management systems. Data includes the results of:

- observations
- tests and measurements
- surveys.

Data may be presented in the form of:

- graphs
- tables
- control charts.

Data could also take the form of semi-quantitative observations and be expressed on a scale (for example, 1 to 4 or + to ++++).

Calculations may be performed with or without a calculator or computer software. For example, calculated scientific quantities could include:

- percentages, fractions, decimals
- conversions between SI units
- areas (m^2) and volumes (mL, L, m^3) of regular shapes (for example, packaging, 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/μL, dilution mL/L)

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- average count, colonies per swab surface, cell counts (live and dead/total)
- process variables, such as, pressure, velocity, flow rates
- % content of moisture, ash, fat, protein, alcohol, sulphur dioxide, 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 could include:

- maximum, minimum values
- spread of data
- increasing/decreasing data, rate of change
- outliers, data beyond control limits or normal range.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- codes, records and checks data accurately
- calculates scientific quantities relevant to their work and presents accurate results in the required format
- recognises obvious trends in data
- maintains the confidentiality of data in accordance with workplace and regulatory requirements.

Underpinning knowledge

Competency includes the ability to apply and explain:

- procedures for coding, entering, storing, retrieving and communicating data
- procedures for verifying data and rectifying mistakes
- procedures for maintaining and filing records, security of data
- relevant scientific and technical terminology, such as: precision, accuracy, units, 'out of control'.

Competency also includes the ability to perform calculations involving:

- decimals, ratios, proportions and percent
- calculation of perimeters, areas, volumes, angles
- calculation of scientific quantities, such as concentration
- unit conversion, multiples and submultiples
- use of significant figures, rounding off, estimation, approximation
- substitution of data in formulae
- preparation and interpretation of straightforward process control charts.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment. The following assessment methods are suggested:

- review of data work sheets, 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit may be assessed with technical units, such as:

- *PMLTEST300B Perform basic tests*
- *PMLTEST308A Perform microscopic examination*

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- *PMLTEST303B Prepare working solutions.*

Resource implications

Resources may include:

- data sets and records
- computer and relevant software or laboratory information system
- relevant enterprise procedures.

This competency in practice

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 Laboratory Information Management System (LIMS) 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLORG200A Work within a laboratory/field workplace (induction)

UNIT DESCRIPTOR

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

This unit of competency has no prerequisites.

This unit of competency is applicable to personnel 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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		3.5	Follow work instructions to perform 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 is 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

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.

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Enterprise sites may include:

- laboratories
- head office functions
- production or processing plants
- supplier services and consultancy services.

Key functions may include:

- production
- packaging, warehouse and distribution
- quality assurance
- purchasing, sales and marketing
- human resources (personnel, training, employee relations).

Sources of workplace information could include:

- notice boards, public address or paging systems
- standard operating procedures (SOPs), manuals, work instructions, signs and notices
- material safety data sheets (MSDSs)
- telephone or contract details, email systems, websites
- emergency exits, routes and collection points.

Workplace agreements, policies and procedures could include:

- industrial awards, enterprise bargaining agreements and individual contracts
- emergencies, accidents and incidents
- health, safety and environment
- quality assurance, good laboratory practice (GLP), good manufacturing practice (GMP)
- customer services.

Legislative requirements could involve:

- occupational health and safety
- workers compensation
- equal employment, anti-discrimination, anti-harassment
- ethics, copy right, intellectual property, privacy
- environmental protection.

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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 feasible
- minimising waste.

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 will vary according to the scope and nature of the enterprise's products, and scientific/technical functions and services.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- uses personal protective clothing, equipment (PPE) and containment facilities as required
- follows work instructions to complete tasks within the required timeframe
- works ethically
- works efficiently when alone and with others
- complies with legislative and enterprise requirements in everyday work
- maintains the required quality of work outputs.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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, 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- observation of candidate performing a range of scientific/technical tasks
- feedback from peers and supervisors

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA200A Record and present data*
- *PMLSAMP200A Collect routine site samples*
- *PMLTEST200A Conduct routine site measurements.*

Resource implications

Resources may include:

- relevant documentation, such as enterprise SOPs, legal/regulatory requirements, Codes of Practice
- organisational charts, flow diagrams showing links between enterprise functions and/or production processes
- employment, training and career information.

This competency in practice

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 2, 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 3, they begin bench work by helping to conduct routine tests, such as titrations of 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

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- 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 workplan in conjunction with the supervisor.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLSAMP200A Collect routine site samples

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.

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 point(s) 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
		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

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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

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Samplers usually have access to information, such as:

- enterprise sampling procedures for specific samples, sites and clients
- maps, site plans
- material safety data sheets (MSDSs) and safety procedures
- enterprise recording and reporting procedures.

Site hazards may include:

- solar radiation, dust and noise
- wildlife, such as snakes, spiders, domestic animals
- biohazards, such as micro-organisms and agents associated with soil, air, water
- chemicals, such as acids and hydrocarbons
- sharps, broken glassware
- manual/handling of heavy sample bags and containers
- crushing, entanglement, cuts associated with moving machinery and hand tools
- falling objects, uneven surfaces, heights, slopes, wet surfaces, trenches, confined spaces
- vehicle handling in rough terrain, boat handling in rough or flowing water

Safety procedures may include:

- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as hard hats, heavy protection, gloves, safety glasses, goggles, faceguards, coveralls, gown, body suits, respirators, safety boots

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- 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 decontamination of equipment
- machinery guards
- signage, barriers, service isolation tags, traffic control, flashing lights
- lockout and tagout procedures

Types of samples may include:

- grab samples
- disturbed or undisturbed materials
- composite samples, such as time, flow proportioned, horizontal/vertical cross section
- quality control samples, such as controls, background, duplicate, blanks.

Materials sampled may include:

- gas or air samples
- water, wastewater, stormwater, sewage, sludges
- soils
- construction materials
- solid wastes, such as commercial, industrial, mining
- raw materials, start-, middle-, end- of production run samples, final products for a wide range of manufactured items, including food and beverages
- hazardous materials and/or dangerous goods

Sampling tools and equipment may include but are not limited to:

- front-end loader, backhoe, excavator, drill rig
- shovels, augers, bucket
- sampling frames, sampling tubes, dip tubes, spears, flexible bladders, syringes
- access valves
- sample thief
- weighted sample bottles, bottles, plastic/metal containers and disposable buckets
- sterile containers, pipettes, inoculating loops, disposable spoons

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- pumps, stainless steel bailers

Maintenance of integrity of samples could include:

- appropriate containers and lids (for example, glass, plastic, amber, opaque)
- sealing of sample containers
- purging of sample lines and bores
- decontamination of sampling tools between collection of consecutive samples
- use of appropriate preservatives (for example, 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 may include:

- water supply, gas, electricity
- telecommunications
- irrigation, stormwater, drainage systems
- production plant.

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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent

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conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- closely follows sampling procedures when collecting a variety of samples at a range of sites
- collects samples safely with minimal environmental impact
- maintains the integrity and security of samples
- demonstrates enterprise and/or legal traceability requirements
- liaises with others to access sites and conduct sampling efficiently
- recognises limitations and seeks timely advice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- key terminology and concepts, such as: sample, contamination, traceability, integrity, chain of custody
- 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.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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
- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLTEST200A Conduct routine site measurements.*

Resource implications

Resources may include:

- variety of sample types
- sampling procedures
- a selection of sampling containers, equipment and documentation.

This competency in practice

Construction materials

A laboratory assistant takes daily tar samples from the 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

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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 mouth, to prevent ingestion while they use a small purpose-built shovel to empty the contents into the sample container.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLSAMP201A Handle and transport samples or equipment

UNIT DESCRIPTOR

This unit of competency covers the ability to pick up and transport samples or test/calibration equipment in accordance with enterprise procedures designed to ensure the integrity of subsequent test results. The person transporting the items is not necessarily responsible for sampling or testing. This unit does not cover the ability to handle and transport animals as might be defined under prevailing animal care and ethics legislation and practices.

This unit of competency is based on, and equivalent to, the unit *PMLSAMP300A Handle and transport samples* in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to couriers and laboratory and field 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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		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 requirement
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the pickup and transport of samples and/or test/calibration equipment. The unit also describes skills and knowledge required of a courier who may or may not collect samples. Sample collection is covered in other units of competency.

The worker would have access to:

- enterprise protocols regarding customer liaison and communication
- vehicle log books
- protocols for use of pagers, mobile telephones and two-way radios
- material safety data sheets (MSDSs)

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- precautions for safe handling and handling of specific materials (for example, toxic, infective, radioactive, 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 could involve:

- use of appropriate sample containers (glass, plastic, 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, waterproof)
- restraint of containers to prevent movement
- checking sample viability during transport while avoiding unnecessary handling

Hazards may include:

- biohazards, such as micro-organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals, such as acids and hydrocarbons
- sharps, broken glassware
- manual handling of heavy sample bags and containers and equipment

Safety practices may include:

- use of material safety data sheets (MSDSs)
- use personal protective equipment, such as gloves, safety glasses, goggles, 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, enterprise procedures and regulations
- regular cleaning and/or decontaminating of equipment and vehicle

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Where a laboratory routinely posts or couriers samples or equipment for testing, the International Air Transport Association (IATA) Dangerous Goods Regulations and Australia Post Regulations must be met.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- plans the picking up of items in conjunction with a supervisor
- prepares the vehicle for the required journey
- checks communication devices so contact is possible between the courier, reception centre, and routine pickup locations (as necessary)
- deals with individuals, customers, clients and reception staff effectively and courteously
- records details of item exchange in relevant sections of chain of custody forms (as required)
- maintains the integrity of collected samples or equipment during transport
- contains and cleans up spillage or breakages
- uses appropriate techniques and equipment to safely dispose of waste materials
- maintains confidentiality in all aspects of work
- reports problems, accidents or incidents in accordance with enterprise procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

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- 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, shock on samples
- procedures for the containment and cleanup of spillages and breakages
- need for efficient waste containment and disposal practices
- need for maintenance of equipment used in the processes of handling and transporting samples.
- relevant health, safety and environment requirements.

Knowledge is also required of:

- enterprise procedures for responding to emergencies
- contact details for key personnel.

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example, for biomedical samples:

- labile nature of biological and environmental samples
- possible infectivity of biological materials
- possible effects of exposure to radioactive materials.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment. 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.

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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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS302A Participate in laboratory/field workplace safety.*

Resource implications

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.

This competency in practice

Calibration

Calibration laboratories must take special care to ensure that they do not damage test equipment during the 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 pickup and handling/storage conditions

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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

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

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 be hazardous the technician assembles a full set of safety equipment. They also locate a laptop computer with Material Safety Data Sheet (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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLTEST200A Conduct routine site measurements

UNIT DESCRIPTOR

This unit of competency covers the ability to make direct measurements using enterprise procedures and equipment calibrated by others. Measurements will be straightforward and involve a minimal number of steps, take a short time and have easily recognised control limits.

This unit of competency has no prerequisites.

This unit of competency is applicable to production operators, field assistants and laboratory assistants in manufacturing, construction materials and environmental services.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Prepare for measurement(s)	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

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2.	Perform measurement(s)	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 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

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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

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel usually have access to information, such as:

- enterprise procedures for specific client measurements at particular sites
- maps and site plans
- material safety data sheets (MSDS) and safety procedures
- enterprise recording and reporting procedures.

Hazards may include:

- solar radiation, dust and noise
- wildlife, such as snakes, spiders, domestic animals
- biohazards, such as micro-organisms and agents associated with soil, air, water
- chemicals, such as acids and hydrocarbons
- manual/handling of heavy equipment or materials
- crushing, entanglement, cuts associated with moving machinery
- falling objects, uneven surfaces, heights, slopes, wet surfaces, trenches, confined spaces
- vehicle handling in rough terrain, boat handling in rough or flowing water
- vehicular or pedestrian traffic

Safety practices may include:

- use of material safety data sheets (MSDSs)
- use personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face-guards, coveralls, gown, body suits, respirators, safety boots

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- 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 tagout procedures

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 could include:

- sound (for example, dB level, dBA)
- light levels, illumination
- basic production/process parameters (for example, flow, temperature, pressure, mass, depth)
- simple surveys (for example, number of trees in quadrant)
- background radiation (for example, Geiger counter)
- dimensions
- meteorological measurements (for example, temperature, rainfall, wind)

Common measuring equipment could include:

- tape measure, rulers, micrometers calipers, water level indicators
- balances
- meter/probe systems (for example, dissolved oxygen (DO), electrical conductivity (EC))
- analogue and digital meters (for example, voltage, current, resistance, pressure, temperature, barometers, anemometers, hygrometers)
- dipsticks or spot test kits
- clocks, timing devices.

Services may include:

- water supply, gas, electricity

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- telecommunications
- irrigation, stormwater, drainage, sewerage systems
- production plant.

Appropriate corrective actions may include:

- logical check of equipment set-up
- check of calibration, zero error, drift for basic instruments
- careful re-reading of procedures
- repeat measurements
- seek advice.

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 and contaminants.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- closely follows procedures when performing a variety of measurements at a range of sites

- performs measurements with minimal environmental impact
- reads scales/displays accurately for a wide range of values
- records data legibly, free of errors and with appropriate accuracy, precision and units
- demonstrates enterprise and/or legal traceability requirements
- liaises with others to access sites and perform measurements efficiently
- recognises limitations and seeks timely advice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- key terminology and concepts, such as: analogue, digital, accuracy, precision, traceability, uncertainty and chain of custody
- purpose of the measurements
- 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, clean-up, spillage
  - handling, transport and storage of dangerous goods
- relevant health, safety and environmental requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of the quality of data and documentation provided by candidates
- 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. Questioning techniques should suit the language and literacy levels of the candidate.

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Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLSAMP200A Collect routine site samples.*

Resource implications

Resources may include:

- access to a variety of sites
- measurement and safety procedures
- a selection of measuring equipment and documentation.

This competency in practice

Manufacturing and construction materials

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 (for example, valves, 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLCOM300B Communicate with other people

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to personnel in all industry sectors covered by this Training Package.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 resolution

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if beyond own area of responsibility

4.5 Complete all workplace documents legibly and accurately in accordance with enterprise procedures.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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 and documentation could include:

- enterprise procedures that deal with:

– anti-discrimination, equal opportunity and anti-harassment legislative requirements

– legislative requirements (for example, Therapeutic Goods Act) and Codes of Practice (for example, good manufacturing practice (GMP) and Food Standards Code Australia, New Zealand)

– customer service, telephone protocols

– technical tasks

- information directories for staff access, (personnel, telephone), online databases, CD ROMS

- workplace documents, such as:

– standard operating procedures (SOPs), laboratory methods

– job (batch) cards and job descriptions

– equipment manuals, service logs

– induction manuals

– supplier catalogues

– (daily) production schedules

– laboratory schedules

– calibration and maintenance schedules

– guide to relevant Acts and regulations (for example, Food Standards Code)

– material safety data sheets (MSDSs)

– non compliance reports

– quality manuals

– time sheets, logbooks

– product specifications

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- text procedures
- shift handover reports
- pick lists
- HACCP procedures

- libraries
- information which uses:
  - common scientific and technical terminology
  - symbols, charts, signs, written text, tables, graphs and calculations.

Communication may include interactions with:

- supervisors and managers
- other laboratory and production personnel
- members of the public, customers and clients.

Items of equipment may include:

- telephone, two-way radio, PA system, fax, computer (email)
- direct display readouts
- on-line information systems.

Interpersonal communication includes:

- active listening
- including others
- effective questioning
- tolerating the view of others, attempting to reduce conflict and to negotiate suitable outcomes.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- communicates effectively with people at different organisational levels and from diverse cultural backgrounds
- uses available communication equipment (for example, telephone, on-line and hard copy directories, email, fax, intranet and Internet)
- listens attentively and clarifies messages and instructions to confirm their meaning
- locates relevant sources of information
- provides accurate information in an effective and timely manner
- understands colloquial, scientific and technical terminology appropriate to their expected level of knowledge and their workplace
- completes relevant workplace documents legibly and accurately
- responds to calls and messages within accepted enterprise timelines
- promotes cooperation through personal interactions.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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, anti-harassment requirements
- communication protocols and the completion of workplace documentation
- relevant health, safety and environment requirements.

Knowledge is also required of the:

- products and services provided by the enterprise
- layout of the enterprise and laboratory
- role of laboratory services to the enterprise and customers

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- organisational structure.

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Manufacturing, Food Processing and construction materials

- instructions to production staff when altering production mixes as a result of laboratory analysis.

Biomedical

- 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).

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLQUAL300B Contribute to the achievement of quality objectives.*

Resource implications

Resources may include:

- enterprise procedures and documents
- equipment, such as telephone, fax and computer (email)

This competency in practice

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.

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

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

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Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLMAIN300B Maintain the laboratory fit for purpose

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to personnel in all industry sectors covered by this Training Package.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Clean work preparation areas	1.1 Clean preparation areas using appropriate cleaning agents and 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
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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel work in accordance with work instructions and standard operating procedures which incorporate all relevant aspects of OHS legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods.

OHS legislation is state and territory based and includes general OHS Act and hazard specific regulations and Codes of Practice especially those relating to environmental hazards and dangerous goods.

Industry standards, codes and guidelines may include:

- AS 2243 Safety in laboratories Parts 1–10
- AS 2982 Hand washing facilities
- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 1678 Emergency procedures guide for hazardous materials
- AS 2500 Storage of goods
- AS 2503 Safety storage and handling of information cards
- AS 1940 Storage and handling of flammable and combustible liquids
- AS 3780 Storage and handling or corrosive liquids
- AS 4452 Storage and handling of toxic substances
- AS4332 Storage and handling of gases in cylinders

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- AS 4187 Code of Practice for cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment and maintenance of associated environments in health care facilities
- standards for the segregation of wastes, such as AS 2243.3 and AS 2243.4
- AS/NEC/ISO 14000
- confined space legislation
- Australian Dangerous Goods Code
- Australian Code for Transport of Dangerous Goods
- guidelines for the operation of classes of laboratories
- Australian Quarantine Inspection Service guidelines for the importation of biological products
- National Code of Practice for the labelling of workplace substances (NOHSC: 2012)
- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms.

This unit of competency forms a major part of the work of laboratory assistants. Equipment, material, procedures and facilities will vary according to the scope and classification of the laboratory. Typical equipment could include:

- animal cages
- autoclaves
- balances
- blenders, centrifuges and separating equipment
- cell counters, staining machines
- dishwashers, refrigerators, freezers, ovens, microwave ovens, incubators, water baths
- fume hoods, biohazard containers, biological safety cabinets
- gas cylinders
- glassware (burettes, pipettes); plastic ware; glass, plastic, quartz cuvettes
- hotplates, mantles, burners, muffle furnaces
- light and fluorescence microscopes
- microtomes, tissue processors
- thermometers, thermohygrographs, instrument chart recorders, hydrometers, pH meters and ion selective electrodes

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- ultrasonic cleaners.

Typical materials could include:

- consumable items, such as syringes, pipette tips, weigh boats
- disposable clothing and PPE
- distilled water, reagents, chemicals, disinfectants, detergents, agar media and plates
- equipment spares, such as fuses, bulbs, batteries
- oils/lubricants, fuels, industrial gases, cryogenics, such as dry ice and liquid nitrogen
- paper, stationery
- reference samples and standards.

All maintenance activities, such as cleaning, storing, prevention of contamination are carried out according to established enterprise procedures. Cleaning requirements will vary with the scope of the laboratory and may include:

- decontamination and/or disinfection
- hygiene monitoring
- operation of automatic cleaning apparatus, such as pipette washer, ultrasonic cleaners, dishwashers
- sterilisation and disposal of wastes using: boiling, high pressure air or steam, microwaves, chemicals, gas, filtration, ultraviolet radiation, autoclaving
- use of specialised techniques, such as chromic acid baths, soaking in hypochlorite.

Preparation areas include benches, sinks and fume cupboards.

Agents for cleaning include decontaminants, organic solvents and cleaning solutions.

Spillages include chemicals, radioactive and biologically active materials.

Wastes include broken glass, sharps, micro-organisms, solvents, excess test samples, spent reagents, disposable PPE, and used containers, boxes, bags, palettes.

Stock records may include:

- usage, loans, breakage
- data sheets
- calibration and maintenance history
- handbooks, warranty documents, catalogues, manuals, MSDSs.

Communication could involve other people, such as:

- laboratory, production, administration, cleaning staff
- internal/external contractors

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- emergency personnel.

Maintenance issues could involve:

- spillages, leakages, breakages, contamination
- stock requirements, shortages
- potential hazards, incidents and emergencies
- hygiene issues
- equipment malfunction
- recycling and waste disposal.

Hazards may include:

- electric shock
- microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- aerosols from broken centrifuge tubes, pipetting
- solar radiation, dust, noise
- sources of ignition, flammable liquids and gases
- sharps, broken glassware and hand tools
- chemicals, such as acids, heavy metals, pesticides, hydrocarbons
- cryogenics, such as dry ice and liquid nitrogen
- fluids under pressure, such as steam, industrial gas cylinders
- occupational overuse syndrome, slips, trips and falls
- manual handling, working at heights and in confined spaces
- crushing, entanglement, cuts associated with moving machinery or falling objects
- pedestrian and vehicular traffic.

Established 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
- 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

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- 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
- use of material safety data sheets (MSDS)
- handling and storage of all hazardous materials and equipment in accordance with labelling, materials safety data sheets and manufacturer's instructions
- identifying and reporting operating problems or equipment malfunctions
- following established manual handling procedures for tasks involving manual handling
- 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

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- safely cleans work preparation areas and equipment using appropriate cleaning agents, apparatus and techniques
- safely removes spillages and disposes of wastes
- minimises the exposure to hazards of self, others and the laboratory
- safely stores equipment and materials using enterprise procedures, relevant codes and guidelines
- monitors and reports stock levels and the condition of laboratory materials and equipment

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- keeps accurate, up to date records
- reports potential hazards and maintenance issues using enterprise procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- enterprise procedures for the cleaning of work preparation areas, materials and equipment
- 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 (MSDSs) for materials handled regularly during the performance of maintenance tasks
- relevant health, safety and environment requirements.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- observation of the candidate's techniques for cleaning 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS302B Participate in laboratory/field workplace safety.*

Resource implications

Resources may include:

- access to work preparation areas, stocks, materials and equipment
- cleaning, decontamination and/or disinfection agents and apparatus
- personal protection equipment
- stock order firms, labels and records/forms.

This competency in practice

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

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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 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 its 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

PMLOHS301B Work safely with instruments that emit ionising radiation

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 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.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory or field operators working under supervision or direction of para-professionals, commonly in a construction materials testing or similar environment.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 in place
	2.4 Ensure security of instruments when the vehicle is unattended

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements include or have been prepared from:

- Australian and international standards, such as:

– AS2243 Safety in laboratories, Part 4 Ionising radiation and Part 5 Non-ionising radiation

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- Codes of Practice prepared by
  - Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)
  - National Health and Medical Research Council (NHMRC)
- State and territory legislation dealing with health and environmental protection
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications
- licensing requirements.

Instruments and equipment used may include:

- soil moisture/density gauges
- borehole logging probes
- fluid density/level detectors
- battery chargers
- radiation monitors/doimeters
- motor vehicles
- storage areas for nuclear sources
- documentation, including user manuals, enterprise safety manuals
- radiation warning signs.

Typical skills may include:

- performing radiation surveys using radiation monitors
- using radiation dosimeters
- transporting instruments containing radioactive materials
- storing instruments containing radioactive materials
- using instruments containing radioactive materials

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- maintaining instruments containing radioactive materials.

Hazards and problems may include:

- jamming of the source rod in the exposed position
- incidents during transportation
- fire
- theft of equipment containing radioactive sources
- on-site accidents
- keeping other personnel clear of instrument
- instrument breakdown.

Safe working practices include the critical elements for radiation safety

- 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).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- keeps other personnel clear of radiation sources
- demonstrates emergency procedures

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- performs and documents radiation surveys
- places the instrument into storage
- safely transports the instrument in a motor vehicle
- safely handles and uses the instrument
- observes, interprets and reports atypical situations
- communicates problems to appropriate personnel promptly.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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.

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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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS302A Participate in laboratory/field workplace safety*
- *PMLTEST411A Perform mechanical tests*
- *PMLDATA400A Process and interpret data.*

Resource implications

Resources may include:

- appropriate tools, instruments, equipment and materials
- enterprise procedures, test methods, equipment manuals.

This competency in practice

Construction materials

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 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 handheld radiation meter is used, and the results recorded.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 2	Level 2

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PMLOHS302A Participate in laboratory/field workplace safety

UNIT DESCRIPTOR

This unit of competency covers the ability to apply enterprise OHS policies and procedures dealing with the identification and control of hazards, working safely at all times, emergency response and contributing to the maintenance of workplace safety. It is expected that personnel will be provided with clear directions, information, training and appropriate supervision. Responses are restricted to a 'first response' approach, including the notification of appropriate enterprise personnel.

This unit of competency is based on the Generic Competency A in the National Guidelines for Integrating Occupational Health and Safety into National Industry Competency Standards [NOHSC: 7025 (1998) 2nd Edition]. It is equivalent to *PMLOHS300A Work safely in accordance with defined policies and procedures* in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to all workers in all industry sectors with laboratory/field operations, including induction/entry level, school-based and trainee technicians. Workers with supervisory responsibilities should be assessed against the units *PMLOHS400A Maintain laboratory/field enterprise safety* and/or *PMLOHS601A Implement and monitor OHS and environmental management 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 are found at the end of this unit of competency under the section 'This competency in practice'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel work in accordance with work instructions and standard operating procedures which incorporate all relevant aspects of OHS legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods.

OHS legislation is state and territory based and includes general OHS Act and hazard specific regulations and Codes of Practice especially those relating to environmental hazards and dangerous goods.

Industry standards, codes and guidelines include:

- AS 2243 Safety in laboratories
- AS 2982 Hand washing facilities

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- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 1678 Emergency procedures guide for hazardous materials
- AS 2500 Storage of goods
- AS 2503 Safety storage and handling of information cards
- AS 1940 Storage and handling of flammable and combustible liquids
- AS 3780 Storage and handling or corrosive liquids
- AS 4452 Storage and handling of toxic substances
- standards for the segregation of wastes, such as AS 2243.3 and AS 2243.4
- AS/NEC/ISO 14000
- Australian Dangerous Goods Code
- Australian Code for Transport of Dangerous Goods
- guidelines for the operation of classes of laboratories
- Australian Quarantine Inspection Service guidelines for the importation of biological products
- National Code of Practice for the labelling of workplace substances (NOHSC:2012)
- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms.

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.

A hazard is a source or situation with a potential for harm in terms of human injury or ill health, damage to property, the environment or a combination of these. Physical hazards may be considered to be sources of energy that, if not controlled may cause injury or damage.

Hazards may include:

- electric shock

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- microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- solar radiation, dust, noise
- chemicals, such as acids, heavy metals, pesticides, hydrocarbons
- aerosols from broken centrifuge tubes, pipetting
- radiation, such as alpha, beta, gamma, X-ray, 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, 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 in confined spaces
- crushing, entanglement, cuts associated with moving machinery or falling objects
- pedestrian and vehicular traffic
- vehicle and boat handling.

Addressing hazards may include:

- hazard and incident reporting and investigation procedures
- elimination
- substitution, such as review of nature of substances or processes used
- isolation, such as:
  - 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

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- 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, materials safety data sheets 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 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 of material safety data sheets (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.

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.

Designated personnel may include the laboratory manager, supervisor, OHS coordinator and OHS representative.

Enterprise policies and procedures may include instructions for:

- all OHS specific procedures, such as for 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.

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An incident is an event that has cause or has the potential for injury, ill-health or damage. Incidents and emergencies may include:

- workplace injury and accidents — cutting, stabbing, puncturing, crushing, immersion in water, suffocation, hypothermia, burns, heat stress, animal bites, allergic reactions, assaults
- biological, chemical or radioactive spills; fire; bomb threat; security threat; explosion.

Emergency equipment may include first aid equipment, eye wash kit or shower and fire extinguisher.

Participating in OHS activities 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 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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

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Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- demonstrates the ability to recognise potential incidents and take appropriate corrective action
- can demonstrate workplace fire drill, incident, first aid and emergency evacuation procedures
- follows OHS and environmental policies and procedures for hazard identification and risk control, including the use, storage and maintenance of personal protective equipment
- follows enterprise instructions and procedures relating to storage, transport and disposal of dangerous goods
- follows instructions designed to ensure the correct labelling of samples and reagents
- uses equipment to protect health and safety
- communicates health and safety and environmental issues promptly with designated personnel.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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
- 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 (MSDSs)
- 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 for equipment used and key safety elements of the procedures.

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- 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.

Knowledge is also required of the:

- site layout, including emergency exits, location and use of safety alarms, emergency response system, procedures and personnel
- enterprise OHS and environmental policies and procedures.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment. 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with any other technical units in the context of the need to perform all work safely.

Resource implications

Resources may include:

- laboratory/field work environment, equipment and materials
- personal protective equipment
- enterprise procedures.

This competency in practice

Manufacturing

A laboratory assistant working in a laboratory was asked to produce a particular solvent-borne paint. Because of the hazardous nature of the task, the assistant referred to the material safety

data sheets (MSDSs) which specified that a particular respirator and gloves be used. The assistant followed the requirements and safely prepared the batch of paint.

Food and beverage 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 materials safety data sheets (MSDSs) 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 standard operating procedures.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLORG301A Plan and conduct laboratory/field work

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.

This unit of competency is based on, and equivalent to, the units PMLORG300A Follow established work plan and PMLTEAM300A Work efficiently as part of a team in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory or technical assistants/officers and instrument operators working in all industry sectors covered by this Training Package.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 task(s) 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

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			accordance with plan
3.	Identify and resolve work problems	3.1	Recognise problems or opportunities for improved work performance
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All work is performed ethically and professionally and includes:

- following enterprise policy and procedures, regulations and legislation
- 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

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 may include but are not limited to performing:

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- set up and pre-use checks of laboratory equipment
- calibration status checks
- sampling and testing following standard procedures
- maintenance and cleaning tasks.

Workplace procedures may include:

- standard operating procedures SOPs
- job cards, batch cards, production schedules
- job descriptions
- methods, recipes, procedures and protocols.

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.

Each team member assists the rest of the team to organise and manage its workload.
The team may:

- be ongoing with responsibility for particular services or functions, or 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 outside laboratory facilities.

The team operate 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, Codes of Practice
- agreed responsibility and accountability requirements
- appropriate goals, objectives
- given resource parameters.

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The work tasks of individual team members will vary according to the size of enterprise, the scope of the laboratory and their level of responsibility.

The team may use a variety of strategies to maintain work flow:

- 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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

conducts work based on ethical values and principles

- clarifies tasks and recognises resource needs
- follows relevant procedures
- recognises potential disruptions or changed circumstances and modifies work plan in conjunction with relevant personnel
- compensates for a variety of working environments (indoor, outdoor and night)
- seeks assistance from relevant personnel when difficulties arise
- achieves quality outcomes within timelines
- works effectively with team members who may have diverse work styles, cultures and perspectives
- promotes cooperation and good relations in the team.

Underpinning knowledge

Competency includes the ability to apply and explain:

- enterprise procedures covering:
  - customer service
  - quality
  - OHS and environmental legislative requirements
  - technical work that the candidate routinely performs
- workplace agreements and employment conditions, such as:
  - workers compensation
  - industrial awards enterprise agreements
  - equal employment opportunity
  - anti discrimination and anti-harassment
  - ethical background relevant to the nature of the work, such as:

- use of animals for research
- genetic modification, gene therapy, cloning, stem cells
- in vitro fertilisation
- forensic testing of populations
- importance of commercial confidentiality

- problem solving strategies
- interpersonal communication and conflict resolution techniques
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 working 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. Questioning techniques should suit the language and literacy levels of the candidate.

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Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLOHS302A Participate in laboratory/field workplace safety
- PMLCOM300B Communicate with other people
- technical units related to the tasks undertaken.

Resource implications

Resources may include:

- enterprise procedures, equipment and materials for relevant technical tasks.

This competency in practice

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 required 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 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

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more evenly distributed the workload over their shift, improved safety in the laboratory and reduced the risk of error.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 2	Level 2	Level 1	Level 1	Level 1

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PMLQUAL300B Contribute to the achievement of quality objectives

UNIT DESCRIPTOR

`This unit of competency covers the development of a working knowledge of quality principles and their application in laboratory/field work.

This unit of competency has no prerequisites.

This unit of competency is applicable to production personnel and laboratory/field assistants working in all industry sectors covered by this Training Package.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All personnel that conduct sampling and testing have defined roles and responsibilities within the enterprise's quality system. Their roles and responsibilities are set out in quality manuals and workplace procedures.

Quality manuals and workplace procedures may be based on standards, codes and regulations, such as:

- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- Food Standards Code 2002 Australia New Zealand (FSANZ) and amendments
- AQIS Export Control Orders
- NATA accreditation procedures
- AOAC standards
- ADAC regulations
- ISO 9000 series Quality management and quality assurance standards
- AS 2830 Good laboratory practice
- Therapeutic Goods Act

- Codes of Practice, such as good laboratory practice (GLP) and good manufacturing practice (GMP)
- OECD Principles of good laboratory practice
- customer specific requirements/standards.

Quality control procedures may include:

- standards imposed by regulatory and licensing bodies
- enterprise quality procedures

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- 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.

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 may involve:

- verbal responses
- data entry into laboratory information management system (LIMS) or enterprise databases
- brief written reports using enterprise proformas.

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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- applies required quality control procedures during sampling, testing and the recording of data
- provides quality products and services to customers in keeping with their role
- resolves simple customer requirements
- minimises waste and rework
- contributes to improvements in productivity and quality through teamwork and commitment to personal work standards.

Underpinning knowledge

Competency includes the ability to apply and explain:

- role of internal and external audits
- quality requirements of the candidate’s job role and function(s)
- continuous improvement and waste minimisation principles
- recording, reporting and document control requirements.
- relevant health, safety and environment requirements.

Knowledge is also required of the:

- 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.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLCOM300B Communicate with other people
- technical units of competency dealing with sampling and testing.

Resource implications

Resources may include:

- enterprise quality manual and procedures
- standard operating procedures (SOPs).

This competency in practice

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 standard operating procedure (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 standard operating procedure (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

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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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 1	Level 2	Level 1	Level 1	Level 1

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PMLQUAL301B Apply critical control point requirements

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 HACCP (Hazard Analysis and Critical Control Points) plan.

This unit of competency has no prerequisites.

This unit of competency is applicable to production personnel and laboratory assistants.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Control points refer to those key points in a work process that must be monitored and controlled. This includes critical, quality and regulatory control points. Personnel who monitor control points require access to quality manuals, standards and workplace documentation, such as:

- HACCP plans/documents/procedures
- product safety plan
- production/quality procedures/requirements
- State/national legislation
- standard operating procedures (SOPs)
- quality manuals
- food safety plans and/or pharmaceutical safety requirements
- good manufacturing practice (GMP).

Products/materials handled by laboratory assistants could include:

- raw materials
- ingredients
- adjuncts/process aids
- consumables
- finished product
- chemicals
- food additives.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard.

In particular, assessors should look to see that the candidate:

- correctly monitors the critical, quality and regulatory control points for their own work area responsibilities
- prevents contamination from occurring or recurring
- records information using the enterprise reporting system
- collects and analyses data to identify variation from limits
- takes approved corrective action(s) as required
- supports continuous improvement through observation and communication.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the HACCP plan, including:
  - the critical control points, 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 requirement
- methods for systematically investigating and responding to problems
- control points and their potential impact on work systems
- relevant health, safety and environment requirements.

Knowledge is also required of the:

- products and services provided by the enterprise
- layout of the enterprise, divisions, and laboratory
- organisational structure of the enterprise

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- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with

- PMLDATA200A Record and present data
- PMLQUAL300B Contribute to the achievement of quality objectives.

Resource implications

Resources may include:

- quality manuals and procedures
- HACCP plans and records
- recording equipment
- case studies to illustrate a range of HACCP issues.

This competency in practice

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

PMLSAMP302A Receive and prepare samples for testing

UNIT DESCRIPTOR

This unit of competency covers the ability to log samples, check sample documentation, schedule and prepare a range of samples for testing. All operations are performed in accordance with standard operating procedures (SOPs). This unit does not include testing, tissue processing or similar techniques.

This unit of competency is based on, and equivalent to, the unit *PMLSAMP301A Receive and prepare a range of samples for pathology testing* in PML99.

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 and information

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		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
		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 intergrity
		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

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other laboratory wastes.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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 could include:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms
- enterprise operating procedures for preparing samples
- safety manuals describing personal protective equipment requirements; control of hazardous wastes; containment and cleanup of spillages; disposal and recycling of wastes
- 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 referral to external laboratories
- procedure sheets indicating transport and storage requirements
- procedure sheets for physical and chemical separation
- enterprise quality manuals
- material safety data sheets (MSDSs).

Where a laboratory routinely posts or couriers samples for testing, the International Air Transport Association (IATA) Dangerous Goods Regulations and Australia Post Regulations must be met.

Samples received may include:

- gas or air samples
- liquid samples, such as water, wastewater, stormwater, sludges and complex mixtures, sewage
- solid samples, such as soils, sediments, rocks/minerals, concrete, quarry or mining products
- solid wastes, such as hazardous, non-hazardous, domestic, commercial, industrial, mining, agricultural
- raw materials, start-, middle-, end- of production run samples, final products.

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Hazards may include:

- biohazards, such as micro-organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- dust and noise
- chemicals, such as acids and hydrocarbons
- aerosols
- sharps, broken glassware
- manual handling of heavy sample bags and containers
- crushing, entanglement, cuts associated with moving machinery.

Safe work practices may include:

- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gown, body suits, respirators, 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, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

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Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- receives and logs samples in accordance with enterprise procedures
- checks samples for history and acceptable transport conditions
- applies standard precautions when dealing with hazardous materials
- applies knowledge of relationship(s) between specific sample preparation and associated tests
- promptly clarifies specific client requirements with appropriate personnel, as necessary
- performs sample preparation and sub-sampling in accordance with enterprise procedures
- labels and stores samples following enterprise procedures and maintains sample integrity, and traceability
- follows required sample disposal procedures
- maintains all equipment and workspace in accordance with enterprise procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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 accurate and complete labelling of samples
- 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, in biomedical laboratories:

- potentially infective nature of all biological materials
- nature of unstable solutions, such as anticoagulated whole blood
- non-conformance of clotted samples for procedures, such as routine haematological tests.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLCOM300B Communicate with other people*
- *PMLOHS302B Participate in laboratory/field workplace safety.*

Resource implications

Resources may include:

- a selection of sample containers, tubes, request forms, sample documentation
- simulated samples when an authentic sample is unavailable or inappropriate.

This competency in practice

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.

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Construction materials 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 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 e-mails 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLSCIG300B Operate basic handblowing equipment

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.

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 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

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		2.6	Follow equipment shutdown procedures
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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work typically conducted by less experienced glassblowers.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements include or will have been prepared from:

- industry Codes of Practice
- OHS and environmental legislation and standards

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- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

This competency includes ability to use tools and equipment, such as:

- bench burner, hand torch, micro torch and ribbon burners, gas supplies and gas economisers
- dydinium glasses, polariscope
- 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, strain viewer
- mechanical glass cutters and saws
- mechanical glass grinding equipment
- communication equipment.

Typical skills may include:

- working safely with glass
- setting up and maintaining tools and equipment
- using tools and equipment to perform basic glassblowing operations
- using appropriate glass blowing hand manipulation techniques
- cutting, heating, bending, shaping, sealing and related glass working techniques
- minimising strain by using appropriate techniques
- using coefficients of expansion appropriately

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- maintaining safe working pressures
- storing glass appropriately
- making and grinding components, such as stopcocks.

Typical problems 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 may include:

- sharps, broken glassware
- heat sources, such as burners and ovens
- fluids under pressure (acetylene, oxygen)
- glass dust
- cuts associated with glass grinders and cutters
- manual handling of heavy sample bags and containers.

Safe work practices may include:

- use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators, safety boots
- correct labelling of reagents and hazardous materials
- handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

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All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard, using basic bench/hand glasswork techniques and equipment to fabricate general glass apparatus.

In particular the assessor should look to see that the candidate:

- can start up, set up and shut down equipment in accordance with work instructions
- selects appropriate grades of glass and prepares them for use
- optimises equipment operating parameters
- maintains temperature and stress parameters
- uses equipment to prepare items that meet specification
- reports atypical results and problems to appropriate personnel according to enterprise procedures
- records and communicate work results
- follows correct OHS and GLP practice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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 glass working parameters
- pre-heating procedures
- basic theory of re-entry angles and stress points

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- 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.

Assessment context and methods

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 time frame 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

Although there is some overlap in the knowledge and skills in this unit with *PMLSCIG301B Repair glass apparatus using general glassblowing equipment*, competence in this unit should be demonstrated before the unit *PMLSCIG301B* is assessed.

Resource implications

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.

This competency in practice

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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 2

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PMLSCIG301B Repair glass apparatus using simple glassblowing equipment

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to personnel generally working in scientific educational institutions. 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Prepare for repair operations	1.1 Identify job, appropriate procedure, hazards and safety requirements and the 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 components for job

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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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work typically conducted by less experienced scientific glassblowers.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements.

These procedures and requirements include or have been prepared from:

- industry Codes of Practice
- OHS and environmental legislation and standards
- material safety data sheets (MSDSs)
- 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.

This competency includes the ability to use tools, materials and equipment, such as:

- burners, gas supplies and gas economisers
- glass working 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, strain viewer
- various glass types, including soda-lime, borosilicate, quartz, silica and special formula glasses

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- glass to metal seals
- communication equipment.

Hazards may include:

- sharps, broken glassware
- heat sources, such as burners and ovens
- fluids under pressure (acetylene, oxygen)
- glass dust
- cuts associated with glass grinders and cutters
- manual handling of heavy sample bags and containers.

Safe work practices may include:

- use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators, safety boots
- correct labelling of reagents and hazardous materials
- handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- demonstrates a knowledge and awareness of contamination cleaning techniques to be carried out before repair operations are undertaken
- demonstrates a knowledge of the use and function of the broken apparatus
- safely applies appropriate glassblowing techniques to repair apparatus
- follows blueprints, drawings, sketches and designs relevant to repair work
- selects appropriate grades of glass and prepare for use
- determines types of contaminants present on/in apparatus and use appropriate treatment process, with particular attention to risks associated with blowing used and possibly contaminated glass
- prepares apparatus for repair
- optimises and uses glassblowing equipment
- identifies atypical or out of normal repair problems
- reports problems to either supervisor or outside service technician according to enterprise procedures
- records and communicates work results
- follows correct OHS and GLP practice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- relevant glassblowing techniques
- knowledge of the risks associated with blowing used and contaminated glass
- contamination cleaning techniques to be carried out before repair operations are undertaken
- 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

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- relevant health, safety and environment requirements.

Assessment context and methods

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 time frame 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 directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSCIG300B Operate basic handblowing equipment.

Resource implications

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.

This competency in practice

Education

A trainee glass blower 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 glass working parameters, he/she repairs the equipment using safe apparatus. Finally the glass blower subjects the equipment to the appropriate

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annealing/conditioning process and checks the final outcome with his/her supervisor. Any contaminated or used glass waste is disposed of appropriately.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 2

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PMLTEST300B Perform basic tests

UNIT DESCRIPTOR

This unit of competency covers the ability to perform tests using standard methods and with access to readily available advice. Personnel are required to demonstrate close attention to the accuracy and precision of measurements and the data obtained. In general, they 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.

This unit competency has no prerequisites.

This unit of competency is applicable to laboratory/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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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4.	Perform tests on samples	4.1	Identify, prepare and weigh or measure sample and standards to be tested
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by supervised laboratory assistants who perform a range of basic tests and measurements.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– AS/NZS 2243.2 Chemical aspects

– AS 2243.6 Mechanical aspects

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- AS 2243.10 Storage of chemicals
- AS 2830 Good laboratory practice

- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs) and safety procedures
- 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.
- Codes of Practice.

Preparation of samples can 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 could include:

- visual/optical tests of appearance, colour, texture, identity, turbidity, refractive index (alcohol content, Baume/Brix)
- physical tests, such as:
  - density, specific gravity, compacted density
  - moisture content, water activity
  - particle size, particle shape, size distribution
- chemical tests, such as:
  - gravimetric
  - colorimetric

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- electrical conductivity (EC), pH
- specific ions using dipsticks and kits
- nutrients (for example nitrates, orthophosphates) using basic kits
- ashes, including sulphated ashes

• biological/environmental tests, such as:

- pH, oxygen reduction potential (ORP), dissolved oxygen (DO), electrical conductivity
- E coli using test kits
- surface hygiene/presence of microbes

• packaging tests, such as:

- tearing resistance, bursting strength, impact resistance
- permeability and/or leakage

• mechanical tests, such as:

- Emerson class
- concrete slump

Other measurements may include:

- simple ground surveys
- meteorological parameters, such as: wind direction/strength, rainfall, max./min. temperature, humidity, solar radiation
- simple background radiation survey
- production/process parameters, such as temperature, flow, pressure
- gas levels in a confined space.

Common measuring equipment may include:

- dimension apparatus
- dissolved oxygen (DO), electrical conductivity (EC)
- analogue and digital meters, charts/recorders
- basic chemical and biological test kits
- dipsticks and site test kits (for example, HACK)
- timing devices
- temperature measuring devices, such as thermometers, thermocouples.

Hazards may include:

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- electric shock
- biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- solar radiation, dust, noise
- chemicals, such as: sulphuric acid, fluorides, 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 in confined spaces
- crushing, entanglement, cuts associated with moving machinery or falling objects.

Enterprise controls to address hazards may include:

- use of material safety data sheets (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
- use of appropriate equipment, such as biohazard containers and cabinets, laminar flow cabinets
- 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, materials safety data sheets and manufacturer's instructions, 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 may involve:

- recycling of non-hazardous waste, such as chemicals, batteries, plastic, metals, glass

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- appropriate disposal of hazardous waste
- correct disposal of excess sample/test material
- correct storage and handling of hazardous chemicals.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets enterprise procedure or standard methods accurately
- uses safety information (for example, MSDSs) and performs procedures safely
- checks test equipment before use
- completes all tests within required timeline without sacrificing safety, accuracy or quality
- calculates, records and presents results accurately and legibly
- maintains security, integrity and traceability of all samples, data/results and documentation
- cleans and maintains equipment.

Underpinning knowledge

Competency includes the ability to apply and explain:

- purpose of test
- principles of the standard method

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- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA200A Record and present data.*

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment standards and materials
- enterprise procedures and standard methods, equipment manuals
- material safety data sheets (MSDSs).

This competency in practice

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 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 shelf-life. The packaging must also be able to withstand the rigours of the production and distribution process. While the packaging is purchased to meet the shelf-life 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 shelf-life. 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLTEST303B Prepare working solutions

UNIT DESCRIPTOR

This unit of competency covers the ability to prepare working solutions and to check that existing stocks are suitable for use. This unit assumes that calculations of quantities, choice of reagent grades and required dilutions will be specified by the supervisor.

This unit of competency has no prerequisites.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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3.	Check existing stock of solutions	3.1 Monitor shelf-life of working solutions as per laboratory procedures
		3.2 Replace out-of-date or reject solutions as per laboratory procedures
		3.3 Conduct routine titrimetric analyses, if appropriate, to determine if solutions are fit for purpose.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by supervised laboratory assistants who prepare a range of working solutions for laboratory use. Test solutions include those required to perform laboratory tests. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS 2162.1 General – volumetric glassware
  - AS 2163 Laboratory glassware – measuring cylinders
  - AS 2165 Laboratory glassware – burettes
- industry methods, such as American Association of Cereal Chemists (AACC) Solution methods
- Codes of Practice, such as GLP and GMP
- material safety data sheets (MSDSs)
- National Measurement Act
- 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.

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The nature of test solutions will depend on the enterprise and the range of testing carried out. Typical test solutions may include:

- solutions required for diagnostic/analytical and limit tests in food and chemical laboratories, such as sulphates, chlorides, 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, titrimetric indicators
- solutions required for laboratory maintenance and disinfection, such as 70% ethanol, hypochlorite.

Laboratory equipment may include:

- pH meters
- balances
- magnetic stirrers, waterbaths and hot plates
- measuring cylinders, beakers, conical flasks, volumetric flasks, pipettes, burettes
- filter papers and funnels
- fume cupboards.

Hazards may include:

- corrosive chemicals, such as acids and alkalis
- sources of heat, such as burners
- sharps, broken glassware
- spillages.

Safety precautions may include:

- use of material safety data sheets (MSDSs)
- 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, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Monitoring quality of solutions can include:

- noting turbidity to exclude absorption of moisture
- noting deposits to exclude microbial contamination or chemical degradation
- noting crystals to exclude evaporation

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- conducting titrations to check concentration
- noting colour changes indicating a pH shift with solutions containing indicators
- checking expiry dates on solution containers.

Concentration terms may include: % w/w, % w/v, % v/v, ppm (mg/L), molarity.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, the assessor should look to see that the candidate:

- uses appropriate materials, equipment and procedures to prepare solutions
- follows appropriate OHS (and hygiene, if appropriate) procedures
- uses all equipment safely, efficiently and in accordance with enterprise procedures
- uses enterprise procedures to calculate concentrations
- identifies solutions not fit for use
- uses titrations to determine the concentration of solutions
- labels, stores and disposes of solutions appropriately
- records and present data appropriately.

Underpinning knowledge

Competency includes the ability to apply and explain:

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- relevant biological, chemical, food and laboratory terminology
- 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 MSDSs
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA200A Record and present data
- PMLOHS302A Participate in laboratory/field workplace safety.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment and reagents
- standard operating procedures and testing methods
- access to appropriate containers and storage facilities.

This competency in practice

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 substandard 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.

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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.

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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLTEST304B Prepare culture media

UNIT DESCRIPTOR

This unit of competency covers the ability to prepare culture media free of contamination required and facilitate optimal growth of organisms and cells. It also includes the ability to organise the materials, equipment and work environment and follow standard methods.

This unit of competency has the following prerequisite(s):

- *PMLTEST305B Perform aseptic techniques.*

This unit of competency is applicable to laboratory assistants in the biomedical, biological, environmental, food, pharmaceuticals 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 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

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3.	Pour, label and store media	3.1	Add labile constituents where necessary, under conditions that will not lead to their denaturation or 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 occupational health and safety of self and others
		5.2	Place disposable and reuseable 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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel work in accordance with work instructions and standard operating procedures which incorporate all relevant aspects of OHS legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods.

Regulations, codes and standards may include:

- AS 2243 Safety in laboratories
- AS 2500 Storage of goods
- AS 2503 Safety storage and handling of information cards
- AS 2982 Hand washing facilities
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 4187 Code of Practice for cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities.

The range of equipment may include:

- balance
- pH meter
- hot plate stirrer, bunsen burners
- autoclave, Arnold steamer
- membrane filtration equipment
- measuring cylinders, flasks and glass ware, petri dishes
- distilled water apparatus
- automatic agar pourers
- labelling equipment
- refrigerators
- sterilisation indicators
- self refilling syringes
- Falcon dishes
- media storage bottles, tissue culture bottles.

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Workplace information may include:

- standard operating procedures (SOPs)
- client and product specifications
- Australian Quarantine Inspection Service requirements for safe disposal of plates and media
- operation and maintenance manuals for automated media preparation equipment
- production schedules and instructions
- material safety data sheets (MSDSs)
- good laboratory practice (GLP) and good manufacturing practice (GMP) manuals
- manufacturer’s instructions or verbal direction from laboratory manager, supervisor or senior technician
- Food Standards Code Australia and New Zealand.

Media may be prepared from formulated powders obtained from microbiological companies or from first principles under supervision of a technical officer or scientist.

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, selenite broth
- control media
- differential media, such as eosin-methylene blue agar, MacConkey's agar.
- selective media, such as deoxycholate-citrate agar, Lowenstein-Jensen medium
- tissue culture media
- labile constituents, such as include blood, hormones or antibodies.

Sterilisation techniques could include autoclaving, steam and membrane filtration, boiling, microwaving, radiation, high temperature, high pressure steam, gas and chemical treatments.

Quality control checks include streaking out of cultures to a single colony and lawn cultures.

Hazards may include:

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- micro-organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- sources of heat, such as ovens, burners, autoclaves
- sharps, broken glassware
- fluids under pressure, such as steam
- radiation used for sterilisation.

Safe work practices may include:

- use of material safety data sheets (MSDSs)
- 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, enterprise procedures and regulations
- regular cleaning and/or decontaminating equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- uses appropriate personal protective equipment
- uses a vessel large enough to endure adequate mixing and heating of the media

- prevents cross contamination
- follows enterprise procedures consistently
- confirms sterility of media, by using appropriate sterilisation techniques
- maintains adequate space between containers to ensure efficient sterilisation
- allows the chamber pressure of the autoclave to return to zero and temperature to cool to 80–90ºC before opening autoclave door to prevent boil over or plugs/caps being blown off flasks or tubes
- carries out post sterilisation procedures, such as dispensing or adding using aseptic technique
- ensures 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
- selects media suitable for isolating and/or growth of a specified organism
- labels and store culture media according to enterprise procedures
- accurately records data
- reports non-compliance, anomalies or out-of-specification results
- sorts, collects, treats, recycles or disposes of waste
- demonstrates ability of media to support growth of relevant micro-organism or tissue.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the relationship between the correct preparation of culture media and the optimal growth of organisms or cells
- the purpose and features of culture media
- nature, properties and use of range of biological media
- accurate measuring techniques
- mathematical skills to calculate mass and volume
- the relationship between sterile practices, hygiene procedures and the ability to obtain growth free of contamination
- temperature control requirements
- basic microbiological concepts and terminology, including growth rates in culture, production of gas and haemolysis of red cells in media

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- the importance of physical requirements, such as pH and isotonicity on optimal growth of organisms and cells
- importance of D, L isomers in media ingredients
- methods for purifying water for use in the preparation of culture media
- role of cell growth regulators/inhibitors in the culture medium
- role of macronutrients and micronutrients in the culture medium
- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS302A Participate in laboratory/field workplace safety.*
- *PMLTEST305B Perform aseptic techniques.*

Resource implications

Resources may include:

- work schedule and enterprise procedures, including advice on safe work practices
- relevant equipment and personal protective equipment
- material safety data sheets (MSDSs).

This competency in practice

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!

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLTEST305B Perform aseptic techniques

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory assistants and technicians working in the field or laboratory in the biomedical, biology, food and beverage and environmental sectors of the industry.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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2.	Transfer materials aseptically	2.1 Protect the integrity of the sample source by sterilising the sampling site and flaming the mouth of transport or culture vessel
		2.2 Sterilise inoculating loops and/or pipette where used 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 Streak plate inoculations to maximise potential for single colony growth and to avoid contamination
		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 reuseable 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel work in accordance with work instructions and standard operating procedures which incorporate all relevant aspects of OHS legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods.

Regulations, codes and standards may include:

- AS/NZ 2243.3 Safety in laboratories, Part 3 — Microbiology

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- AS 2500 Storage of goods
- AS 2503 Safety storage and handling information cards
- AS 2982 Hand washing facilities
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 4187 Code of Practice for cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities
- Food Standards Code Australia and New Zealand.

Facilities, equipment and processes would conform to the recommendations of AS/NZ 2243.3 Safety in laboratories, Part 3: Microbiology, and National Health and Medical Research Council guidelines on infection control.

Personal protective equipment may include:

- gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators
- biohazard containers and laminar flow cabinets.

Aseptic sampling and transfers will typically involve accessing a sample source, using specified equipment to remove a sample and transferring it to a specified vessel without:

- contamination of the sample source
- contamination of the sample
- cross contamination
- contamination of the workplace.

Sampling transfers may include 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 could include:

- body fluids and liquids
- water and soil
- sterile pharmaceuticals
- yeasts and moulds

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- milk and yoghurt
- swabs and smears
- propagation tissue
- plant material
- fermented foods and beverages.

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, waterbaths, refrigerators, freezers and possibly dry ice and liquid nitrogen cylinders
- laminar flow units and biohazard cabinets
- autoclave or pressure cooker
- swabs
- continuous culture systems.

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 reuseable materials
- bar coding material and labels.

Sterilisation techniques could include autoclaving, steam and membrane filtration, boiling, microwaving, radiation, high temperature, high pressure steam, gas and chemical treatments.

Hazards may include:

- accessing the sample from difficult or dangerous areas

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- dry ice and liquid nitrogen vapour
- UV light sources
- heat from bunsen burners
- molten agar
- sharps
- hazardous substances and/or infectious agents.

Workplace information may include:

- standard operating procedures (SOPs)
- specifications for safe waste disposal of biohazardous materials
- production schedules and instructions
- work notes
- material safety data sheets (MSDSs)
- manufacturer's instructions
- verbal instructions from laboratory manager, supervisor or senior technician
- guidelines for small scale genetic manipulation work.

It is expected that all procedures, including recording of samples, operation of equipment and cleaning/decontamination will be carried out according to established laboratory procedures and these may vary across sectors. All sterilising equipment must meet state OHS legislation for pressure equipment. All samples and wastes must be handled in accordance with OHS and environmental guidelines and Australian Standard AS 2243.3.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- prevents cross contamination of sample source and sample
- manipulates equipment to prevent contamination of culture medium during transfer
- sterilises equipment as required to prevent cross contamination of work area, personnel and environment.

Underpinning knowledge

Competency includes the ability to apply and explain:

- principles of infection control related to occupational health and safety, 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 multicellular parasites) in terms of their laboratory culture
- effects of physical and chemical agents on microbial growth and death.

The candidate must be able to follow defined OHS policies and procedures. In some instances the candidate may also need to apply:

- environmental requirements
- infection control procedures
- food safety principles
- relevant health, safety and environment requirements.

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example, for the food processing industries:

- food spoilage symptoms
- beneficial/detrimental organisms relevant to specific food industry sector.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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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 (questioning will be appropriate to the language and literacy levels of 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.

Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS302A Participate in laboratory/field workplace safety.*

Resource implications

Resources may include:

- standard laboratory with appropriate equipment and materials
- enterprise procedures and standard methods
- material safety data sheets (MSDSs).

This competency in practice

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

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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 resterilised the inoculating loop by introducing and holding it in the bunsen flame to minimise the generation of bacterial aerosols.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 2	Level 1	Level 1	Level 1	Level 1

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PMLTEST306B Assist with fieldwork

UNIT DESCRIPTOR

This unit of competency describes the ability to perform tasks associated with organisation of fieldwork, field surveys and field camp operations. It also covers basic field survival skills and collection of samples in the field. This unit of competency does not include gaining clearance for animal trapping, tagging, keeping or experimentation. It does not cover animal handling techniques. The worker would only perform those tasks under the guidance and supervision of a scientific officer.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory and field assistants working in the environmental monitoring, mining, construction and rural industry sectors.

All aspects of field and laboratory work covered by this unit 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.

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’.

ELEMENTS		PERFORMANCE CRITERIA	
Elements describe the essential outcomes of a unit of competency.		Performance Criteria describe the level of performance required to demonstrate achievement of the element.	
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.	Perform tasks related to field camp operations	2.1	Check unpacked items against inventory
		2.2	Store supplies and equipment as specified
		2.3	Restock supplies as necessary
		2.4	Check sanitation facilities as required
		2.5	Dispose of camp waste in accordance with safety and environmental requirements

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3.	Perform tasks related to field surveys	3.1	Assemble equipment for field work as per project specifications
		3.2	Collect samples 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 environmental data as directed
		3.6	Dispose of survey wastes in accordance with safety and environmental requirements
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 close down of field camp	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	Return supplies and equipment to storage at enterprise location
		5.4	Conduct a stocktake of equipment and supplies for replenishment where required
		5.5	Assist in the dispatch of collected samples for laboratory analysis.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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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All field work will be performed according to legislative and environmental requirements and industry guidelines and Codes of Practice. In the field the worker and supervisor would generally have access to the following:

- written fieldwork procedures, standard operating procedures and operating manuals
- basic test procedures (validated and authorised)
- basic sampling procedures (labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products
- permits for wildlife capture and handling
- animal welfare and ethics requirements, Codes of Practice
- cleaning, hygiene and personal hygiene requirements
- environmental requirements related to disposal of waste
- incident and accident/injury reports
- instructions to comply with new legislation, standards, guidelines and codes
- first aid kit and survival manual.

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, conventional codes and symbols for signalling
- tools, vehicle recovery equipment and spare parts
- navigation and communication equipment, including global positioning system.

Hazards may include:

- solar radiation, dust, noise

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- personnel getting lost
- incidents or emergencies, such as snake or animal bites
- severe weather conditions
- manual handling of heavy objects
- vehicle and boat handling in rough/remote conditions
- moving machinery, hand tools.

Safety procedures may include:

- use of personal protective equipment, such as sunscreen, hat, safety glasses, gloves, 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, enterprise procedures and regulations.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- completes tasks (associated with the organisation, set up, maintenance and close down of a field camp) efficiently and safely
- collects samples in accordance with enterprise procedures and legislative requirements

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- maintains and stores samples in accordance with special requirements for continued wellbeing, viability and integrity of sample
- records data according to enterprise procedures and legislative requirements
- prepares documentation accurately and in accordance with requirements
- performs all fieldwork in accordance with safety and environmental requirements.
- disposes of wastes in accordance with safety and environmental requirements.

Underpinning knowledge

Competency includes the ability to apply and explain:

- terminology relevant to the physical chemistry, biology and ecology of samples and specimens
- enterprise procedures relating to sample collection, maintenance and storage
- enterprise procedures relating to field testing of samples
- specific legislation and Codes of Practice related to sample and animal collection
- principles of safety relating to fieldwork, such as use of LPG, operation of generators, use of protective clothing
- communication procedures using two-way radio and satellite phone
- basic field survival strategies, such as map reading, use of compass, ‘stay with vehicle’ in the event of accident or emergency
- documentation in accordance with enterprise procedures and legislative requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of performance during field trips with a focus on sample collection and storage, accurate documentation, field testing of samples, collection of environmental data, safety aspects of fieldwork and basic field survival skills, team work
- paper exercises associated with organisation of fieldwork, fieldwork operations and basic field survival strategies
- role plays with a focus on accident and emergency situations requiring use of communication procedures and basic field survival strategies
- oral or written questions.

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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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLORG301A Plan and conduct laboratory/field work
- PMLCOM300B Communicate with other people.

Resource implications

Resources may include:

- enterprise procedures, regulations and Codes of Practice
- relevant field equipment, samples, test kits and reagents.

This competency in practice

Environmental

On a field trip to determine the biodiversity of an island fringing reef, a technical assistant assisted in constructing a grid map of the study area. The assistant was then asked to count the number of six different species of plant in part of the grid, taking care to minimise the impact on the environment. The assistant was also required to accurately record the data on a map to show the location of each plant using a predetermined key. The survey was successfully completed because enterprise procedures were followed.

Testing

A technical assistant was asked to appropriately pack and safely transport water sampling and monitoring equipment to a distant field site. Firstly, the assistant checked that all the equipment was in working order and that he/she was able to use and maintain it. Given that the technical assistant was licenced to operate a small boat and was a competent underwater diver he/she was also asked to perform a simple underwater survey of macrophytes in a lake in the study area. This was done using standard safety and operating procedures and the results were recorded on a grid map and in the daily log book.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

PMLTEST307B Prepare trial batches for evaluation

UNIT DESCRIPTOR

This unit of competence 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.

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 according to established procedures

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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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competence describes work conducted by laboratory assistants, generally working under the guidance of a senior technician, scientific officer, laboratory supervisor/manager. Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements can include or be prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Materials, tools and equipment used may include:

- soils, concrete, asphalt, aggregates, polymers, ceramics, metals, foodstuffs, solvents
- ovens, sieves, balances, volumetric measures, mixers
- hand tools, including shovels, scoops, spatulas
- consumables, including sample bags, labels
- documentation, including specifications, manufacturers' handbooks, worksheets
- test equipment appropriate to the various materials.

Typical skills may include:

- working safely with equipment and hazardous materials
- working safely in laboratory conditions
- setting up and maintaining tools and equipment

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- using tools and equipment to perform basic sampling techniques
- using tools and equipment to perform basic testing techniques
- basic calculations
- observing and recording information on testing and sampling
- making basic measurements of volume and mass
- handling and storing materials appropriately.

Typical problems may include:

- not following standard operating procedures
- measurement errors
- calculation errors
- materials of unreliable quality
- insufficient mixing
- poor sampling procedures
- equipment breakdown and breakage.

Hazards may include:

- electric shock
- biohazards, such as microbiological organisms and agents associated with soil, air, water
- solar radiation, dust, noise
- chemicals
- sharps, broken glassware and hand tools
- flammable liquids and gases
- fluids under pressure
- manual handling heavy objects
- crushing, entanglement, cuts associated with moving machinery or falling objects.

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, safety boots
- use of material safety data sheets (MSDS)

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- 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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- calculates batch quantities, concentrations and other relevant parameters
- follows standard operating procedures
- measures quantities accurately
- takes representative samples
- identifies and describes materials accurately
- handles and transports samples correctly
- records sampling and testing information
- uses tools and equipment effectively and efficiently
- observes, interprets and reports atypical situations
- communicates problems to appropriate personnel

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- records and communicates work results
- works safely
- interprets information from materials safety data sheets.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the properties of mixing materials and how they affect the properties of the final product
- hazards involved with materials and equipment involved
- measurement of mass and volume
- basic calculations involving SI units, proportion, ratio, and percentage
- representative sampling
- uses of various materials/enterprise products
- basic testing methods for relevant materials
- enterprise traceability requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSAMP302A Handle and transport samples or equipment

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- PMLSAMP400B Prepare representative samples in accordance with a sampling plan
- PMLTEST300B Perform basic tests.

Resource implications

Resources may include:

- standard facility with appropriate tools, equipment and materials
- enterprise procedures, MSDS, product formulation/specifications.

This competency in practice

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 20-litre batch in the laboratory. She/he calculates that this quantity will provide sufficient material for the required tests, without undue waste. She/he calculates the quantity of each material required for the trial batch. The assistant selects and prepares the tools and equipment she/he needs to mix, sample and test the concrete. She/he wears overalls, safety boots and glasses, and uses a barrier cream. She/he measures out the quantities required for the trial batch, charges the mixer and allows it to mix for the specified time. She/he then discharges the concrete onto a suitable surface. She/he 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. She/he adjusts the batch quantities and draws up amended values. She/he disposes of the excess concrete and cleans the equipment and tools.

She/he then mixes a new batch using the amended figures. This process continues until the manager is satisfied with the concrete quality. She/he then mixes a larger batch so that she/he can prepare specimens for testing its hardened-state properties.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

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Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLTEST308A Perform microscopic examination

UNIT DESCRIPTOR

This unit of competency covers the ability to prepare routine samples and examine them using a light microscope, standard methods and readily available advice. Personnel are required to set up microscopes for optimum resolution and observe, identify and report sample characteristics. The unit covers limited interpretation and analysis of results. Troubleshooting of equipment and procedures is not required

This unit of competency is based on, but is not equivalent to, the unit *PMLTEST301A Perform biological laboratory procedures* in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory or technical assistants in all industry sectors covered by this Training Package.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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, reagents and equipment and implement enterprise control measures
2. Set up work area for preparation and examination of samples	2.1 Collect equipment and reagents 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
	2.3 Check reagents are fit for purpose and report any items that require replacement

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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
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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel will have access to procedures that include or have been prepared from the following:

- Australian and international standards, such as:
  - AS ISO/IEC 17025 general requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243 Safety in Laboratories
  - AS 2830 Good laboratory practice
- Codes of Practice (such as GLP and GMP)
- safety manuals
- quality manuals and equipment and procedure manuals
- 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
- material safety data sheets (MSDSs)
- enterprise recording and reporting procedures

- production and laboratory schedules
- material, production and product specifications.

Preparation of samples may include:

- filtration
- centrifugation
- aseptic transfer of specimen
- selection of diluent to preserve or enhance visibility of the cells to be counted
- serial dilution to enable individual cells to be reliably counted
- selection, filling and cover slipping of a clean, dry counting chamber to ensure even distribution of cells during filling
- thin film or smear on a slide
- fixing of films to minimise cell damage and the production of artefacts
- staining of fixed material to illustrate required tissue or cell characteristics
- 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
- filling a counting chamber in one continuous flow without bubbles or overflow.

Checking sample condition may include:

- labelling
- spillage
- spoilage due to incorrect storage and transport conditions
- temperature control
- suitability for the examination.

Pre-use checks may include: calibration, cleaning and routine maintenance.

Equipment may include:

- glass slides
- counting chambers (for example, haemocytometer)
- optical graticules and stage micrometers
- tissue culture flasks.

Light microscopes may include:

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- bright field illumination microscopic examination up to 1000x magnification
- stereomicroscopes, dissection microscopes
- compound microscopes
- phase contrast microscopes
- inverted microscopes.

Biological samples may include:

- smears, impression smears, sections, squashes, films and whole mounts
- a monolayer of cells in smears and films
- 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.

Checking prepared samples may include looking for:

- clean and scratch-free microscope slides to reduce artefacts
- 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 are restricted to what can be viewed by bright field microscopy and may include:

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- number of cells (for example, 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, trajectory
- presence of stained material, such as starch
- colour/staining, morphology
- motility.

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 may include:

- micoorganisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals and stains
- sharps, broken glassware
- aerosols.

Safety practices and personal protective equipment may include:

- use of material safety data sheets (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 organisation of workbench
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent

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conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- follows enterprise standards, procedures and practices
- maintains personal safety and that of others
- uses personal protective clothing and other safety equipment correctly
- minimises cross contamination and contamination of the laboratory and environment
- minimises generation of aerosols as smears or films are prepared
- sets up the workbench and microscope ergonomically
- sets up, cleans and uses a light microscope to achieve optimum resolution of the specimen
- performs cell counts on diluted and undiluted samples
- performs basic cell measurements using grids
- logs and tracks samples through all steps from receiving a sample through to completion of a procedure and reporting
- follows enterprise quality control procedures
- correctly handles and stores samples and reagents

Underpinning knowledge

Competency includes the ability to apply and explain:

- basic structure and function of cells and organelles
- basic classes and classification of organsims of organisms, such as prokaryotes, eukaryotes, plants, animals, bacteria, viruses and prions

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- cell physiology and processes, such as simple and facilitated diffusion, plasmolysis, osmosis, tonicity, active transport, energy production, mitosis, motility, phagocytosis and pinocystosis
- parts and function of a light microscope
- purposes and mechanisms of staining (for example, Gram +ve and –ve)
- interpretation and recording of test result, including simple calculations
- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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, 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA200A Record and present data*
- *PMLTEST305B Perform aseptic techniques*
- *PMLOHS302A Participate in laboratory/field workplace safety*
- *PMLQUAL300B Contribute to the achievement of quality objectives.*

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment, such as light microscopes, samples, stains and counting chambers

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- enterprise procedures, standard methods and materials.

This competency in practice

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. She/he 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. She/he identifies the characteristic starch granules of the flour sample and records the degree of gelatinisation in the starch granules in the baked samples. She/he 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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLTEST310A Perform histological procedures

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. Personnel will work under direct supervision and have ready access to enterprise procedures. Viewing of slides is covered in *PMLTEST308A Perform microscopic examination*. More complex histological tests involving specialised stains, histochemistry and immunohistochemistry are covered in *PMLTEST503B Perform histological tests*.

This unit of competency is based on, but is not equivalent to, the unit *PMLTEST301A Perform biological laboratory procedures* in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory assistants working in biomedical, biotechnology, environmental and education 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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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 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 don’t meet specifications

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Personnel will have access to procedures that include or have been prepared from the following:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 9000 series Quality management and quality assurance standards

– AS 2243 Safety in laboratories

– AS 2830 Good laboratory practice

- Codes of Practice (such as GLP and GMP)
- safety manuals
- quality manuals and equipment and procedure manuals
- 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
- material safety data sheets (MSDSs)
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.
- instructions to comply with legislation, standards, guidelines and codes
- stock records and inventory
- waste minimisation and disposal protocols.

Equipment, reagents, specimens and systems may include:

- tissue processors
- microtomes and microtome knives (non-disposable or disposable)
- embedding centres
- flotation baths, drying ovens
- microtome knife sharpeners
- reagents, such as formaldehyde, ethanol, xylene, paraffin, 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 could include the following:

- 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).

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Pre-use checks could include: safety/serviceability, cleanliness and routine maintenance.

Hazards may include:

- micro-organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals and stains
- aerosols
- sharps, broken glassware.

Safety protocols/practices may include:

- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as gloves, safety glasses, goggles, faceguards, coveralls, gown
- 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, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- cuts sections free of wrinkles, scores and folds and at the specified thickness to demonstrate tissue and cellular structures, granules, inclusions and organelles as required

- cover slips slides, ensuring that no air bubbles are formed and material is preserved for the life of the slide
- labels slides clearly with case number, specimen and stain details
- manages tasks and organises work to ensure the timely completion of tasks
- uses specimens, reagents and materials economically and disposes of wastes safely
- uses equipment safely
- maintains equipment, recording and reporting malfunctions appropriately.
- minimises cross contamination between specimens
- maintains traceability through all steps from receiving a specimen through to completion of a procedure.

Underpinning knowledge

Competency includes the ability to apply and explain the:

- 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
- use of regressive haematoxylin and eosin staining
- 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 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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The following assessment methods are suggested:

- observation of the candidate performing tissue processing, embedding, cutting, pick up and mounting
- inspection of sections and slides prepared by candidate
- review of quality control records for sections and slides prepared 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLTEST308A Perform microscopic examination.*

Resource implications

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.

This competency in practice

Biomedical

A laboratory assistant is asked to prepare a series of 5 μm 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 H & E stain and passes the tray of prepared slides to the researcher for further analysis.

Education

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A laboratory assistant in a high school was asked to prepare sections of plant tissue using a hand microtome 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 procedure(s) 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 set-up, pre-use checks of the equipment and appropriate disposal of the sections at the end of the practical class.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

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PMLCAL400A Perform standard calibrations

UNIT DESCRIPTOR

This unit of competency covers the ability to calibrate test and measurement equipment without deviation 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.

Standard calibration procedures are sometimes complex and lengthy but must be carried out in a methodical and standard manner. Personnel are not permitted to deviate from explicit instructions in any manner, nor modify the procedure, nor substitute alternative equipment. The ability to vary standard calibrations is covered in the unit: *PMLCAL500A Perform non-standard calibrations*.

This unit of competency has no prerequisites.

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. They work under limited supervision. The 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
Prepare items for calibration	1.1 Select the authorised calibration procedure in accordance with enterprise procedures
	1.2 Identify hazards and use the 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
	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

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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
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
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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or may have been prepared from:

- Australian and international standards, such as:

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- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- ISO 5725–1, 6 Accuracy (trueness and precision) of measurement methods and results
- ISO 9000–1 Quality management and quality assurance standards Part 1 Guidelines for selection and use
- ISO 9004–1 Quality management and quality system elements – Part 1 Guidelines
- ISO 9004–4 Quality management and quality system elements – Part 4 Guidelines for quality improvement
- ISO 10012 Quality assurance requirements for measurement equipment
- Guide to the expression of uncertainty in measurement, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML
- industry/sector specific guides, such as the Eurachem/CITAC Guide on 'Quantifying Uncertainty in Analytical Measurement'

- material safety data sheets (MSDSs)
- enterprise recording and reporting procedures, 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, equipment manufacturers
- incident and accident/injury reports
- schematics, work flows, laboratory layouts, production and laboratory schedules.

Standard calibrations may involve testing and/or calibrating the following equipment and reference materials using standard methods and procedures:

- common types of 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, 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, RF power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes, watthour references
- working standards, instruments and testing equipment, such as: EMC test equipment, field strength meters, flammability test equipment, gauges/test fingers/test pins, hipot testers,

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impact hammers, impulse testers, instrument calibrators, network analysers, signal generators, spectrum and harmonic analysers.

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 may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, 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.

Reference material may include, for example:

- colour standards
- graded granular materials
- hardness blocks

This unit of competency may involve communication 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 examples, NATA)
- manufacturers of equipment and suppliers of spare parts and materials.

The working environment will have a controlled environment but could be a:

- purpose-built designed facility
- mobile facility in the field.

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- maintains very close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results (especially during lengthy tests)
- critically examines each calibration step to ensure repeatability and validity of data
- applies all relevant procedures and regulatory requirements to ensure the quality and integrity of the services or data he/she provides
- prepares test/calibration documentation that is accurate and complies with requirements
- operates equipment correctly and safely
- recognises problems or departures in systems and documentation and initiates actions to prevent or minimise them
- recognises and reports opportunities for improvements to procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- purpose of metrology and calibration, including common terminology, concepts, principles, procedures, and applications
- NATA's and NMI's role in the measurement and testing system in Australia
- traceability, including legal requirements for traceability
- requirements for the competence of testing and calibration laboratories (for example, AS ISO/IEC 17025) as they affect job role and responsibilities

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- selection and application of appropriate test methods and calibration procedures
- hierarchy and appropriate selection of reference materials and instruments
- non-conformance/non-compliance procedures and protocols associated with equipment, reference material and calibration procedures
- use of calibration and correction charts
- calculation procedures to give results in appropriate accuracy, precision and units
- troubleshooting procedures for equipment and test methods
- methods for statistical analysis (means, ranges, 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
- enterprise and/or legal traceability requirements
- relevant health, safety and environmental requirements.

Knowledge is also required of the:

- 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 and calibrations 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

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- optics and radiometry
- pressure measurements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- 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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA400A Process and interpret data*
- *any relevant PMLTEST400 series or PMLTEST500 series unit of competency.*

Resource implications

Resources may include:

- specialised calibration/test equipment, reference standards, laboratory facilities
- access to a library of calibration methods, procedures, equipment specifications
- enterprise quality manual and procedures.

This competency in practice

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

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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

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 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 QA 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

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 QA bench for checking by the supervisor. All cables and equipment used for the calibration are returned to the store.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 1	Level 2	Level 2	Level 2

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PMLDATA400A Process and interpret data

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.

This unit of competency is based on, and equivalent to, the unit *PMLDATA300A Process and record data* in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory assistants, field/laboratory technicians and instrument operators in all industry sectors covered by this Training Package.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 and associated uncertainties using given formulae and data
	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

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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 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 their 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Data may be recorded on worksheets or entered into spreadsheets or databases linked to information management systems. Data includes the 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 and control charts.

Data could also take the form of semi-quantitative observations and be expressed on a scale, for example, 1 to 4 or + to ++++.

Calculations may be performed with or without a calculator or using computer software, spreadsheets, databases and statistical packages. Examples of calculated scientific quantities could include:

- percentage and absolute uncertainties in measurements and test results
- areas (m^2) and volumes (mL, L, m^3) of regular shapes, such as packaging

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- dose (mg), average mass, mass percentage, density, specific gravity, moisture, relative and absolute humidity, viscosity, permeability
- ratios, such as mass to mass, mass to volume and volume to volume percentages
- concentration, such as molarity, g/100mL, mg/L, mg/µL, ppm, ppb, dilution mL/L
- average count, colonies per swab surface, cell counts, such as live and dead/total
- process variables, such as pressure, gauge pressure, velocity, flow rates
- biological oxygen demand (BOD), chemical oxygen demand (COD), total organic carbons (TOC)
- % content of moisture, ash, fat, protein, alcohol, sulphur dioxide, 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
- stress, strain, moduli, force.

Records could include information associated with:

- purchase of equipment and materials, service records
- safety procedures
- history of calibration and test results.

Reference materials could include:

- material safety data sheets (MSDSs)
- equipment manuals and warranty, supplier catalogues, handbooks
- sampling and test procedures, standard operating procedures (SOPs)
- enterprise quality manual, customer quality plan
- validation of the equipment and associated software where applicable
- validation of spreadsheets developed in house for assay and process calculations
- OHS regulations, guidelines and procedures
- Australian and International Standards, NATA technical notes, National Measurement Act.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent

conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- can code, record and check the documentation of data
- calculates statistical quantities relevant to his/her work and presents accurate results in the required format
- calculates scientific quantities relevant to his/her work and presents accurate results in the required format
- recognises anomalies and trends in data
- maintains the confidentiality of data in accordance with workplace and regulatory requirements
- keeps records up-to-date and secure.

Underpinning knowledge

Competency includes the ability to apply and explain:

- procedures for coding, entering, storing, retrieving and communicating data
- procedures for verifying data and rectifying mistakes
- procedures for maintaining and filing records, security of data
- relevant scientific and technical terminology, such as precision, accuracy, ‘out of control’ traceability.

Competency also includes the ability to:

- perform calculations involving fractions, decimals, ratios, proportions and percent
- perform calculations of mean, median, mode, range and standard deviation
- perform calculations of perimeters, areas, volumes, angles

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- perform calculations of scientific quantities (for example, concentration)
- use scientific notation, convert units involving multiples and submultiples
- use significant figures, round off, estimate, approximate
- calculate and interpret absolute and percentage uncertainties
- transpose and evaluate formulae
- prepare graphs, tables and charts (pie, bar, histogram) and interpret trends
- prepare and interpret process control charts.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of data work sheets, 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- technical units, such as the PMLTEST300 series and PMLTEST400 series of units
- PMLDATA501B Use laboratory application software.

Resource implications

Resources may include:

- data sets and records
- computer and relevant software or laboratory information system
- relevant workplace procedures.

This competency in practice

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 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 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, for example, 450.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

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Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 1	Level 1	Level 2	Level 2	Level 1

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PMLMAIN400A Maintain and control stocks

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.

This unit of competency has no prerequisites.

This unit of competency is relevant to experienced laboratory technicians and technical officers working in all industries who have responsibility for maintaining stock levels for their work 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'.

This unit of competency is based on, and equivalent to, the unit *PMLMAIN500A Maintain and control stocks* in PML99.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 QC sampling and testing procedures when appropriate
	1.6 Report stock problems outside own knowledge and authority limitations to relevant personnel

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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 records	3.1	Record all relevant details accurately using the 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency includes the ability to apply workplace procedures relating to:

- ordering, purchase and receipt of stocks
- verification of temperature control for delivered and stored stocks (for example, reagents containing enzymes)
- organisation of compatible batch or lot numbers
- storage of stocks, stock control, rotation of stock

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- quality control testing, monitoring of use by dates of standards and shelf life of reagents (for example, DNA, enzymes, antibodies, radioisotopes and vitamins)
- reporting non-conformance.

Information sources and documentation may include:

- Australian Standards, such as:
  - AS 2508 Safe storage and handling information cards
  - AS 1940 Storage and handling of flammable and combustible liquids
  - AS 3780 Storage and handling of corrosive substances
  - AS 4452 Storage and handling of toxic substances
  - AS 4332 Storage and handling of gases in cylinders
  - AS 2243 Safety in laboratories
- enterprise OHS manual and quality manual
- Material Safety Data Sheets (MSDSs)
- internal/external stock orders and overdue actions
- workplace procedures for cleaning
- customer database and supplier catalogues.

Records could include:

- stock usage
- orders, progress of orders
- equipment servicing and repairs
- current inventories
- QC sampling, testing and stock rotation.

Communication could require the use of equipment or systems, such as:

- telephone, fax, email, mail
- online information systems, inventories, print records, databases, catalogues
- filing systems
- Auslan.

Communication could involve:

- suppliers
- freight companies

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- internal customers
- external customers.

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, industrial gas bottles.

Safety procedures may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, coveralls, 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
- regular cleaning of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

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Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, the assessor should look to see that the candidate:

- confirms customer requirements with senior personnel where there is doubt
- accesses online databases and/or catalogues efficiently
- interprets labelling information (lot number, batch, date) and MSDSs correctly
- applies procedures for safe handling, storage and transport of stocks
- uses required safety and manual handling equipment and procedures
- performs QC sampling and testing and rotates stock in accordance with SOPs
- follows workplace procedures for predicting and/or determining demand for stock
- maintains stock at prescribed levels for their work area, through regular inspections, timely ordering of replacement items and follow up of late orders
- copes with peak and seasonal variations in stock usage and production conditions
- follows workplace procedures for researching, ordering and receipt of stock
- completes and records all documentation accurately
- demonstrates effective and appropriate communication and interpersonal skills when dealing with customers and suppliers.

Underpinning knowledge

Competency includes the ability to apply and explain:

- technical terminology relating to ordering and storage of stocks
- laboratory stock, product and service information
- common usage and International Union of Pure and Applied Chemistry (IUPAC) name for relevant chemical reagents, (if applicable)
- 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.

Assessment context and methods

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This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 QC 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLMAIN502A Maintain instruments and equipment.*

Resource implications

Resources may include:

- stocks of materials and equipment
- stock order forms and documentation
- sampling and testing equipment.

This competency in practice

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

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLOHS400A Maintain laboratory/field workplace safety

UNIT DESCRIPTOR

This unit of competency covers the ability to monitor and maintain the occupational health and safety (OHS) and environmental programs within a work area where the person has some supervisory responsibility for others. Personnel will be able to participate in risk assessment and management processes, such as working with other staff to assess and manage risks associated with technical activities, coaching others in participating in OHS and environmental management issues, being a safety representative or participating in a safety committee. Their work is done in accordance with defined enterprise policies and procedures.

This unit is based on the outcomes of the National Occupational Health and Safety Commission (NOHSC) Generic Competency Standard B [NOHSC:7025(1998) 2nd Edition]

This unit of competency has no prerequisite(s).

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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		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 in the work area	3.1	Ensure enterprise procedures are clearly defined, documented and followed
		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 OHS and the environment
6.	Support the implementation of emergency procedures	6.1	Ensure that enterprise procedures for dealing with incidents and emergencies are available and known

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within the work group	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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Enterprise policies, procedures and programs incorporate all relevant aspects of OHS legislation and the codes, regulations and Australian standards applying to environmental hazards and dangerous goods.

OHS legislation is State and Territory based and includes general OHS Act and hazard specific regulations and Codes of Practice especially those relating to environmental hazards and dangerous goods.

Industry standards, codes and guidelines include:

- AS 2243 Safety in laboratories
- AS 2982 Hand washing facilities
- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 1678 Emergency procedures guide for hazardous materials
- AS 2500 Storage of goods
- AS 2503 Safety storage and handling of information cards
- AS 1940 Storage and handling of flammable and combustible liquids
- AS 3780 Storage and handling of corrosive liquids
- AS 4452 Storage and handling of toxic substances
- standards for the segregation of wastes (AS 2243.3 and AS 2243.4)
- AS/NEC/ISO 14000
- Australian Dangerous Goods Code

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- Australian Code for Transport of Dangerous Goods
- guidelines for the operation of classes of laboratories
- Australian Quarantine Inspection Service guidelines for the importation of biological products
- National Code of Practice for the labelling of workplace substances (NOHSC:2012)
- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms.

A hazard is a source or situation with a potential for harm in terms of human injury or ill-health, damage to property, the environment or a combination of these. Physical hazards may be considered to be sources of energy that, if not controlled, may cause injury or damage.

Hazards may include:

- electric shock
- microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- solar radiation, dust, noise
- chemicals, such as acids, heavy metals, pesticides, hydrocarbons
- aerosols from broken centrifuge tubes, pipetting
- radiation, such as alpha, beta, gamma, X-ray, 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, 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 in confined spaces
- crushing, entanglement, cuts associated with moving machinery or falling objects
- pedestrian and vehicular traffic
- vehicle and boat handling.

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Addressing hazards may include:

- hazard and incident reporting and investigation procedures
- elimination
- substitution, such as review of nature of substances or processes used
- isolation, such as:
  - 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, materials safety data sheets 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 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 material safety data sheets (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, gown, body suits, respirators and safety boots.

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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.

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, 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, batch sheets
- industry Codes of Practice and guidelines.

Risk is the chance of something happening that will result in injury or damage. It is measured in terms of consequences and likelihood. Risk management is the systematic process that is directed towards identifying hazards, assessing the risk and developing controls to minimise the risk and monitoring the effectiveness of the controls (and taking action as required). It may include using a risk register.

Risk assessment is a process that involves analysing the risk, identifying 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 pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring control.

Hierarchy of control is also referred to as the 'safety decision hierarchy' and describes the preferred order of risk-control measures from most to least preferred, that is:

eliminating risk

substituting with a lesser hazard

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isolating personnel from hazard

engineering controls

applying administrative controls, for example, procedures and training

using personal protective equipment.

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 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 on line software for the inventory, manifest and information retrieval regarding hazardous materials
- 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 include:

- workplace injury and accidents

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- biological and chemical spills
- leakage of radioactivity
- fire
- bomb threat
- security threat.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- works safely at all times
- ensures others in the workgroup work safely and follow OHS and environmental policies and procedures for hazard identification and risk control
- communicates health and safety and environmental issues with designated personnel
- ensures that enterprise procedures for dealing with incidents and emergencies are available and known by work group
- communicates effectively with personnel at all levels within the enterprise and OHS specialists
- can prepare brief reports for a range of target groups, including OHS committee, OHS representatives, managers and supervisors.

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Underpinning knowledge

Competency includes the ability to apply and explain:

- 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.

Knowledge is also required of:

- the elements of an Occupational Health and Safety Management System (OHSMS) 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 (for example language and literacy, communication skills, cultural background, gender, workers with special needs, part time, casual or contract workers).

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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

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- written and/or oral questioning to assess underpinning knowledge of principles and practices of effective OHS management and the enterprise's OHSMS, 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 aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with any other relevant technical units in the context of the need to perform all work safely.

Resource implications

Resources may include:

- laboratory/field work environment, equipment and materials
- personal protective equipment, safety equipment
- enterprise OHS management system, policies and procedures

This competency in practice

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 material data safety sheets 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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

PMLORG400A Prepare practical science classes and demonstrations

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. Personnel are required to assess and treat risks associated with practical activities. They may work autonomously but are required to liaise closely with teaching staff about the design and scheduling of practical activities.

This unit of competency has no prerequisites.

This unit of competency is applicable to technical assistants and technical officers working in the secondary and tertiary education sectors and those zoos, aquariums and museums that run education programs. Some personnel may have the additional role of fire warden, first aid officer or OHS representative. They may also have other skills, such as boating, SCUBA diving or trade qualifications.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 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

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			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,

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as necessary.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, enterprise procedures and test methods. These procedures include or have been prepared from regulations, codes and guidelines, including:

- AS 2243 Safety in laboratories
- AS 2982 Hand washing facilities
- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 1678 Emergency procedures guide for hazardous materials
- AS 2500 Storage of goods
- AS 2503 Safety storage and handling of information cards
- AS 1940 Storage and handling of flammable and combustible liquids
- AS 3780 Storage and handling of corrosive liquids
- AS 4452 Storage and handling of toxic substances
- standards for the segregation of wastes, such as AS 2243.3 and AS 2243.4
- AS/NEC/ISO 14000
- Australian Dangerous Goods Code
- Australian Code for Transport of Dangerous Goods
- guidelines for the operation of classes of laboratories
- permits for wildlife capture and handling
- animal welfare and ethics requirements, Codes of Practice
- Australian Quarantine Inspection Service guidelines for the importation of biological products
- National Code of Practice for the labelling of workplace substances (NOHSC:2012)

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- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically-altered organisms.

Hazards may include:

- electric shock
- microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- solar radiation, dust, noise
- exposure to extreme weather conditions
- snake, insect and animal bites
- chemicals, such as acids, heavy metals, pesticides, hydrocarbons
- aerosols from broken centrifuge tubes, pipetting
- radiation, such as alpha, beta, gamma, 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, 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 in confined spaces
- crushing, entanglement, cuts associated with moving machinery or falling objects
- vehicle and boat handling.

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

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- handling and storing hazardous materials and equipment in accordance with labelling, materials safety data sheets 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 hats, hearing protection, gloves, safety glasses, coveralls, gown, 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 is the chance of something happening that will result in injury or damage. It is measured in terms of consequences and likelihood. Risk management is the systematic process that is directed towards identifying hazards, assessing the risk and developing controls to minimise the risk and monitoring the effectiveness of the controls (and taking action as required). It may include using a risk register.

Risk assessment is a process that involves analysing the risk in order 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 pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring control.

Hierarchy of control is also referred to as the ‘safety decision hierarchy’ and describes the preferred order of risk control measures from most to least preferred, that is:

1 eliminating risk

2 substituting with a lesser hazard

3 isolating personnel from hazard

4 engineering controls

5 applying administrative controls, for example, procedures and training

6 using personal protective equipment.

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Personnel may use computers for communication (email and internet) word processing and preparation of spreadsheets.

Typical materials may include:

- live flora and fauna, such as plant specimens
- animals, such as rats, bacteria, algae, insects, fungi
- blood and blood products, human or animal tissue and fluids
- teaching aids, such as textbooks, videos
- distilled water, reagents, chemicals, disinfectants, detergents, agar media and plates
- consumable items, such as syringes, pipette tips, weigh boats
- oils/lubricants, fuels, industrial gases, cryogenics, such as dry ice and liquid nitrogen
- equipment spares, such as fuses, bulbs, batteries
- paper, stationery
- reference samples and standards.

Typical equipment may include:

- analytical instruments, such as UV/VIS and AAS spectrometers; GC, HPLC.
- animal cages
- autoclaves
- balances
- blenders, centrifuges and separating equipment
- cell counters, staining machines
- dishwashers, refrigerators, freezers, ovens, microwave ovens, incubators, water baths
- fume hoods, biohazard containers, biological safety cabinets
- gas cylinders
- glassware (burettes, pipettes); plastic ware; glass, plastic, quartz cuvettes
- hotplates, mantles, burners, muffle furnaces
- light and fluorescence microscopes
- microtomes, tissue processors
- teaching aids, such as VCR and DVD players, computers
- thermometers, pH meters and ion selective electrodes

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- ultrasonic cleaners
- analytical instruments, such as UV/VIS and AAS spectrometers, gas chromatograph GC.

Incidents and emergencies include:

- workplace injury and accidents
- biological and chemical spills
- leakage of radioactivity
- fire
- bomb
- security threats.

Contingencies may include:

- new information
- urgent requests
- modified activities
- changed situations
- late instructions from appropriate personnel
- substitution of reagents.

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 may involve:

- teaching staff
- other technical staff
- students during practical classes
- students doing projects or postgraduate studies.

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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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- clarifies/designs practical activities and assesses resource needs
- works with teaching staff and students to assess risks, develop and implement controls and monitors their effectiveness
- prepares laboratory experiments and demonstrations on time with the correct materials and equipment
- works with teaching staff and students to ensure all practical activities are performed safely (through demonstrations and monitoring of practical activities)
- manages contingencies and resources within level of responsibility
- maintains the laboratory fit for purpose
- liaises with suppliers to obtain stocks of materials and equipment using enterprise procedures

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- works effectively with students and staff who may have diverse work styles, cultures and perspectives.

Underpinning knowledge

Competency includes the ability to apply and explain:

- scientific terminology used in common practical activities
- relevant legislation, regulations, 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 and risk management, hierarchy of control
- problem solving techniques and contingency planning
- relevant enterprise health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS400A Maintain laboratory/field workplace safety*

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- *any of the PMLTEST400, PMLTEST500 and PMLMAIN500 series of units relevant to the practical activities conducted.*

Resource implications

Resources may include:

- laboratory/field work environment, equipment and materials
- personal protective equipment, safety equipment
- enterprise OHS management system, policies and procedures

This competency in practice

Education

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

A technical officer has responsibility for the technical 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 3	Level 3	Level 2	Level 2	Level 2

PMLQUAL400B Contribute to the ongoing development of HACCP plans

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 action(s) and complete the review and update of documents and systems related to HACCP plans.

This unit of competency has no prerequisites.

This unit of competency is applicable to technical assistants working in food and beverage processing and pharmaceutical industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 action(s) 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

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2.	Provide support for the implementation of HACCP plans	2.1	Analyse roles, duties and current competency of 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 document(s)
		3.3	Validate the effectiveness of changes to the HACCP plan.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency is relevant to experienced technical officers who may work individually or as part of a team. During the review or development of a HACCP Plan, personnel may need to access:

- manufacturers/suppliers specifications
- recording sheets
- equipment instructions
- relevant legislation
- equipment operation manuals
- standard operating procedures (SOPs)
- work instructions
- result forms
- Food Standards Codes
- Pharmaceutical Standards Codes.

The computer software packages used for the development and implementation of HACCP plans will vary between and within industry sectors.

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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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, the assessor should look to see that the candidate:

- obtains necessary data and results
- analyses data and identifies corrective action
- develops a corrective action plan
- monitors and evaluates effectiveness of any changes suggested within the context of the ongoing development of HACCP plan
- consults and communicates appropriately with associated personnel
- recognises major and minor non-conformities
- constructs flow diagrams, hazard analysis tables
- delivers training to workplace personnel to assist their understanding of their roles and responsibilities for the implementation of HACCP
- documents and presents recommendations and changes.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the principles of HACCP and relationship to food or pharmaceutical safety

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- communication channels and consultative arrangements
- flow chart symbols
- problem solving techniques to identify cause and options to remedy problems
- the production process
- control charts, control limits and control measures
- microbiological and chemical safety hazards
- risk assessment
- critical control points
- quality improvement tools and techniques, including statistical process control
- procedures for addressing non-compliance
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLQUAL301B Apply critical control point requirements
- PMLQUAL300B Contribute to the achievement of quality objectives.

Resource implications

Resources may include:

- access to all appropriate documentation, such as HACCP plan and quality manuals.

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This competency in practice

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 is 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 1	Level 2	Level 1

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PMLQUAL401B Apply quality system and continuous improvement processes

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 and detect non-conformances and work with others to suggest improvements in productivity and quality.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory technicians working in all industry sectors who are most likely to contribute to quality improvements in areas or processes associated with their own job function and/or specialisation.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 practice
	1.6 Conduct work in accordance with sustainable energy work practices
	1.7 Promote sustainable energy principles and work practices to other workers

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2.	Analyse opportunities for corrective and/or optimisation action	2.1	Compare current work practices, procedures and 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 cause(s) to predict likely impacts of change(s) and decide on the appropriate action(s)
		3.2	Identify required change(s) to standards and procedures and training
		3.3	Report recommendations to designated personnel
4.	Participate in the implementation of recommended action(s)	4.1	Implement approved action(s) and monitor performance following change(s) to evaluate results
		4.2	Implement change(s) to systems and procedures to eliminate possible causes
		4.3	Document outcomes of actions and communicate them to relevant personnel

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency is relevant to experienced technical officers who may work individually or as part of a team.

Quality manuals and procedures may be based on standards, such as:

- ISO 9001, 9002 and 9003 series Quality management and assurance standards
- ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- NATA requirements of signatories
- Good laboratory practice (GLP), good manufacturing practice (GMP), the British Standard BS 5750 and the OECD Principles of good laboratory practice
- enterprise and customer product specifications
- AS1199 Sampling procedures and tables for inspection by attributes
- AS1399 Guide to AS1199.

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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.

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 may involve:

- supervisors, managers and quality managers
- administrative, laboratory and production personnel
- internal/external contractors, customers and suppliers.

Reporting may involve:

- verbal responses
- data entry into laboratory or enterprise database
- brief written reports using enterprise proformas.

Quality improvement opportunities that directly relate to the work of technical assistants and officers could include improved:

- production processes
- hygiene and sanitation procedures
- reductions in waste and re-work
- laboratory layout and work flow

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- safety procedures
- communication with customers
- methods for sampling, testing and recording data.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- applies all relevant procedures and regulatory requirements to ensure the quality and integrity of the products/services or data they provide
- applies and promotes sustainable energy principles and work practices
- detects non-conforming products or services in the work area
- follows enterprise procedures for documenting and reporting information about quality
- contributes effectively within a team to recognise and recommend improvements in productivity and quality
- applies effective problem solving strategies
- implements and monitors improved practices and procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- specifications for laboratory products and services in the candidate's work area

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- 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
- methods for statistical analysis (means, median, mode, ranges, standard deviations) and statistical sampling procedures
- sustainable energy principles
- problem solving techniques, such as:
  - identifying inputs and outputs
  - sequencing a process
  - identifying and rectifying a problem step
  - root cause analysis
  - implementing preventative strategies
- relevant health, safety and environment requirements.

The candidate should also demonstrate the ability to select and apply quality improvement tools and techniques, for example:

- run charts, control charts, histograms and scattergrams to present routine QC data
- PDCA (plan, do, check, act)
- Ishikawa fishbone diagrams, cause and effect diagrams
- logic tree
- similarity/difference analysis
- Pareto charts and analysis
- force field/SWOT analysis.

Knowledge is also required of the:

- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- lines of communication
- role of laboratory services to the enterprise and customers.

An appreciation of the link between the enterprise's quality systems and business goals is required as a basis for decision making and action.

Specific industry

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Additional knowledge requirements may apply for different industry sectors. For example, in the biomedical sector:

- ethical requirements dealing with patient confidentiality
- regulations pertaining to trapping, tagging and handling of animals (Code 64)
- guidelines for pre-transfusion testing
- OGTR Guidelines for large scale, small scale and planned release of genetically-manipulated organisms (Office of the Gene Technology Regulator).

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of documentation completed by the candidate 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSAMP400B, PMLTEST400 and PMLTEST500 series units.

Resource implications

Resources may include:

- enterprise quality manual and procedures
- quality control data/records
- customer complaints and rectifications
- candidate's supervisors and peers.

This competency in practice

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

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experienced technician agreed that this was feasible, but suggested that because the waste was petroleum high in chromium the team should consider 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 industries

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 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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLSAMP400B Obtain representative samples in accordance with sampling plan

UNIT DESCRIPTOR

This unit of competency covers the ability to obtain a range of samples that are representative of the source material (raw ingredients, product in process, final product) and to prepare the samples for testing. All sampling activities are to be in accordance with a defined sampling plan. This unit does not cover the subsequent testing of the samples.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory technicians in all industry sectors covered by this Training Package.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Prepare for sampling	1.1 Confirm the sampling location(s), 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
	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

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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, 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

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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

5.4 Minimise the generation of wastes and environment impacts

5.5 Ensure the safe collection of all hazardous wastes for appropriate disposal.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency may cover laboratories or processing sites and may involve:

- a range of sampling plans, samples and sampling procedures, which apply to the enterprise site, plant laboratory or field sites
- enterprise products/materials, hazardous materials
- a range of sampling points and/locations
- methods and procedures which may be written to meet enterprise, client and/or regulatory/certifying body requirements.

Samplers usually have access to information, such as:

- enterprise and/or client sampling schemes and sampling plans
- industry methods, such as American Association of Cereal Chemists (AACC) Preparation of samples
- enterprise and/or client procedures
- material safety data sheets (MSDSs)
- relevant Australian Standards, such as:

– AS 1678 Emergency procedures guide for hazardous materials

– AS 2500 Storage of goods

– AS 2503 Safety storage and handling of information cards

– AS 1940 Storage and handling of flammable and combustible liquids

– AS 3780 Storage and handling of corrosive liquids

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- AS 4452 Storage and handling of toxic substances
- Australian Dangerous Goods Code
- Australian Code for Transport of Dangerous Goods
- National Code of Practice for the labelling of workplace substances (NOHSC:2012)

- site plans, maps and specifications
- enterprise recording and reporting procedures.

Materials sampled may include:

- gas or air samples
- liquid samples, such as water, groundwater, wastewater, stormwater, sludges, 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, materials used in production processes, such as flocculants
- plants
- animals
- microbiological 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 may include but are not limited to:

- shovels, augers, chain saws
- sampling frames, sampling tubes, dip tubes, spears, flexible bladders, syringes
- front-end loader, backhoe, excavator, drill rig
- sample bottles or containers, plastic containers and disposable buckets
- access valves
- sample thief

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- auto samplers
- pumps, stainless steel bailers
- traps and cages
- sterile containers, pipettes, inoculating loops, disposable spoons.

Maintenance of integrity of samples could include:

- use of compatible container, such as glass, plastic, amber, 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 may include:

- solar radiation, dust and noise
- wildlife, such as snakes, spiders, domestic animals
- biohazards, such as micro-organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals, such as acids and hydrocarbons
- aerosols
- sharps, broken glassware
- manual handling of heavy sample bags and containers
- crushing, entanglement, cuts associated with moving machinery and hand tools
- vehicular and pedestrian traffic.

Safety procedures may include:

- use of material safety data sheets (MSDSs)

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- use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gown, body suits, respirators, 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, enterprise procedures and regulations
- regular cleaning and/or decontaminating equipment and work areas
- machinery guards
- signage, barriers, service isolation tags, traffic control, flashing lights
- lockout and tagout procedures.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- collects the specified quantity of sample to enable all processing and testing to occur and backup samples to be stored
- obtains a sample that is representative of the bulk material
- preserves the integrity of samples by closely adhering to procedures
- labels samples and subsamples to satisfy enterprise/legal traceability requirements
- identifies atypical materials and samples and takes appropriate action
- maintains sampling equipment in appropriate condition

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- completes sampling records using enterprise procedures
- follows safety regulations and enterprise OHS procedures during sampling, transport and storage
- follows relevant legislative requirements for the disposal of waste and the preservation of the environment.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the links between correct OHS procedures and personal and environmental safety particularly at high risk sites
- the basic principles of sampling, including:

– 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, stratified sampling

- characteristics of product/material to be sampled and likely contaminants
- links between quality control, quality assurance and quality management systems and sampling procedures
- enterprise procedures dealing with legislative requirements for the handling, labelling and transport of hazardous goods
- 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, for biomedical and environmental services:

- specific legislation on biohazards
- guidelines for infection control in the health-care setting
- OGTR Guidelines for the handling of genetically manipulated cells
- documentation procedures for the chain of custody for samples to be used as evidence or for blood transfusion.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA400A Process and interpret data
- *PMLOHS302A Participate in laboratory/field workplace safety*
- *any of the PMLTEST400 and PMLTEST500 series units relevant to the sampling.*

Resource implications

Resources may include:

- variety of sample types
- sampling plans
- a selection of sampling containers and sampling equipment.

This competency in practice

Manufacturing

A metallurgical laboratory technician is very familiar with preparing representative samples for a range of final products in a steel-making 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

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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 PPE 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLSAMP401A Prepare mineral samples for analysis

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 to take appropriate corrective actions.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory personnel 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Interpret and schedule client requirements	1.1 Review client request to identify sample/analysis requirements, preparation methods and equipment involved.
	1.2 Inspect sample(s), 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

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2.	Prepare client sample(s) for analysis	2.1	Estimate safe times for the preparation of required sample proportions
		2.2	Split sample(s) to obtain representative sub-samples as required
		2.3	Safely operate comminution equipment
		2.4	Monitor texture of the sample(s) 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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS4433.2 Guide to the sampling of particulate materials — Preparation of samples
  - AS3988 Copper, lead, zinc, gold and silver ores — Guide to sample preparation for the determination of gold
- Codes of Practice, such as GLP and GMP
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs) and published preparation methods
- quality manuals, equipment and procedures manuals
- equipment startup, operation and shutdown procedures
- enterprise recording and reporting procedures
- production and laboratory schedules.

Samples may include:

- solids, such as rocks, minerals, soils, sands, stream sediments
- core and other drill samples, such as RAB, RC, aircore
- slurries, powder concentrates, metallurgical solutions
- dump samples, grab samples.

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Client requests/documentation may include:

- client profile, sample identification and sample receipt
- preparation methods, storage and analyses required
- service charges.

Preparation methods may include:

- sorting, boxing and drying
- sieving
- primary crushing (for example, 10mm, 2mm)
- fine pulverising (for example, 100 micron, 75 micron)
- partial digestion requiring separation (for example, aqua regia)
- complete digestion (for example, multi-acid digest)
- non destructive (for example, LIF, $Li_2B_4O_7$ disks)
- solvent extraction (for example, di isobutyl ketone dibK).

Preparation equipment may include:

- splitters (for example, riffles, rotary dividers)
- mills (for example, ball, ring, rod)
- bowls (for example, chrome-steel, tungsten-carbide, zirconia) and tumblers
- crushers (for example, cone, jaw, roll), grinders, disc pulverisers
- sieves
- ovens, muffle furnaces, hot plates, microwave ovens
- ultrasonic baths
- centrifuges, vacuum and pressure filtration
- volumetric glassware/plasticware, dispensers
- analytical balances
- autosamplers
- sample containers, labels.

Hazards may include:

- asbestiform minerals, dust, silica, fibrous samples

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- chemicals, such as hydrofluoric acid, bromine, perchloric acid, aquaregia, cyanide, lead-based compounds, free-mercury, nickel compounds
- noise, vibration
- crushing, entanglement, cuts associated with moving machinery
- manual handling of heavy loads, such as sample bags
- heat, exhaustion, stress, fatigue.

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, fumehoods
- guards for moving machinery parts
- noise insulation
- using personal protective equipment, such as mask, gloves, boots, goggles, coats, ear muffs, 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, cyanide
- 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.

Critical preparation steps that determine analytical accuracy and precision may include:

- monitoring drying (incipient, total)
- mixing to ensure homogeneity before subsampling
- suitability of reagents for purpose (for example, dryness)
- accurate operation of dispensers and balances
- critical/non critical volumes, critical reagent quantities
- temperature control during digests
- loss of solution prior to/after mixing
- type and acid strength in final solutions

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- mechanical loss of digest (sputtering, residues on glassware/plasticware, filtering).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- recognises hazards and works safely at all times
- interprets and closely follows preparation methods
- prepares a range of samples that consistently meet client requirements (that is, representative, free of contamination, specified quantity and particle size, ready for analysis)
- recognises problems, atypical preparation stages and implements corrective actions
- achieves required sample throughput
- recognises limitations and seeks timely advice
- minimises rework, waste and environmental impact
- disposes of all waste, surplus and spent samples responsibly.

Underpinning knowledge

Competency includes the ability to apply and explain:

- geological properties of common samples, such as sulphides, oxides, silicates
- terminology, such as homogeneous, heterogeneous, integrity, segregation

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- 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, equilibria
- tracking analytes of interest during changes of state
- safety information (for example, MSDSs)
- 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, conversions
- enterprise and/or legal traceability requirements
- relevant health, safety and environmental requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLOHS302A Participate in laboratory/field workplace safety*
- *PMLDATA200A Record and present data.*

Resource implications

Resources may include:

- a variety of mineral samples
- mineral preparation methods, standard operating procedures
- mineral preparation equipment, materials, reagents
- safety equipment.

This competency in practice

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 subsample 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST402B Prepare, standardise and use solutions

UNIT DESCRIPTOR

This unit of competency covers the ability to prepare, standardise and use solutions to monitor the quality of prepared solutions.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory technicians working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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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
		3.3	Record all relevant details as per laboratory procedures and report results
		3.4	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 as per 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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by laboratory technicians who prepare, standardise and use solutions and monitor the quality of the prepared solutions.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures may include or have been prepared from:

- Australian and international standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243 Safety in laboratories
  - AS 2830 Good laboratory practice
- Codes of Practice, such as GLP and GMP
- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals
- enterprise and reporting procedures
- production and laboratory schedules
- material, production, product and solution specifications
- waste minimisation and safe disposal procedures.

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.

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Apparatus and reagents which may be used to prepare standard solutions include:

- balances
- pipettes, burettes, volumetric glassware, weighing bottles
- dessicators, filtering media
- ovens, muffle furnaces
- solutions, indicators, primary and secondary standards
- auto titrators, pH meters and other related meters and electrodes for determining equivalence points, top pan and analytical balances
- magnetic stirrers and heaters, water baths.

Checking useability of solutions could include:

- examining stained samples for correct staining reactions
- performing pH checks
- confirming enzyme activity
- checking red cell suspensions for haemolysis.

Hazards may include:

- chemicals, such as strong acids and bases, stains
- sharps, broken glassware
- burners, hot plates, ovens, furnaces.

Safe work practices may include:

- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as gloves, safety glasses, goggles, faceguards, coveralls, gown
- use of biohazard containers, laminar flow cabinets, fumehoods
- correct labelling of reagents and hazardous materials
- handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning and/or decontaminating of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent

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conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, the assessor should look to see that the candidate can:

- use balances and volumetric glassware appropriately
- select and use primary and secondary standards appropriately
- select and use indicators appropriately
- select and care for electrodes appropriately
- perform QA checks for solution performance (for example, enzyme activity, ferric chloride for phenolic solutions, isotonicity for saline)
- 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
- record results to enterprise standards
- label and store solutions in accordance with enterprise procedures
- interpret and follow enterprise standard operating procedures (SOPs)
- interpret and use safety information, such as that provided by material safety data sheets (MSDSs) and follow relevant safety procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- solution terminology, chemistry of acids, bases, buffers, redox reactions and complexometric reactions

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- grades of glassware, reagents and their use
- reactions used for standardisation and desirable characteristics
- determination of equivalence points using indicators and graphical methods
- calculation methods, including appropriate units, uncertainties and balancing equations
- enterprise communication and reporting procedures
- OHS procedures, including those for using corrosive materials
- relevant health, safety and environment requirements.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLTEST400* and *PMLTEST500* series units dealing with sampling, tests and measurements.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate volumetric equipment
- laboratory reagents and equipment
- standard operating procedures (SOPs) and testing methods.

This competency in practice

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

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volumetric flask. This solution of known concentration is then titrated with acids of unknown concentration and the concentration of the acids determined.

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. The technician reported the incident along with the results to the supervisor, who decided that the enzymes could be used for that day.

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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST403B Assist with geotechnical site investigations

UNIT DESCRIPTOR

This unit of competence covers the ability to assist with geotechnical site investigations. This competency is typically performed by laboratory technicians working under the guidance of a geotechnical (para)-professional or engineer.

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Prepare for on-site operations	1.1 Identify the job, location, appropriate procedures and safety requirements
	1.2 Identify site hazards and use appropriate personal protective equipment and safety procedures as specified for 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, equipment and materials in accordance with job requirements
	1.5 Select suitable transport for site access
	1.6 Ensure site access requirements, such as entry permits and safety inductions have been organised

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2.	Assist with excavation of boreholes, test pits and/or trenches	2.1	Identify the sampling/testing location
		2.2	Excavate or supervise 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, recording the reason for termination
		2.6	Clean up on completion, backfilling or sealing the excavation or ensuring that it is left in a safe and uncontaminated condition
3.	Assist with sampling	3.1	Prepare sampling equipment and materials
		3.2	Take disturbed and undisturbed samples in accordance with established practices
		3.3	Label samples and record details in accordance with established practices
		3.4	Handle and transport samples in accordance with established practices
		3.5	Clean and maintain sampling equipment, avoiding environmental damage, including stormwater contamination
4.	Assist with testing	4.1	Prepare test equipment and materials
		4.2	Perform or assist in performing tests in accordance with established practices
		4.3	Record test data in accordance with established practices
		4.4	Clean and maintain testing equipment, avoiding environmental damage, including stormwater contamination

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5. Maintain records	5.1 Record data in accordance with established practices
	5.2 Maintain equipment records in accordance with established practices
	5.3 Maintain confidentiality of enterprise information.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competence describes the work conducted by laboratory operators or technicians conducting sampling and testing at construction, mining or drilling sites.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements may include or have been prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, 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 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, slopes
- vehicular and pedestrian traffic.

Safety procedures may include:

- location of site services before investigations commence

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- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as hard hat, hearing protection, sunscreen, gloves, masks, goggles, coveralls, safety boots
- 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, traffic control.

Tools and equipment may include:

- hand tools, including shovels, crowbars, scoops, spanners, wrenches, tape measure
- consumables, including sample bags, labels, sample tubes, wax
- documentation, including maps, plans, worksheets
- field test equipment, including DCP, SPT, shear vane, pocket penetrometer, water level indicator
- safety clothing and equipment, including helmet, boots, gloves, earmuffs, glasses
- excavation equipment, including hand and power augers.

Typical skills may include:

- working safely with equipment and around earthmoving plant
- driving safely on- and off-road
- working safely in field conditions
- setting up and maintaining tools and equipment
- using tools and equipment to perform basic sampling techniques
- using tools and equipment to perform basic in-situ testing techniques
- cleaning equipment before leaving site in compliance with environmental authority requirements
- reading site plans and operating GPS equipment to locate sampling positions
- identification of soil, rock and fill materials
- observing and recording information on testing and sampling
- making basic measurements of plan location and depth
- handling and storing samples appropriately.

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Typical problems include:

- caving of the excavation
- drilling difficulties
- not knowing the requirements of the design engineer
- not understanding the nature of the item being designed (for example, retaining wall, piled structure, 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, construction activities.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- identifies and locates site services, sampling and testing sites
- identifies problems in siting (for example, services) immediately
- takes representative samples

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- identifies and describes materials accurately
- handles and transports samples correctly
- records sampling and testing information
- uses tools and equipment effectively and efficiently
- observes, interprets and reports on the geotechnical conditions
- communicates problems to appropriate personnel
- records and communicates work results
- works safely.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the basic concepts, purposes and principles of geotechnical site investigation
- identification and classification of materials
- engineering properties of soil and rock materials
- representative sampling and testing
- map and drawing interpretation
- uses of soil and rock materials in engineering and construction
- in-situ testing methods
- relevant health, safety and environment requirements.

Assessment context and methods

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.

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

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSAMP302A Handle and transport samples or equipment
- PMLSAMP400B Obtain representative samples in accordance with a sampling plan
- PMLTEST300B Perform basic tests.

Resource implications

Resources may include:

- access to sites, tools, equipment
- enterprise procedures, sampling plans, test methods and equipment manuals.

This competency in practice

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 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, 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 one metre at regular intervals in the proposed roadways to obtain samples for California Bearing Ratio tests. Adjacent to each, he/she performs a dynamic cone penetrometer test to two metres to assess the in-situ material.

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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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST404A Perform chemical tests and procedures

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.

This unit of competency is based on, and is equivalent to, the unit *PMLTEST401A Perform instrumental tests/procedures.*

This unit of competency has no prerequisites.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 procedure
	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 reporting of results
3. Check equipment before use	3.1 Set up equipment/instruments in accordance with test method requirements

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		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	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

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		6.3	Ensure the safe collection of laboratory and hazardous waste for subsequent disposal
		6.4	Care for and store equipment and reagents as 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243.2 Safety in Laboratories — Chemical aspects
  - AS 2830.1 Good laboratory practice — Chemical analysis
  - AS 2162.1 General — Volumetric glassware
  - AS 2134.1 Flame atomic absorption spectrometry
  - AS 3753 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry
- industry methods, such as RACI and/or AACC methods for inorganic constituents
- Codes of Practice (such as GLP and GMP)
- National Measurement Act
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- quality manuals and equipment and procedure manuals

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- equipment startup, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Preparation of samples may include processes, such as grinding, mulling, preparation of discs, digestion, dissolving, ashing, refluxing, extracting, filtration, evaporation, flocculation, precipitation, washing, drying and centrifugation.

Non instrumental test/procedures may include:

- gravimetric analysis, such as:
  - loss on drying
  - suspended solids
  - ashes, such as sulphated and gravimetric assays (for example, sulphates and nitrogen in fertilisers)
  - Ni by dimethylglyoxime
  - bitumen content of asphaltic concrete
- titrimetric analysis, such as:
  - acid/base determinations
  - complexiometric, such as water hardness, Fe by dichromate, binder content analysis
  - redox, such as precipitation of chlorides in water
  - dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD)
- filtration, separation, solvent extraction techniques
- corrosion testing, cement content, accelerated weathering.

Instrumental tests may include spectrometric, chromatography and electrochemical methods.

Types of instrumentation and instrumental techniques may include:

- colorimetric, such as enzyme activity, chlorine in water, specific cations and anions
- infrared, ultraviolet and visible spectrophotometry
- other spectrometric techniques, such as:
  - fluorimetric analysis, flame atomic emission, flame atomic absorption spectrometry
  - fourier transform infrared

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- chromatographic techniques, such as:

– column and thin layer analytical and preparative chromatography

– paper, gas, liquid chromatography and HPLC for purity, raw material and formulation checks

– ion chromatography for detection of nitrates, phosphates, sulphates, chlorides, bromides

– gel filtration chromatography for purification of proteins

– affinity chromatography for purification of immunoglobulins

- electrochemical techniques, such as: pH, eH, conductivity, ion selective electrodes
- electrophoretic techniques for DNA patterns and determination of protein purity

- soil testing, such as:

– moisture content

– organic matter content

– specific anions and cations

- autoanalysers for determination of total P, total Kjeldahl N, orthophosphate, nitrite/nitrate, ammonia.

Chemical tests may include methods for:

- control of starting materials, in-process materials and finished products
- environmental monitoring
- basic troubleshooting and/or problem solving within the scope of standard operating procedures (SOP) and enterprise processes.

Hazards may include:

- chemicals, such as:

– acids, for example, sulphuric, perchloric, hydrofluoric

– heavy metals, pesticides

– anions, for example, fluoride

– hydrocarbons, for example, mono-aromatics

- aerosols from broken centrifuge tubes, pipetting
- sharps, broken glassware
- flammable liquids and gases
- cryogenics, such as dry ice and liquid nitrogen

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- 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 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, materials safety data sheets 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
- 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.

Records may include:

- test and calibration results
- equipment use, maintenance and servicing history
- faulty or unsafe equipment.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and

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Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets test methods/procedures accurately
- prepares and tests samples using procedures appropriate to the nature of sample
- performs calibration checks (if required)
- safely operates test equipment/instruments to enterprise standards and/or manufacturer's specification
- prepares calibration graphs and calculates results using appropriate units and precision
- applies basic theoretical knowledge to interpret gross features of data and makes relevant conclusions
- identifies atypical results as out of normal range or an artefact
- traces and sources obvious causes of an artefact
- communicates problem(s) to a supervisor or outside service technician
- records and communicates results in accordance with enterprise procedures
- maintains security, integrity, traceability of samples, sub-samples, test data and results and documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

- chemical principles and concepts underpinning test/procedure, such as:
  - ions, atoms, molecules, bonding and links to chemical properties
  - chemical reactions involving acid/base, redox, complex ion formation, solubility and equilibrium
  - energy levels, absorption/emission spectra
- use of instruments for qualitative and/or quantitative analysis
- purpose of the test(s)

- metrology and/or separation techniques underpinning test/procedure
- 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
- sample preparation procedures
- reagent maintenance and evaluation procedures
- basic equipment/method troubleshooting procedures
- use of calibration procedures
- calculation steps to give results in appropriate units and precision
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA400A Process and interpret data
- PMLTEST402B Prepare, standardise and use solutions.

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Resource implications

Resources may include:

- standard laboratory equipped with appropriate test equipment/instruments, standards and reagents
- enterprise procedures and standard methods.

This competency in practice

Manufacturing

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 standard operating procedures (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 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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2

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PMLTEST405A Perform food tests

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.

This unit of competency has the following prerequisite:

- PMLTEST308A Perform microscopic examination

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 procedure
	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 reporting of results
3. Check equipment before use	3.1 Set up equipment/instruments in accordance with test method requirements

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		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	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 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

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		6.3	Ensure the safe collection of laboratory and hazardous waste for subsequent disposal
		6.4	Care for and store equipment and reagents as 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, Acts and regulations, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - Food Standards Code 2002 Australia New Zealand and amendments
  - AQIS Export Control Orders
  - ISO 9000 series Quality management and quality assurance standards
  - Dairy Food Safety
  - AS 2830 Good laboratory practice
  - AS/NZS 2243 Safety in Laboratories
  - AS/766 Food microbiology
  - Therapeutic Goods Act
  - Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms
  - National Measurement Act
- industry standards, such as RACI or AACI methods for colour, moisture, total ash, fats and proteins, nitrogen, fibre, micro-organisms, viscosity
- Codes of Practice (such as GLP and GMP)

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- material safety data sheets (MSDSs)
- standard operating procedures (SOPs), in house methods
- quality manuals, equipment and procedures manuals
- equipment startup, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications (including maximum residue levels).

Preparation of samples may include processes, such as: grinding, milling, preparation of discs, dissolving, ashing, refluxing, extracting, filtration, evaporation, flocculation, precipitation and centrifugation, culturing of selected micro-organisms, digestion, degassing, temperature equilibration.

Food tests and procedures may include:

- visual and sensory tests, such as:
  - appearance, taste, texture, colour, odour of foods
  - melting point, boiling point, freezing point
  - sediments, scorched particles
  - foreign matter
  - damage to packaging, compatibility of packaging
  - dispersability
- chemical analysis, such as:
  - pH, conductivity, moisture content
  - solids, fats, proteins, carbohydrates
  - ash analysis, salt analysis
  - titratable acids, iodine values, peroxide values
  - enzyme activity
  - specific ions, active ingredients
- microbiological tests and procedures, such as:
  - isolation, detection, classification to genera and some species or micro-organisms
  - enumeration and nomenclature of desirable/non desirable micro-organisms

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- propagation and maintenance of yeast, bacteria, cultures used in food processing
- measurement of spoilage and contamination
- sterility, hygiene and sanitation checks

- optical/spectrometric tests, such as:
- visible and ultraviolet spectrophotometry
- refractive index
- optical rotation

- physical/mechanical tests, such as:
- mass, volume, density, specific gravity, particle size
- foreign matter
- rheology, viscosity, gel strength
- 'wetability', 'whipability'
- homogenisation
- browning (sugar content)
- elasticity, hardness, compressibility, strength
- starch quality

- thermal tests, such as:
- calorific values
- stability of products
- effectiveness of heat treatments.

Tests may include methods for:

- control of starting materials, in-process materials and finished products
- health monitoring
- basic troubleshooting of production processes.

Hazards may include:

- microbiological organisms and agents, associated with soil, air, water, plants, animal tissue and fluids
- chemicals, such as acids, heavy metals, pesticides, hydrocarbons
- aerosols from broken centrifuge tubes, pipetting
- sharps, broken glassware
- flammable liquids and gases

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- cryogenics, such as dry ice and liquid nitrogen
- fluids under pressure, such as steam, industrial gases
- sources of ignition
- high temperature ashing processes
- disturbance or interruption of services.

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, materials safety data sheets 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, 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 may include:

- test and calibration results
- equipment use, maintenance and servicing history
- faulty or unsafe equipment.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

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All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets test methods/procedures accurately
- prepares and tests samples using procedures appropriate to the nature of sample
- performs calibration checks (if required)
- safely operates test equipment/instruments to enterprise standards and/or manufacturer's specification
- prepares calibration graphs and calculates results using appropriate units and precision
- applies basic theoretical knowledge to interpret gross features of data and make relevant conclusions
- identifies atypical results as 'out of normal range' or an artefact
- traces and sources obvious causes of an artefact
- communicates problem(s) to a supervisor or outside service technician
- records and communicates results in accordance with enterprise procedures
- maintains security, integrity, traceability of samples, sub-samples, test data/results and documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

- principles and concepts underpinning the test/procedure, such as:

– ions, atoms, molecules, bonding, affinities and related properties

– chemical reactions, (acid/base, complexiometric)

– structure and properties of proteins, lipids, carbohydrates, vitamins and minerals

– food additives, flavourings, essences

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- nutrient value of major food groups
- interaction of water with food components
- microbiology, including incubation characteristics, selective media, growth stages of bacterial cultures, 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, hardness
- cohesive/adhesive forces, fluid flow, viscosity
- changes of state, energy content, enthalpy change
- electromagnetic spectrum and absorption, emission, refraction of light
- quality control program for raw materials, process control and finished product inspection
- genetically modified foods

- use of instruments for qualitative and/or quantitative analysis
- purpose of test(s)
- 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 the test of modifying equipment/instrument variables
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA400A Process and interpret data.*

Resource implications

Resources may include:

- standard laboratory equipped with test equipment, instruments, standards and materials
- enterprise procedures and standard methods.

This competency in practice

Food processing

A technician was required to conduct an analysis of the level of sorbic acid in samples of processed cheese. 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2

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PMLTEST406A Perform physical tests

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.

This unit of competency is based on, and is equivalent to, the unit *PMLTEST402A Perform non instrumental tests/procedures.*

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory or technical assistants and instrument operators working in the manufacturing, environment, food and construction materials 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 procedure
	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 reporting of results
3. Check equipment before use	3.1 Set up equipment/instruments in accordance with test method requirements

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		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	Record and report results in accordance with enterprise procedures
		5.4	Interpret trends in data and/or results and report ‘out-of-specification’ or atypical results promptly to appropriate personnel
		5.5	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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - AS 2243.7 Safety in Laboratories — electrical aspects
  - ISO 9000 series Quality management and quality assurance standards
- Codes of Practice (such as GLP and GMP)
- National Measurement Act
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- quality manuals, equipment and procedures manuals
- equipment startup, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Preparation of samples may include processes, such as:

- drying, washing, grinding, sieving, melting, moisture conditioning
- cutting, trimming or machining of test specimens, etching.

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Physical tests and procedures may include:

- precise measurement of position, orientation and dimensions, such as:
  - 3D set up of manufacturing tools using inclinometers, verniers, laser
  - thickness using vernier, X-ray, gamma ray
  - particle size using sieving, laser
  - dimensional stability involving expansion, contraction, weathering
  - movement using strain gauge, accelerometer
- mass, density and specific gravity, such as:
  - moisture/density relationship
  - compaction
  - loose and compacted density
- thermal tests, such as:
  - thermal conductivity
  - coefficients of expansion (for example, linear, volume)
  - melt flow index
  - calorimetry, (for example, specific heat, latent heat)
  - combustion properties (for example, enthalpy, energy content)
  - drying times
  - thermal stability of products
- optical tests, such as:
  - flatness, surface finish
  - refractive index
  - optical rotation
  - transmission/absorption of filters
  - colour matching of products
- acoustic tests, such as:
  - absorption, reflection, transmission
  - intensity, attenuation, loudness (dB)
  - amplitude, frequency
- electrical tests, such as:
  - conductance, resistance, insulation

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- temperature dependence of dielectrics
- magnetic tests, such as:
- permeability
- retentivity, hysteresis loss, coercivity
- intrinsic induction.

Tests may include methods for:

- control of starting materials, in-process materials and finished products
- investigation of sources of construction materials
- basic troubleshooting of enterprise processes.

Hazards may include:

- microbiological organisms and agents, associated with soil, air, water
- chemicals, such as acids and solvents
- radiation, such as alpha, beta, gamma, X-ray, 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, industrial gases
- sources of ignition
- burners, ovens
- disturbance or interruption of services
- crushing, entanglement, cuts associated with moving machinery (grinders).

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, materials safety data sheets and manufacturer's instructions
- identifying and reporting operating problems or equipment malfunctions
- cleaning equipment and work areas regularly using enterprise procedures

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- 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 may include:

- test and calibration results
- equipment use, maintenance and servicing history
- faulty or unsafe equipment.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets test methods/procedures accurately
- prepares and tests samples in accordance with specified methods
- performs calibration checks (if required)
- safely operates test equipment/instruments to enterprise standards and/or manufacturer's specifications
- applies basic knowledge of physical properties of materials to interpret gross features of data and make relevant conclusions
- identifies atypical results, such as 'out of normal' range or an artefact

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- traces and sources obvious causes of an artefact
- communicates problem(s) to a supervisor or outside service technician
- records and communicates results in accordance with enterprise procedures
- maintains security, integrity and traceability of samples, sub-samples, test data/results and documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

- physical principles and concepts underpinning the test/procedure, such as:
  - matter, interatomic and intermolecular forces, states of matter
  - mass, weight, forces, pressure, energy
  - properties of gases, pressure/volume/temperature, density, diffusion, compressibility
  - cohesive/adhesive forces, hydrostatic pressure, fluid flow, viscosity, friction
  - thermal expansion, thermal conductivity, coefficients of expansion
  - changes of state, energy content, enthalpy change, endothermic and exothermic processes
  - electromagnetic spectrum, primary/secondary colours, reflection, refraction diffraction, interference of light
  - electrical concepts, including electric field, voltage, current, resistance, AC/DC
  - (electro)magnetic concepts, including magnetic field and flux, electromagnetic induction
  - sound concepts, including wave properties, amplitude, frequency, loudness dB
- use of instruments for qualitative and/or quantitative analysis
- purpose of test(s)
- 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
- sample preparation procedures
- basic equipment/method troubleshooting procedures
- use of calibration procedures
- calculation steps to give results in appropriate units and precision
- enterprise and/or legal traceability requirements

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- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA400A Process and interpret data.*

Resource implications

Resources may include:

- standard laboratory equipped with appropriate test equipment/instruments, standards and materials
- enterprise procedures and standard methods.

This competency in practice

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 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.

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2

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PMLTEST407A Perform biological procedures

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.

This unit of competency has the following prerequisite(s):

- PMLTEST305B Perform aseptic techniques
- PMLTEST308A Perform microscopic examination.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 procedure
	2.2 Record sample description, compare with specification and note and report discrepancies
	2.3 Prepare samples in accordance with testing requirements
	2.4 Ensure traceability of sample from receipt to reporting of results
3. Perform techniques that	3.1 Select suitable techniques in accordance with

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	assist in the classification of a cell or species		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.	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
		5.3	Ensure the safe disposal of biohazardous wastes
		5.4	Clean, care for and store equipment and reagents as required
6.	Maintain laboratory records	6.1	Record approved data into enterprise system
		6.2	Maintain confidentiality and security of enterprise information and laboratory data
		6.3	Maintain equipment and calibration logs in accordance with enterprise procedures.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 9000 series Quality management and quality assurance standards

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- AS/NZS 2243 Safety in Laboratories — biological aspects, chemical aspects
- AS 2830 Good laboratory practice
- AS 2162.1 General — Volumetric glassware
- AS 2134.1 Flame atomic absorption spectrometry
- AS 3753 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry
- Therapeutic Goods Act
- National Measurement Act

- Codes of Practice, such as GLP and GMP
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- quality manuals and equipment and procedure 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.

Techniques for preparation of samples may include:

- dissection, such as preparation of thymus extracts from mice
- extraction (for example, solvent extraction)
- filtration (for example, filter water samples and plate the sediment onto agar plates for incubation and growth of E Coli)
- separation (for example, dialysis)
- precipitation and flocculation
- centrifugation (excluding ultra centrifugation)
- chromatography
  - gel filtration chromatography (for example, crude purification of proteins)
  - affinity chromatography (for example, purification of immunoglobulins)
- electrophoresis
  - polyacrylamide gel electrophoresis for separation of DNA segments

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- agarose gel electrophoreis
- capillary electrophoresis
- gradient gel electrophoresis.

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, such as:
- growth on differential media
- colony morphology (size, shape)
- biochemical reactions, such as miniaturised test strips, redox reactions, sugar tests.
- 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, such as:
- light
- phase contrast
- bright field
- dark ground
- enumeration
- colourimetry and spectrophotometry, such as:
- ultraviolet/visible
- fluorimetric
- infrared
- flame emission
- atomic absorption spectrometry
- electrochemistry, such as:

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- pH
- ion selective electrodes and polarography (for example, concentration of chloride ions)

- chromatography, such as:
- column and thin layer analytical and preparative chromatography
- paper, gas, liquid chromatography and HPLC.

Hazards may include:

- microbiological organisms and agents, associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals, such as acids, solvents and stains
- aerosols from broken centrifuge tubes, pipetting
- sharps, 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, acetylene in atomic absorption spectrometry
- sources of ignition
- disturbance or interruption of services.

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, materials safety data sheets 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
- 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 may include:

- collection for sterilization by autoclaving (for example, autoclaving of microbiological plates)

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- appropriate storage (for example, of waste containing radioactive isotopes)
- use of biohazard waste containers.

Records may include:

- test calibration results
- equipment use, maintenance and servicing history
- faulty or unsafe equipment
- batch number, catalogue number, use by date for analytical kits.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets test procedures accurately
- prepares and tests samples using procedures appropriate to the nature of sample
- performs calibration checks (if required)
- safely operates test equipment to enterprise standards and/or manufacturer’s specification
- prepares calibration graphs and calculates results in appropriate units and precision
- applies basic theoretical knowledge to interpret gross features of data and make relevant conclusions
- identifies atypical results as out of normal range or an artefact using reference material or QC sera

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- traces and sources obvious causes of an artefact
- communicates problem(s) to a supervisor or outside service technician
- records and communicates results as per enterprise procedures
- maintains security, integrity, traceability and identity of samples, sub-samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- hazards and risks in biological laboratories
- biological principles and concepts underpinning test/procedure, such as:
  - 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, the web of life)
  - classifications, such as bacteria, viruses, yeasts, single cell, multicellular, plants, animals, prions, helminths, prokayotes, eukaryotes
  - phases of the cell cycle
  - Mendelian genetics, such as inheritance, meiosis, karyotypes, dominant and recessive traits, genotypes and phenotypes, 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
- use of instruments for qualitative and/or quantitative analysis
- separation techniques underpinning test/procedure

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- 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
- sample preparation procedures
- reagent maintenance and evaluation procedures
- basic equipment/method troubleshooting procedures
- use of calibration charts
- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- 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.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA400A Process and interpret data
- PMLTEST404A Perform chemical tests and procedures.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate test equipment and instruments, reagents and materials
- standard operating procedures and testing methods.

This competency in practice

Biomedical

A laboratory technician conducts a screening test for parasites in stool samples. He/she 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. He/she prepares the sample by adding solvent to a portion and shaking it before placing it in a centrifuge. After satisfactory separation, he/she 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 magnification and searches for eggs. He/she enters a nil result in the LIMS and disposes of the sample in accordance with enterprise procedures.

Biomedical

A technical officer is requested to determine the total protein concentration of a blood sample using colorimetry. After checking the condition of the sample, he/she 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. He/she 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, he/she enters the test results into the LIMS.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2

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PMLTEST408A Undertake environmental field-based monitoring

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 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.

This unit of competency has no prerequisites.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Confirm requirements for field monitoring activities with supervising staff	1.1 Clarify the purpose, objectives and the defined site(s) for the field monitoring activities
	1.2 Review all emergency plans, and 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(s)
	1.5 Clarify details of all samples to be collected and field parameters to be measured
	1.6 Confirm final data format(s) 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	2.1 Develop check lists, based on work program, to

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	monitoring activities		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

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4.2 Ensure that monitoring/camp site(s) are 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements.

Policy, legislation, regulations, standards, may include:

- government policy (for example, sustainable development, impact assessment)
- environmental protection legislation (for example, air, water, noise, waste)
- specific environmental standards
- Australian Standards, National Environmental Protection Measures (NEPM).

Codes of practice, field protocols and field procedures may include:

- industry Codes of Practice
- enterprise sampling and monitoring protocols
- permits for wildlife capture and handling
- animal welfare codes and ethics committee approval
- site specific requirements
- data quality procedures.

Communication may include: face-to-face, telephone, written documents, meetings.

Purpose of field monitoring activities may include:

- single or multiple site sampling and monitoring

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- 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 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 may include:

- solar radiation, dust, noise
- personnel getting lost
- accidents, emergencies, 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 may include:

- use of personal protective equipment, such as sunscreen, hat, safety glasses, gloves, coveralls, safety boots
- 'stay with vehicle' and other survival techniques
- regular communication schedule
- GPS, maps, 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 may include:

- field note books or log books

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- standard operating procedures (SOPs) covering fieldwork, sampling, testing
- equipment operating manuals, calibration procedures, instrument fault finding procedures, general maintenance and repair procedures
- emergency, first aid, survival procedures
- field camp procedures for cleaning, cooking, safety, security, hygiene, work management, set up/take down
- requirements related to protection of the environment
- incident/accident/injury report forms.

Administrative requirements and appropriate approvals may include: travel requisitions, authority for use of vehicles and equipment, insurance, permits.

Equipment may include:

- navigation and communication equipment (for example, compass, maps, global positioning system, two-way radio, mobile phone)
- survey equipment
- sampling equipment and containers, animal cages
- parameter specific meter or multi-probes (for example, dissolved oxygen, electrical conductivity, pH, turbidity, nitrates, phosphates, temperature)
- field test kits to determine such parameters as dissolved gases, chemical anions and cations, heavy metals, E-Coli, biological oxygen demand
- portable colourimeters, field microscopes
- filters, sieves
- soil monitoring kits
- data loggers
- tools, spares, vehicle recovery equipment
- first aid equipment.

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 (for example, maps, permission, keys, condition of tracks)
- arranging and checking all transportation systems (for example, vehicles, boats, aircraft)

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- 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 (for example, maps, photographs, descriptions)
- preparing sample containers (for example, container type and preparation, preservation techniques, labelling)
- arranging correct transport, storage and laboratory testing of samples collected during field activities
- arranging additional laboratory testing.

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 for specific parameters
- clear and accurate recording of data
- safe operation of motor vehicles and boats.

Management of field camp activities (if necessary) 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, supervision of staff
- location, establishment, maintenance of site, including hygiene and waste
- removal of waste, site remediation.

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(s)

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- unforseen environmental impacts
- contact with hazardous wastes.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- demonstrates understanding of purpose and the objectives of a field activity, including:
  - information and analysis required
  - end users of information
  - significance of outcomes for broader program(s)
- communicates effectively and efficiently with staff and other relevant parties
- reviews a written work program and defines the major field activities
- reviews emergency, safety or environmental field plans and documents the key aspects which relate to a defined field activity
- develops accurate and complete check lists covering instruments, equipment and associated supplies necessary for a defined field activity
- applies sampling, testing and data quality procedures accurately under field conditions
- prepares, checks and calibrates field instruments
- demonstrates correct and safe use, under laboratory and field conditions, of field instruments and/or equipment (including field calibration)
- defines and correctly prepares sample containers for different field samples

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- takes samples, under field conditions, according to defined procedures
- maintains, stores and transports samples/specimens to ensure their wellbeing, viability and integrity (as appropriate)
- packs and transports supplies, equipment and instruments to and/or from a field site
- accurately performs field tests according to written instructions
- records data and information, conducts quality checks and field analysis
- works safely for the protection of self and others
- negotiates with staff and stakeholders and reaches satisfactory agreements, where possible
- responds effectively to changed or unforseen circumstances.

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Underpinning knowledge

Competency includes the ability to apply and explain:

- risk assessment principles
- field sampling and monitoring procedures
- technical capabilities and limitations of common equipment and instruments
- basic instrument fault identification and rectification procedures
- sampling procedures, including labelling and traceability
- collection and preservation of plants and animals to enable subsequent identification
- specific legislation and Codes of Practice related to sample and animal collection
- a range of chemical and physical field monitoring procedures
- operation of communication systems
- operation of transportation systems
- enterprise procedures for the recording of field data
- application of data quality procedures under field conditions
- location and management of monitoring sites
- relevant health, safety and environment requirements, including field safety/survival principles.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of field data and results obtained by candidate
- feedback from supervisors and peers
- demonstration of understanding of existing work program requirements by:
  - 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

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSAMP400B Obtain representative samples in accordance with a sampling plan
- PMLOHS400A Maintain laboratory/field workplace safety.

Resource implications

Resources may include:

- vehicles, survey equipment, sampling/monitoring equipment, consumables, manuals
- work program, enterprise procedures, Codes of Practice, field protocols.

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This competency in practice

Environmental

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

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 4C 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

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 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 were assembled. All supplies and field equipment were purchased or assembled, checked against an inventory and securely stowed in the vehicles.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 3	Level 2	Level 2	Level 2	Level 2

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PMLTEST409A Capture and manage scientific images

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 if required in the future.

The unit has no prerequisites.

This unit of competency is applicable to personnel in all industry sectors who capture images as part of their main job role. 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 the *Visual Arts, Crafts and Design Training Package CUV03:*

- *CUVPHI04A Apply photoimaging lighting techniques*
- *CUVPHI05A Use a 35mm SLR camera or digital equipment*
- *CUVPHI06A Plan and carry out image capture in response to brief*
- *CUVPHI207A Process photoimages to work print/file 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 are found at the end of this unit of competency under the section ‘This competency in practice’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 shoot	2.1 Select and assemble the required equipment
	2.2 Follow ethical and legal work practices at all times
	2.3 Assess risks or hazards and implement safety procedures

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		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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 may include photographic, digital, X-ray and video images, and prints or transparencies of subjects, such as:

- building sites, environmental survey and monitoring sites
- accident or incident sites, injuries
- forensic evidence
- biological specimens
- histological sections
- live animals
- chromatography gels.
- Other imaging techniques may include:
- direct transformation from images to data, such as reading of DNA sequencing gels
- autoradiations

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- micrographs
- other non visible light sources, such as ultraviolet light, fluorescence and phosphorescence
- electron micrographs.

Job requirements and brief may include:

- description and specification of work, including constraints, 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, notes.

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 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, appropriate magnification
- technical requirements, such as: resolution, film type, tripods, shutter speed, lens type, colour differential
- back up method and equipment for image capture
- specification of final product, size, delivery, number, cost
- position of subject.
- Equipment may include:
- lighting
- backdrops
- camera systems and accessories.

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Hazards may include:

- microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- solar radiation, dust, noise
- chemicals and radioisotopes
- X rays and other sources of electromagnetic radiation (laser, UV)
- manual handling of heavy objects
- slips, trips and falls, falling objects, moving machinery (for example, on building sites)
- pedestrian and vehicular traffic.

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, gown, 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, materials safety data sheets and manufacturer's instructions
- following established manual handling procedures.
- Ethical and legal work practices include consideration of:
- industry Codes of Practice, contracts, permits, 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 may include sending images for processing, processing the images or use of commercial software.
- Storage of records may include the brief, technical specifications and images. It may include file management (back ups, data retrieval, storage) and can be paper based, electronic or digital.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal

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legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- can create and interpret a brief
- can apply an imaging technique that best meets the specifications and purpose of the job, consistent with enterprise procedures
- provides a back up system of image capture when shooting images
- produces consistent high quality, cost effective outcomes for clients
- keeps accurate records that allow future replication of images
- works safely and in an ethical manner consistent with legislation, regulations and Codes of Practice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- repercussions of manipulation of images and differences between adjustment and 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.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of portfolio of work completed by 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST519A Prepare animal and plant material for display.

Resource implications

Resources may include:

- appropriate facilities, equipment and materials for photoimaging
- enterprise procedures, equipment manuals, industry catalogues and journals.

This competency in practice

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 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.

Key Competencies

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The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST410A Undertake environmental field-based, remote-sensing monitoring

UNIT DESCRIPTOR

This unit of competency covers the ability to design, construct, organise and undertake a defined field-based, remote sensing monitoring activity. This includes sampling, instrumental calibration and monitoring, data collection and storage, 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 buildings, structures associated with the remote-sensing monitoring activities.

This unit of competency has no prerequisites.

This unit of competency is applicable to technical, field and environmental officers working in the environmental services 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 are found at the end of this unit of competency under the section ‘This competency in practice’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Confirm remote sensing field monitoring requirements with supervising staff	1.1 Clarify the purpose, objectives and the preferred site(s) 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 format(s) will suit stakeholders who receive or use the data
	1.5 Clarify details of any statutory requirements that apply to the site(s) and associated field activities
	1.6 Review existing remote sensing monitoring protocols, and siting standards or associated in-house requirements which relate to the field activities

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2.	Design and 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(s).	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(s)
		3.4	Establish remote monitoring station
		3.5	Test operation of total system under field conditions
4.	Operate and maintain monitoring site(s)	4.1	Undertake regular or emergency inspections of the site(s) according to set procedures
		4.2	Undertake calibration checks as per written instructions
		4.3	Inspect and maintain all instruments, equipment and data systems and organise replace of defective items
		4.4	Perform all field and laboratory activities safely and with minimal impact on the environment

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		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(s) and finalise all data requirements with supervising staff
		5.2 Dismantle monitoring system and arrange checking, packaging and transportation of all equipment and instruments back to base
		5.3 Close down site in accordance with enterprise and environmental requirements
		5.4 Hand back site(s) and inform all relevant authorities
		5.5 Test, decontaminate (if required) and store all equipment appropriately
		5.6 Document all close-down actions.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements.

Policy, legislation, regulations, standards, may include:

- government policy (for example, sustainable development, impact assessment)
- environmental protection or conservation legislation
- specific environmental standards (for example, air, water, noise, industrial effluent)
- Australian Standards, National Environmental Protection Measures (NEPM).

Codes of Practice, field protocols and field procedures may include:

- industry Codes of Practice or protocols
- remote-sensing monitoring protocols
- data quality procedures.

Remote-sensing monitoring activities may include but are not limited to: meteorology, geology/mining, hydrology, air quality, water quality, noise and vibrations.

Communication and/or consultation strategies may include:

- face-to-face
- telephone
- written documents
- meetings.

Purpose of field monitoring activities may include:

- single or multiple site monitoring
- component of enterprise environmental management plan
- remote-sensing monitoring of physical/chemical parameters
- requirement to comply with statutory requirements
- requirement to comply with industry sampling/monitoring protocols/Codes of Practice.

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 may include:

- solar radiation, dust, noise
- personnel getting lost
- accidents, emergencies, 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 may include:

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- use of personal protective equipment, such as sunscreen, hat, safety glasses, gloves, coveralls, safety boots
- 'stay with vehicle' and other survival techniques
- regular communication schedule
- GPS, maps, 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 may include:

- travel requisitions
- authority for use of vehicles and equipment
- permits
- insurance.

Instruments and equipment may include but are not limited to:

- navigation and communication equipment (for example, compass, maps, global positioning system, two-way radio, mobile phone)
- sampling and autosampling equipment for air, water, stormwater, wastewater, sewage
- instruments to measure air pollutants (for example, oxides of carbon, oxides of sulphur, oxides of nitrogen, hydrocarbons, particulates (PM10, PM2.5 total suspended, ozone)
- instruments to measure water quantity and/or hydrological parameters (for example, flow, dissolved oxygen, electrical conductivity, pH, turbidity, nitrates, phosphates, temperature)
- instruments to measure meteorological parameters (for example, pressure, minimum and maximum temperature, wet and dry bulb temperatures, humidity, rainfall, wind speed and direction)
- instruments to measure sound pressure levels (for example, noise or sound pressure meter).

Enterprise procedures for field activities may include:

- field note books or log books
- standard operating procedures (SOPs), fieldwork procedures, remote-sensing monitoring procedures
- equipment operating manuals, calibration procedures, instrument fault finding procedures, general maintenance and repair procedures
- requirements related to protection of the environment
- incident/accident/injury report forms.

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- demonstrates understanding of purpose and objectives of the monitoring, including:
  - information and analysis required
  - end users of information
  - significance of outcomes for broader program(s)
- communicates effectively and efficiently with staff and other relevant parties
- identifies and interprets statutory requirements accurately
- confirms type, quantity and quality of data needed for defined monitoring activity
- demonstrates ability to assemble test, operate and close down a field-based, remote-sensing monitoring system under laboratory/field conditions
- undertakes reconnaissance and evaluates monitoring sites
- identifies and establishes a secure field monitoring site according to defined criteria
- demonstrates ability to appropriately package and transport supplies, equipment and instruments into the field
- negotiates with staff and stakeholders and reaches satisfactory agreements, where possible
- responds effectively to changed or unforeseen circumstances.

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Underpinning knowledge

Competency includes the ability to apply and explain:

- correct terminology relevant to field monitoring activities
- field monitoring aims and objectives
- 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
- automatic and manual sampling and calibration 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of data and results obtained by 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

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- identification and recording of potential environmental impacts associated with construction and operation of a defined monitoring site

- 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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLMAIN502A Maintain instruments and equipment.

Resource implications

Resources may include:

- vehicles, monitoring and communication equipment, consumables, manuals

- work program, enterprise procedures, Codes of Practice, field protocols.

This competency in practice

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 with all relevant authorities regarding siting, supply of services, access and security; as well as design, assemble and establish the remote-sensing monitoring system. On-going operation, maintenance and annual evaluation are also the responsibility of the senior technical officer in conjunction with senior staff.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 3	Level 2	Level 2	Level 2	Level 3

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PMLTEST411A Perform mechanical tests

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory or technical assistants and instrument operators working in the manufacturing, food and construction materials 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 procedure
	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 reporting of results

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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	Interpret trends in data and/or results and report ‘out-of-specification’ or atypical results promptly to appropriate personnel
		5.5	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

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		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
		7.2	Maintain confidentiality and security of enterprise information and laboratory data
		7.3	Maintain equipment and calibration logs in accordance with enterprise procedures.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– AS 2243.6 Safety in Laboratories — Mechanical aspects

– AS 1012 Methods of testing concrete

– AS 1289 Methods of testing soils for engineering purposes

– DIN EN ISO 5269 Pulps — Preparation of laboratory sheets for physical testing

– ISO 9142 Adhesives

– ISO 9000 series Quality management and quality assurance standards

- Codes of Practice (such as GLP and GMP)
- National Measurement Act
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- quality manuals, equipment and procedures manuals
- equipment startup, operation and shutdown procedures

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- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Preparation of samples and test-pieces may include processes, such as cutting, trimming or machining of specimens, etching.

Mechanical tests and procedures may include:

- adhesive strength
- elastic properties and strength of materials
- slip resistance, friction
- viscosity, torque
- creep, endurance
- abrasion, hardness, impact, indent, penetration resistance
- pressure and/or vacuum testing using manometers, load cells.

Tests may include methods for:

- control of starting materials, in-process materials and finished products
- investigation of sources of construction materials
- basic troubleshooting of enterprise processes.

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, cuts associated with moving machinery or falling objects.

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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, materials safety data sheets 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 may include:

- test and calibration results
- equipment use, maintenance and servicing history
- faulty or unsafe equipment.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets test methods/procedures accurately
- prepares and tests samples/test-pieces in accordance with specified methods
- performs calibration checks (if required)
- safely operates test equipment/instruments to enterprise standards and/or manufacturer's specifications
- applies basic knowledge of mechanical properties of materials to interpret gross features of data and make relevant conclusions
- identifies atypical results, such as 'out of normal' range or an artefact
- traces and sources obvious causes of an artefact
- communicates problem(s) to a supervisor or outside service technician
- records and communicates results in accordance with enterprise procedures
- maintains security, integrity and traceability of samples, test-pieces, test data/results and documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

- mechanical principles and concepts underpinning the test/procedure, such as:
  - matter, interatomic and intermolecular forces, states of matter
  - mass, weight, forces, pressure, energy
  - cohesive/adhesive forces, friction, slip resistance
  - elasticity, hardness, ductility, malleability, strength of materials, elastic limit, elastic moduli, ultimate stress
  - electrical concepts, including electric field, voltage, current, resistance, AC/DC)
- use of instruments for qualitative and/or quantitative analysis
- purpose of test(s)
- metrology techniques underpinning test/procedure
- principles and concepts related to equipment/instrument operation and testing
- function of key components of the equipment/instrument

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- effects on test of modifying equipment/instrument variables
- sample preparation procedures
- basic equipment/method troubleshooting procedures
- use of calibration procedures
- calculation steps to give results in appropriate units and precision
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA400A Process and interpret data.*

Resource implications

Resources may include:

- standard laboratory equipped with appropriate test equipment/instruments, standards and materials
- enterprise procedures and standard methods.

This competency in practice

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 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. He/she 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. He/she then starts the compression test machine and checks that the load pacer is set to the correct loading rate. He/she 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 (eg. a shear failure) he/she 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. He/she 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2

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PMLTEST412A Prepare tissue and cell cultures

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.

This unit of competency has the following prerequisite(s):

- *PMLTEST305B Perform aseptic techniques.*

This unit of competency is applicable to technical assistants working in laboratories in the biomedical, environmental, biotechnology and education 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
	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

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		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with legal/regulatory framework of regulations, codes and guidelines, relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 9000 series Quality management and quality assurance standards

– AS 2243.2 Safety in Laboratories — Biological aspects

– AS 2243.3 Safety in Laboratories — Microbiology

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- AS 2830 Good laboratory practice
- AS 1678 Emergency procedures guide for hazardous materials
- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- AS 2982 Hand washing facilities
- SAA HB9 Occupational personal protection, and other relevant standards for protective clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 4187 Code of Practice for cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities.

- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms
- Good Laboratory Practice (GLP)
- Therapeutic Goods Act
- guidelines for the operation of classes of laboratories (for example, PCII, PCIII and PCIV physical containment)
- enterprise procedures, standard operating procedures (SOPs), quality assurance procedures
- verified test methods.

Applications of plant tissue/cell culture could 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 could include:

- establishment and maintenance of animal cell lines, such as liver, epidermal, fibroblastic
- maintenance of continuous cell lines
- preparation of cell cultures for commercial sale
- growth and enumeration of viruses

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- 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 may include:

- biohazards, such as infectious agents, oncogenic DNA
- chemical and radiation hazards
- allergenic factors
- cryogenic liquids, such as nitrogen
- heat from burners, molten agar
- ultraviolet light
- sharps, broken glassware
- contaminated clothing.

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, materials safety data sheets 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
- 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

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- 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 may include:

- growth cabinets
- culture vessels, growth chambers, sterile containers, culture plates, flasks and bottles
- autoclaves
- positive filtration apparatus
- auto pipettes, pipette pumps
- cell counting chambers, haemocytometer
- incubators, including specialised atmosphere carbon dioxide
- light and binocular inverted microscopes
- centrifuges.

Pre-use checks include:

- performing routine maintenance
- checks on raw materials and consumables include use by date, possible contamination and storage conditions.

Sterilisation and disposal of biohazardous wastes may include:

- steam and high pressure air or steam
- boiling, microwaving, autoclaving
- filtration
- gas, chemical, radiation.

Plant tissues and cells may include:

- plant tissue, such as petioles, leaves, stems and petals
- meristem tissue
- special tissue, such as fern stolon, seed embryos, somatic embryoids
- tissue for callus development to initiate cell suspension cultures.

Animal tissues and cells may include:

- primary cells from animal tissue, such as heart, liver, kidney, epidermal

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- secondary cells, such as epithelial, endothelial, fibroblast
- continuous cell lines, such as tumour lines, hybidomers, transformed lines (Epstein-Barr virus).

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 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 may include:

- identification of normal and abnormal cells viewed by an inverted stereo microscope
- recognition of contamination, such as bacteria (eg Mycoplasma), fungi, other plant or animal tissue in the media
- checking growth rates
- performing viable cell counts.

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.

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- works safely and satisfies all legal and regulatory requirements, including the use and care of biohazard cabinets
- prepares, dilutes and sterilises reagents and culture media that are fit for purpose
- grows cell lines and tissue to specifications without contaminating the original sample and the environment
- identifies expected cell types and recognises normal and abnormal cells using an inverted microscope
- counts cells (total, viable),
- monitors cell growth and recognises problems, such as contamination
- maintains chain of custody, traceable to the worker, of all cell lines, tissues and logs of work completed and procedures/methods used.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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

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- 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, removal of wastes
- types and sources of contamination
- purposes and mechanisms of staining
- importance of strict aseptic techniques, 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLMAIN300B Maintain the laboratory fit for purpose*
- *PMLTEST304B Prepare culture media*
- *PMLTEST308B Perform microscopic examination.*

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Resource implications

Resources may include:

- laboratory equipped with appropriate equipment, samples, cell lines and reagents
- enterprise procedures, standard methods.

This competency in practice

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 the class.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 1	Level 2	Level 1	Level 1	Level 2	Level 2

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PMLCAL500A Perform non-standard calibrations

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.

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.

This unit of competency has the following prerequisite:

- *PMLCAL400A Perform standard calibrations.*

This unit of competency assumes that personnel can perform standard calibrations for a wide range of equipment.

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. The 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’.

ELEMENT	CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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, changing or deviating from the specified procedure
	1.6 Document and validate any authorised changes or

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			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

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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 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or may have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 5725–11, 6 Accuracy (trueness and precision) of measurement methods and results

– ISO 9000–1 Quality management and quality assurance standards Part 1 Guidelines for selection and use

– ISO 9004–1 Quality management and quality system elements — Part 1 Guidelines

– ISO 9004–4 Quality management and quality system elements — Part 4 Guidelines for quality improvement

– ISO 10012 Quality assurance requirements for measurement equipment

– Guide to the expression of uncertainty in measurement, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML

– industry/sector specific guides, such as Eurachem/CITAC Guide on ‘Quantifying Uncertainty in Analytical Measurement’

- material safety data sheets (MSDSs)
- enterprise recording and reporting procedures, standard operating procedures (SOPs)
- quality manuals, equipment and operating/technical manuals
- test methods and calibration procedures (validated and authorised)

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- test methods and calibration procedures published by: international, national or regional standards, reputable technical organisations, scientific texts or journals, equipment manufacturers
- incident and accident/injury reports
- schematics, workflows, laboratory layouts, production and laboratory schedules.

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, 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, RF power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes, watt-hour references
- working standards, instruments and testing equipment, such as 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, spectrum and harmonic analysers.

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 may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, 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.

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This unit of competency may involve communication 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)
- equipment manufacturers and suppliers of spare parts.

The working environment will have a controlled environment but could be a:

- purpose built designed facility
- mobile facility in the field.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- identifies non-conforming calibration tasks and requests and assesses their significance
- researches current, alternative calibration methods and equipment for a given request
- quantifies the potential or actual impact of a wide range of test/environmental/equipment influences on data quality
- explains complex calibration procedures to clients, clarifies requirements and deviations
- maintains very close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results
- critically examines each calibration step to ensure repeatability and validity of data

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- prepares test/calibration documentation that is accurate and complies with requirements
- operates a wide range of equipment correctly and safely
- applies all relevant enterprise procedures to ensure the quality and integrity of the services or data they provide
- recognises opportunities for improvements to procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- requirements for the competence of testing and calibration laboratories (for example, 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 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, standard deviations) and estimation of uncertainty of measurement (may include the use of soft ware)
- reporting procedures and legislative requirements
- enterprise and/or legal traceability requirements
- relevant health, safety and environmental requirements.

Knowledge is also required of the:

- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- lines of communication

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- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource implications

Resources may include:

- specialised calibration/test equipment, reference standards and materials, laboratory facilities
- access to a library of calibration methods, procedures, equipment specifications
- enterprise quality manual and procedures.

This competency in practice

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 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)

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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 refers to the instrument's 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 3	Level 3	Level 3

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PMLCAL501A Create or modify calibration procedures

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 trialing 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 the unit of competency *PMLCAL502A Create or modify automated calibration procedures*.

This unit of competency has the following prerequisite:

- *PMLCAL500A Perform non-standard calibrations.*

This unit of competency assumes that personnel can perform non-standard calibrations competently for a wide range of equipment.

This unit of competency is applicable to calibration technician/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. This particular unit covers the work of only those personnel who are authorised by their laboratory to create or modify calibration procedures. They work with limited guidance. The 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
	1.5 Confirm that available resources meet all the requirements of the alternative or new procedure
	1.6 Gain authorisation for any deviation from

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			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 that may significantly affect the accuracy or validity of test results

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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 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or may have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 5725–1, 6 Accuracy (trueness and precision) of measurement methods and results

– ISO 9000–1 Quality management and quality assurance standards Part 1 Guidelines for selection and use

- ISO 9004–1 Quality management and quality system elements — Part 1 Guidelines
- ISO 9004–4 Quality management and quality system elements — Part 4 Guidelines for quality improvement
- ISO 10012 Quality assurance requirements for measurement equipment
- Guide to the expression of uncertainty in measurement, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML
- industry/sector specific guides, such as Eurachem/CITAC Guide on 'Quantifying Uncertainty in Analytical Measurement'

- material safety data sheets (MSDSs)
- enterprise recording and reporting procedures, 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, equipment manufacturers
- incident and accident/injury reports
- schematics, workflows, laboratory layouts, production and laboratory schedules.

Modifying or developing new test methods 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, 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, RF power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes, watt-hour references
- working standards, instruments and testing equipment, such as: 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, spectrum and harmonic analysers.

Hazards may include:

- electric shock
- disturbance or interruption of services

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- manual handling of heavy equipment boxes
- sources of electromagnetic radiation (lasers, RF generators/transmitters)
- fluids under pressure
- heat sources, such as ovens.

Safety procedures may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, 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.

This unit of competency may involve communication 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)
- equipment manufacturers and suppliers of spare parts.

The working environment will have a controlled environment but could be a:

- purpose built designed facility
- mobile facility in the field.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- researches current, alternative calibration methods and equipment for a given request
- applies specialised technical knowledge to critically analyse and resolve complex problems associated with measurement non-conformances where solutions are not obvious or readily available
- develops or adapts methods to suit technical and/or client requirements
- conducts reliable calibration/testing trials to ensure a high degree of reproducibility
- explains complex calibration procedures to clients, clarifies requirements and deviations
- liaises with peers and technical staff from other laboratories to clarify and validate test methods
- estimates measurement uncertainty and applies statistical techniques for analysing test and/or calibration data
- writes calibration procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements
- prepares all test documentation accurately, concisely and in accordance with requirements
- recognises opportunities for improvements to procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- requirements for the competence of testing and calibration laboratories (for example, 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

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- 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, standard deviations) and estimation of uncertainty of measurement (may include the use of soft ware)
- 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.

Knowledge is also required of the:

- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource implications

Resources may include:

- specialised calibration/test equipment, reference standards and materials, laboratory facilities
- access to a library of calibration methods, procedures, equipment specifications
- enterprise quality manual and procedures.

This competency in practice

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.

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Calibration

The calibration laboratories within the Australian Defence Force have recently been advised that all metric dimensional metrology (for example, micrometers, verniers, 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 Australian Standard 2102 *Micrometer calipers for external measurement*, copies of the technical specifications relating to the reference 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; amends the template accordingly; and neatly lays 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 3	Level 3	Level 3

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PMLCAL502A Create or modify automated calibration procedures

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.

This unit of competency has the following prerequisite:

- *PMLCAL501A Create or modify calibration procedures.*

This unit of competency is applicable to calibration technician/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. 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. The 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 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

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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
		4.3	Verify all data are the result of a valid measurements and all calculations are correct
		4.4	Confirm the integrity of procedure at each step to

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			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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or may have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 5725–11, 6 Accuracy (trueness and precision) of measurement methods and results

– ISO 9000–1 Quality management and quality assurance standards Part 1 Guidelines for selection and use

– ISO 9004–1 Quality management and quality system elements — Part 1 Guidelines

– ISO 9004–4 Quality management and quality system elements — Part 4 Guidelines for quality improvement

– ISO 10012 Quality assurance requirements for measurement equipment

– Guide to the expression of uncertainty in measurement, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML

– industry/sector specific guides, such as Eurachem/CITAC Guide on ‘Quantifying Uncertainty in Analytical Measurement’

- laboratory calibration software and programs, manufacturer’s proprietary software
- material safety data sheets (MSDSs)
- enterprise recording and reporting procedures, 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, equipment manufacturers
- incident and accident/injury reports
- schematics, workflows, laboratory layouts, production and laboratory schedules.

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

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equipment, spectrophotometers, tape measures, rules, temperature (digital) indicating systems, thermometers, thermocouples, timing devices, vibration analysis equipment, 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, RF power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes, watt-hour references

- working standards, instruments and testing equipment, such as: 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, spectrum and harmonic analysers.

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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 may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, 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.

This unit of competency may involve communication 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)
- equipment manufacturers and suppliers of spare parts.

The working environment will have a controlled environment but could be a:

- purpose-built designed facility
- mobile facility in the field.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and

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Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- assesses the suitability of software controlled calibration procedures
- researches current, alternative calibration methods and equipment for a given request
- develops or modifies calibration procedures to automate as many processes as possible
- writes efficient calibration procedures using an unambiguous, logical sequence of instructions that meet statutory and regulatory requirements
- writes/edits efficient software programs for a range of calibration applications and assesses their integrity under test
- applies specialised technical knowledge to critically analyse and resolve complex problems associated with measurement non-conformances where solutions are not obvious or readily available
- explains automated calibration procedures to clients and clarifies their requirements
- conducts reliable calibration/testing trials to ensure a high degree of reproducibility
- liaises with peers and technical staff from other laboratories to clarify and validate automated procedures
- estimates measurement uncertainty and applies statistical techniques for analysing test and/or calibration data
- critically examines each calibration step to ensure repeatability and validity of data
- prepares all test documentation accurately, concisely and in accordance with requirements
- recognises opportunities for improvements to procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- requirements for the competence of testing and calibration laboratories (for example, AS ISO/IEC 17025) as they affect job role and responsibilities
- limits of authority and procedures for creating or modifying automated calibration procedures

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- 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, standard deviations) and estimation of uncertainty of measurement (may include the use of soft ware)
- enterprise procedures and legislative requirements for documenting calibration procedures
- enterprise and/or legal traceability requirements
- relevant health, safety and environmental requirements.

Knowledge is also required of the:

- 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

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- metrology
- non-destructive testing
- optics and radiometry
- pressure testing.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource implications

Resources may include:

- specialised calibration/test equipment, reference standards and materials, laboratory facilities
- access to a library of calibration methods, procedures, equipment specifications
- laboratory calibration software and programs, manufacturer’s proprietary software
- enterprise quality manual and procedures.

This competency in practice

Background

Automated calibration relies heavily on computers to assist technicians to 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 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 and 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 3	Level 2	Level 3	Level 3	Level 3

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PMLCOM500B Provide information to customers

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 should 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.

This unit of competency has no prerequisites.

This unit of competency is applicable to personnel working as technical officers and laboratory technicians in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 and/or advice	3.1 Ensure that information is accurate, relevant and 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

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		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

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.

This unit of competency requires access to the following types of information sources and documentation:

- information directories (organisational structure, telephone), online database and CD ROMS
- personnel, such as: scientists; technical experts; quality managers; laboratory and production personnel and customer service
- workplace documents, such as:

– equipment manuals

– laboratory records

– NATA requirements

– Australian Standards

– certified laboratory reports

– analysis report sheets (past and present)

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- organisational charts
- standard operating procedures (SOPs)

- enterprise procedures governing, for example:

- receipt of requests
- release of information and results, confidentiality needs of clients and customers
- sample collection protocols and techniques for preserving sample integrity
- handling and collection of native fauna and flora (Code 64)
- filing systems, databases, laboratory records.

This unit of competency may also include the use of items of equipment or systems, such as: telephone, fax, email, computer software, databases, spreadsheets and Auslan.

Information may be provided to:

- internal and external customers
- members of the public
- authorities, including regulatory authorities
- other enterprises, municipalities
- engineers, scientists, other specialist staff.

It may be necessary to provide appropriate information regarding:

- 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, time estimation
- contractual variations and claims
- site assessment and problems
- data analysis, statistical interpretation.

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Specific industry variables

Additional variables may apply for specific industry sectors.

Manufacturing and food processing

It may be necessary to:

- assess requests for changes to formulations and alterations to production processes
- determine variations and their significance for compliance with relevant standards.

Biomedical and environmental

It may be necessary to provide responses to inquiries regarding sample collection and recollection protocol from:

- patients, doctors, nurses and environmental health officers
- collection staff and couriers.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. The candidate must be able to assess requests for information and provide all verbal and written responses in a format that is easily understood by others and in accordance with workplace requirements.

In particular, the assessor should look to see that the candidate:

- correctly prioritises requests for information
- locates and synthesises the required information using appropriate sources

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- provides authorised information that is accurate, relevant, and in the required format
- uses technical terminology appropriate to customer and avoids jargon
- communicates in an efficient and polite manner, taking into account cultural diversity and disabilities
- maintains security and confidentiality of information as required by enterprise procedures
- records and files records of the request and information provided as required by enterprise procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- enterprise procedures relating to:
  - customer service for internal and internal customers with cognisance of cultural and social contexts
  - communication protocols
  - OHS and environmental regulations
- 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.

An awareness of the laboratory's business goals and key performance indicators is required as a basis for dealing with customers.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

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This unit of competency may be assessed with any relevant technical unit of competency.

Resource implications

Resources may include:

- information directories and databases
- workplace documents
- equipment, such as telephone, fax, computer equipment (email or online information systems).

This competency in practice

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 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 received phone requests for the early release of results when they were needed urgently. Sometimes when this occurred, the individual who performed the analyses was unavailable and no one else was sufficiently informed to provide a verbal report on the data. The laboratory personnel realised that they should organise the way they recorded their results so that everyone could access, understand and report them quickly. The team

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developed a centralised system of recording and filing the results. They also organised a series of brief training sessions to share information about the analyses that they performed.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 1	Level 2	Level 2

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PMLDATA500B Analyse data and report results

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.

This unit of competency has the following prerequisite:

- PMLDATA400A Process and interpret data

This unit of competency is applicable to technical officers and laboratory technicians working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Perform scientific calculations	1.1 Ensure raw data are consistent with expectations and reasonable ranges
	1.2 Calculate scientific quantities involving algebraic, logarithmic, exponential, and power 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

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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
		3.5	Determine 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 is 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.

RANGE STATEMENT

6. The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Data may be recorded on worksheets or entered into spreadsheets or databases linked to information management systems. Data includes the results of: tests, measurements, analyses and surveys.

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Calculations may be performed with or without a calculator or computer software, such as spreadsheets, databases, statistical packages. Examples of calculations of scientific quantities could 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, exposure
- optical properties: absorbance/transmittance, path length, extinction coefficient, concentration (Beers law), detection limits
- electrical properties: conductivity, resistivity, dielectric constants
- mechanical properties: stress, strain, elastic moduli, yield strength, hardness
- thermal properties: heat capacity, thermal expansion, thermal conductivity, 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 could include:

- determination of linear, logarithmic, exponential and power relationships
- regression lines and interpretation of correlation coefficients.

Statistical analysis could include the use of:

- histograms, frequency plots, stem and leaf plots, boxplots, scatter plots
- probability, normal probability plots
- Pareto diagrams, Stewhart control charts, CuSum control charts
- regression methods for calibration, linearity checks, comparing analytical methods
- analysis of variance (ANOVA)
- data acceptability tests, such as Q, T and Youden.

Records could include information associated with:

- purchase of equipment and materials, service records
- safety procedures
- history of calibration and test results.

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Reference materials could include:

- material data safety sheets
- equipment manuals and warranty, supplier catalogues, handbooks
- sampling and test procedures, standard operating procedures (SOPs)
- enterprise quality manual, customer quality plan
- OHS regulations, guidelines and procedures
- Australian Standards, NATA technical notes and National Measurement Act.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate 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
- maintain the security and confidentiality of data in accordance with workplace and regulatory requirements

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- report results in the required formats and expected timeframe.

Underpinning knowledge

Competency includes the ability to apply and explain:

- procedures for data traceability
- procedures for verifying data and rectifying mistakes
- procedures for maintaining and filing records, security of data
- the characteristics of a valid measurement
- sources of uncertainty in measurements
- relevant scientific and technical terminology, such as: variables, dispersion, central tendency, process control, process stability, normal distribution, confidence level and replication.
- relevance/importance of the National Measurement Act to laboratory measurement, if applicable.

Competency also includes the ability to perform laboratory computations, such as:

- calculations involving fractions, decimals, ratios, proportions and percent
- evaluation of formulae containing powers, exponents, logarithms functions
- use of scientific notation, correct units, 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, correlation coefficients
- preparation and interpretation of more complex control charts and frequency distribution plots.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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

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- questions to assess understanding of relevant procedures, trends in data, 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- technical units, such as the *PMLTEST* '400' and '500' series units
- PMLDATA501B Use laboratory application software.

Resource implications

Resources may include:

- data sets and records
- computer and relevant software or laboratory information system
- relevant workplace procedures.

This competency in practice

Manufacturing

Before pharmaceutical products can be approved for use in Australia, they must be tested for shelf-life in their Australian sales pack(s). 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 substance(s) 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

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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 the statistical QC 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 β-carotene using spectrometric (UV-VIS) 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLDATA501B Use laboratory application software

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to technical officers and laboratory technicians in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 units in a report
	3.5 Prepare reports of the rationale and history of a computerised database search where appropriate
	3.6 Reference computerised data sources according to

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			the style requirements of the enterprise
4.	Perform simple record housekeeping	4.1	Maintain backup of worked data
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency 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 technical officers would be able to customise the software to meet specific needs. However, they should be able to use software application features and instructions to input, save, analyse, sort, retrieve and display the records or data. They may also make use of in house software manuals to augment their skills and solve operational problems.

Information sources could 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 could include: wordprocessing, spreadsheets, databases, graphical and statistical analysis and laboratory information systems.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

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All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard, using software for the analysis, reporting and management of laboratory and field data and information. In particular, the assessor should look to see that the candidate:

- selects the most appropriate software package for the task from the suite of software applications available
- uses routine instruction sets of the software package to complete the task
- uses software to analyse data, such as quality control and instrument performance characteristics
- backs up electronic storage
- uses scanning software to protect in house software and data.

Underpinning knowledge

Competency includes the ability to apply and explain:

- the applications of the software package
- the terminology associated with the software packages
- the relationship between the package instructions and the data manipulation performed
- types of database models that are available
- the relationship between the protocol for data input and file storage of the data
- general file and record maintenance
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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The following assessment methods are suggested:

- review of analysis tasks linking test results to the 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA500B Analyse data and report results
- Any unit in the *PMLTEST400* or *500* series of units.

Resource implications

Resources may include:

- access to a computer network or a personal computer
- software packages that include a database package, spreadsheet, statistical analysis, simple graphics output
- input and output data.

This competency in practice

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 QC purposes. The software package provides for the input of data, analysis of mean value and variance as well 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

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLMAIN501B Assist in the maintenance of reference materials

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 does not cover the scientific identification of species or specimens.

This unit of competency has no prerequisites.

This unit of competency typically applies to technical officers and laboratory technicians working in all industries who contribute to the maintenance of reference material as part of their job.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 data base
	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	3.1 Verify requests with supervisor before requests for

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	materials to clients		reference materials are processed
		3.2	Supply reference material without contamination of 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Reference materials used in research and manufacturing processes could include:

- specimens, such as cells, tissues and samples of aqueous or proteinaceous standards
- aggregates, grains and powders
- materials used for checking equipment calibrations.

Information sources could include:

- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- test procedures (validated and authorised)
- sampling procedures (labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products
- cleaning, hygiene and personal hygiene requirements
- quality system and continued improvement processes
- incident and accident/injury reports
- schematics, work flows and laboratory layouts

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- instructions to comply with new legislation, standards, guidelines and codes
- waste minimisation and disposal procedures.

Equipment, materials and systems could include:

- centrifuges, waterbaths, 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
- 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.

This unit of competency may include communication with:

- supervisors and managers (laboratory, quality and customer service)
- other laboratory or clinical personnel
- outside suppliers, internal and external customers.

Hazards may include:

- chemicals, reagents
- micro-organisms associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- sharps, such as broken glassware
- disturbance or interruption of services
- manual handling of heavy boxes.

Safety procedures may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, 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.

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard, and that materials and specimens are maintained so that the reference characteristics and attributes are stable in storage and manifest in use after retrieval.

In particular, the assessor should look to see that the candidate:

- maintains material identity during storage
- performs all manipulations safely
- tests stored material for reference characteristics before release
- reconstitutes completely lyophilised materials (if required)
- prepares materials for freeze-drying (if required)
- communicates appropriately with all customers.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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

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- 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 example:

Process manufacturing and construction materials

- 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; 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
- AQIS requirements for imported biologicals.

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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 (for example, barley varieties, such as Proctor, Franklin and Stirling).

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 study, 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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- any of the *PMLTEST* 500 series that may involve using materials from a collection (for example, *PMLTEST501B Perform microbiological tests*)
- PMLORG600B Supervise laboratory operations in work or functional area
- PMLTEST603A Evaluate and select appropriate test methods and/or procedures.

Resource implications

Resources may include:

- equipment and materials related to the occupational task for which the reference material is relevant
- reference materials

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- standard operating procedures (SOPs).

This competency in practice

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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

PMLMAIN502A Maintain instruments and equipment

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.

This unit is based on, but not equivalent to, *PMLTEST302A* and *PMLTEST500A* in PML99. It covers the qualification of instruments but does not include making adjustments to their calibration. This is covered in the unit *PMLCAL400A Perform standard calibrations*.

This unit of competency has no prerequisites.

This unit of competency applies 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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			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
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	Dispose of unwanted components or laboratory waste using enterprise procedures.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by laboratory technicians who calibrate and maintain a range of laboratory equipment and instruments as part of their job.

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All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - AS/NZS 2243.2 Safety in laboratories — Chemical aspects
  - AS 2243.6 Safety in laboratories — Mechanical aspects
  - AS 2243.10 Safety in laboratories — Storage of chemicals
  - AS 2830 Good laboratory practice
- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs)
- 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.

Laboratory equipment and instruments will depend on the enterprise and the range of testing carried out. Items of equipment and instruments may include, but are not limited to:

- balances
- density bottles, pipettes, burettes and volumetric glassware
- thermometers, melting point apparatus, water baths, incubators
- optical microscopes, refractometers, polarimeters
- conductivity meters, pH meters
- ion selective electrodes
- autoclaves
- mixing and separating equipment, such as centrifuges, rifflers and splitters, mixers
- noise meters and blast meters

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- pressure gauges, torque testers, load cells, strain guages, tensiometers
- disintegration apparatus, penetrometers, hardness testing equipment, viscometers, soil compaction and classification equipment
- colorimeters, spectrometers
- chromatographic equipment, electrochemical equipment
- cell analysers and cell counters
- motors, pumps, generators.

Basic repairs may include:

- replacement of fuses and reagents, consumables
- cleaning and/or replacement of cells, torches, 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, belts
- replacement or top up of oils, lubricants or coolants
- basic electrical checks involving simple digital multimeters.

Calibration status/qualification checks might include, but are not limited to:

- matching cells (for dual beam instruments)
- checks for monochromator wavelength and photometric accuracy
- checks for baseline flatness, stray light
- checks on electrode performance

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- checking sensitivity
- 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 may include:

- electric shock
- chemicals, such as acids, cleaning agents
- fluids under pressure, such as steam, 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 may include:

- use of personal protective equipment, such as hearing protection, gloves, safety glasses, coveralls, 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, service isolation tags
- lockout and tagout procedures.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

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All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate 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.

Underpinning knowledge

Competency includes the ability to apply and explain:

- operating principles for equipment/instruments used in routine work
- common sources of equipment/instrument faults and their repair
- 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.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with relevant *PMLTEST400* or *TEST500* series units of competency.

Resource implications

Resources may include:

- laboratory equipped with appropriate equipment and calibration standards
- standard operating procedures (SOPs), calibration and maintenance schedules and procedures.

This competency in practice

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

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

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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 uv-vis spectrometer.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLORG500B Schedule laboratory work for a small team

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to technical officers and laboratory technicians working in a team environment in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 variation(s) or potential disruptions
	3.2 Identify possible causes for the variation(s) and discuss possible adjustments with senior personnel
4. Adjust schedules in consultation with senior personnel	4.1 Adjust schedules in response to operational variation
	4.2 Maintain or renegotiate outputs in accordance with work requirements

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4.3 Update documented schedules and distribute to appropriate personnel.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency is relevant to experienced technical officers who have responsibility for the work outputs of a small work team.

Laboratory work could include:

- setup, pre-use and calibration checks of equipment
- preparation and standardisation of solutions
- maintenance of laboratory facilities, equipment and stocks
- collection, preparation, storage/dispatch of samples
- testing and analysis of raw materials, products and specimens
- preparation of products (for example, sterile media) and product batches
- trial and modification of methods.

Scheduling for a small team could 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, bad weather
  - analysing and solving operational problems resulting in unacceptable test results

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- unexpected events, such as equipment 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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard and to schedule the work activities of a small team to meet operational requirements. In particular, the assessor should look to see that the candidate:

- determines required resources accurately

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- plans schedules that are efficient and satisfy operational requirements without compromising safety, quality, accuracy and ethics
- adheres to timelines whenever possible
- recognises non-standard behaviour in samples and equipment
- recognises potential disruptions to planned timetable
- compensates for a variety of work environments (for example, outdoors or night work)
- adjusts schedules and resource requirements efficiently in response to variations
- communicates and documents schedule variations in accordance with procedures
- recognises and uses capabilities of team members
- communicates effectively with team members and appropriate to cultural and social contexts.

Underpinning knowledge

The candidate requires sufficient knowledge of the enterprise's information systems, procedures and equipment to schedule the laboratory work for a small team to meet operational requirements.

Competency includes the ability to apply and explain:

- 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, 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
- enterprise procedures relating to OHS, access and equity, relevant sections of industrial awards and enterprise agreements
- quality requirements for the tasks scheduled
- relevant health, safety and environment requirements.

An appreciation of the laboratory's business goals is also required as a basis for decision making and actions.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

Competency in this unit should be assessed by collecting evidence over sufficient time to demonstrate the candidate's ability to handle a variety of schedules and contingencies.

The following assessment methods are suggested:

- review of documented work schedules prepared by the candidate which successfully met 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with technical units of competency relevant to the work of the team.

Resource implications

Resources may include:

- workplace procedures
- workplace documentation (for example, production data).

This competency in practice

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 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.

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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 multiskilled. 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLQUAL500A Monitor the quality of test results and data

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.

This unit of competency has the following prerequisite:

- *PMLDATA400A Process and interpret data*

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
	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

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			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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or may have been prepared from:

- Australian and international standards, such as:

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- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- ISO 5725–11, 6 Accuracy (trueness and precision) of measurement methods and results
- ISO 9000–1 Quality management and quality assurance standards Part 1 — Guidelines for selection and use
- ISO 9004–1 Quality management and quality system elements Part 1 — Guidelines
- ISO 9004–4 Quality management and quality system elements Part 4 — Guidelines for quality improvement
- ISO 10012 Quality assurance requirements measurement equipment
- guide to the expression of uncertainty in measurement, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAC, IUPAP, OIML
- industry/sector specific guides, such as Eurachem/CITAC Guide on 'Quantifying Uncertainty in Analytical Measuement'

- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs) and published preparation methods
- quality manuals, equipment and procedures manuals
- equipment startup, operation and shutdown
- enterprise recording and reporting procedures
- production and laboratory schedules.

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, contracts
- worksheets, work books, check sheets, work notes
- original observations, derived data, 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, checking of results.

Charts, tables and statistical tests could include:

- run charts, control charts

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- histograms, frequency plots, stem and leaf plots, boxplots, scatter plots
- probability, normal probability plots
- Pareto diagrams, Stewhart control charts, CuSum control charts
- regression methods for calibration, linearity checks, comparing analytical methods
- analysis of variance (ANOVA)
- data acceptability tests, such as Q, T and Youden.

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 could include:

- spectral interference (for example, in ICP)
- physical interference (for example, in AAS)
- matrix effects
- presence of contaminants
- masking of analytes.

Human and environmental factors could include:

- lack of operator competence and/or training
- inadequate attention to detail, fatigue, stress
- inadequate hygiene, sterility
- unacceptable dust, humidity, temperature, illumination levels
- electromagnetic disturbances
- variations to gas, electricity and water supply
- unacceptable sound and vibration levels.

Sample preparation problems could result from:

- incomplete preparation
- segregation

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- sample disturbance
- incorrect sample containers
- incorrect sample handling (filtered/non filtered, temperature control, preservation)
- incorrect particle size
- incorrect matrix
- incomplete digest.

Preventative/corrective actions could include:

- regular use of certified reference materials
- internal quality controls using secondary reference materials
- participation in interlaboratory 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, 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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- verifies the accuracy and completeness of data, results and technical records
- recognises significant trends in data and/or aberrant results
- uses statistical tests to estimate uncertainties and determine data acceptability
- analyses sampling, sample preparation testing and/or calibration activities to identify potential causes of unacceptable data/results
- applies effective problem solving strategies
- recommends appropriate preventative/corrective actions to control potential/actual non conforming work
- follows enterprise procedures for documenting and reporting information about quality.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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, data acceptability) and sampling procedures
- problem solving techniques, cause analysis
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of verified records and reports generated by candidate
- feedback from supervisors and peers about the candidate's ability to monitor the quality of test results and data

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- questioning to assess understanding of trends in data, sources of uncertainty, 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results*
- *relevant PMLTEST400 or PMLTEST 500 series units of competency.*

Resource implications

Resources may include:

- data files and technical records, laboratory information management system
- appropriate software
- enterprise quality manual and procedures
- access to samples, sampling equipment, test equipment/instruments/materials.

This competency in practice

Calibration

A calibration technician/specialist has completed testing an instrument and places it with the test report on the completed work quality inspection bench. The laboratory quality inspector (who may be the laboratory supervisor) physically examines the item to ensure all accessories have been applied. The inspector checks the test report for validity and correctness and ensures any abnormalities or departures from normal or specified conditions are reported appropriately. Data transfers and calculations are confirmed for accuracy in accordance with standard operating procedures, industry guidelines and the laboratory's accreditation requirements. The inspection also includes ensuring all relevant databases are updated a nd client confidentiality is maintained. Finalisation of the inspection includes signing the certificates and reports. Upon successful inspection, the item is forwarded to another area for subsequent administration and dispatch to the client.

Manufacturing

The person conducting final quality assurance activities is responsible to ensure 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 work sheets 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 quality of work produced by outsourced subcontractors.

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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 3 seconds using standard methods. The measurements are stored in data loggers and downloaded to the laboratory's computer every 24 hrs. Using a standard software package, the laboratory technician generates 1 hr and 24 hr averages for each site. They then graph the results over a one year period and uses the appropriate Australian Air Quality Standard to determine exceedances for the 1 hr and 24 hr 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 3	Level 3	Level 2

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PMLSCIG501B Design and manufacture glass apparatus and glass systems

UNIT DESCRIPTOR

This unit of competence covers the ability to design and manufacture glass apparatus and glass systems. It may include 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. Personnel are required to apply specialised technical knowledge and precise technical skills as well as considerable planning and judgement in their work.

This unit of competency has the following prerequisites:

- *PMLSCIG300B Operate basic handblowing equipment*
- PMLSCIG301B Repair glass apparatus using simple glass blowing equipment.

This competency typically applies 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Scope the design of glass apparatus/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
	2.3 Design the equipment

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		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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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This unit of competence describes the work conducted by skilled and experienced scientific glassblowers who design and manufacture glass apparatus and glass systems as part of their job.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements include or have been prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- material safety data sheets
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Tools, materials and equipment may include:

- bench burner, hand torch 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, strain viewer
- mechanical glass cutters and saws
- mechanical glass grinding equipment
- special formula glasses
- glass to glass and glass to metal seals.

Hazards may include:

- sharps, broken glassware
- residues on used glassware, such as mercury

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- heat sources, such as burners and ovens
- fluids under pressure (acetylene, oxygen)
- glass dust
- cuts associated with glass grinders and cutters
- manual handling of heavy equipment and containers.

Safety practices may include:

- use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators, safety boots
- correct labelling of reagents and hazardous materials
- handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competence must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to design and manufacture glass apparatus systems.

In particular the assessor should look to see that the candidate can:

- interpret a brief, including design requirements and cost
- prepare apparatus and system designs
- incorporate appropriate design factors relevant to use requirements of apparatus

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- select appropriate grades of glass and components and prepare for use
- apply basic theoretical knowledge of chemistry and 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 GLP practice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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 glasswork methods and procedures, including 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.

Assessment context and methods

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 time frame 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 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

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSCIG503B Construct, modify and maintain high vacuum systems
- PMLSCIG502B Perform glass coating, grinding and finishing operations.

Resource implications

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.

This competency in practice

Manufacturing

A scientific glass blower, 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 glass blower 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 glass blower selected the glass, prepared the glass blowing 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

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Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLSCIG502B Perform glass coating, grinding and finishing operations

UNIT DESCRIPTOR

This unit of competence covers the ability to perform glass coating, grinding and finishing operations for scientific glassware. Personnel are required to apply specialised technical knowledge and precise technical skills as well as considerable planning and judgement in their work.

This unit of competency has the following prerequisites:

- PMLSCIG300B Operate basic handblowing equipment
- PMLSCIG301B Repair glass apparatus using simple glass blowing equipment.

This competency typically applies 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 Perform glass coating operation as per standard procedure
	2.3 Perform post-coating procedures to maintain coated

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			surface
		2.4	Perform coating removal processes
		2.5	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/regrinding 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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competence describes the work conducted by skilled and experienced scientific glassblowers who perform glass coating, grinding and finishing operations as part of their job.

All operations are usually performed in accordance with laboratory and/or enterprise procedures. These procedures include or have been prepared from:

- industry Codes of Practice
- material safety data sheets
- 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.

Tools and equipment may include:

- 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, strain viewer
- mechanical glass cutters and saws
- mechanical glass grinding equipment
- safety clothing and equipment.

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Glass coating may include operations, such as:

- cleaning and preparation of glass
- preparing coating solutions
- coating/strip coating and dedicated coating
- protecting coated surfaces
- electroplating
- removal/partial removal of coating.

Grinding may include operations, such as:

- 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 may include operations, such as:

- cleaning, rinsing and drying
- evacuating and sealing
- metallising (if applicable)
- flame and/or mechanical polishing.

Hazards may include:

- sharps, broken glassware
- residues on used glassware, such as mercury
- heat sources, such as burners and ovens
- fluids under pressure (acetylene, oxygen)
- glass dust
- cuts associated with glass grinders and cutters
- manual handling of heavy equipment and containers.

Safety practices may include:

- use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators, safety boots

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- correct labelling of reagents and hazardous materials
- handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time.

Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health.

All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competence must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to perform glass coating, grinding and finishing operations when preparing scientific glassware.

In particular the assessor should look to see that the candidate 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

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- record and report work results
- follow correct OHS and GLP practice.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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.

Assessment context and methods

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 time frame 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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

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- PMLSCIG503B Construct, modify and maintain vacuum systems
- PMLSCIG501B Design and manufacture glass apparatus and glass systems.

Resource implications

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.

This competency in practice

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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLSCIG503B Construct, modify and maintain high vacuum systems

UNIT DESCRIPTOR

This unit of competence 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.

This unit of competency has the following prerequisites:

- PMLSCIG300B Operate basic handblowing equipment
- PMLSCIG301B Repair glass apparatus using simple glass blowing equipment.

This competency typically applies 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
2. Modify high vacuum systems	2.1 Identify opportunities to improve efficiency of vacuum system

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		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 substandard performance clearly
		4.4	Fine-tune 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

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			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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competence describes the work conducted by skilled and experienced scientific glassblowers who construct, modify and maintain high vacuum systems as part of their job.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements include or have been prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- material safety data sheets
- 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.

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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 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, strain viewer
- mechanical glass cutters and saws
- mechanical glass grinding equipment.

Vacuum apparatus includes items, such as:

- manometers
- vacuum traps
- vacuum manifolds
- vacuum distillation apparatus
- gas handling systems.

Maintenance includes procedures, such as:

- 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 may include:

- sharps, broken glassware
- residues on used glassware, mercury
- heat sources, such as burners and ovens
- fluids under pressure (acetylene, oxygen)

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- glass dust
- cuts associated with glass grinders and cutters
- manual handling of heavy sample bags and containers.

Safety practices may include:

- use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators, safety boots
- correct labelling of reagents and hazardous materials
- handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- regular cleaning and/or decontamination of equipment and work areas.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competence must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to use advanced bench/hand glasswork techniques and equipment to fabricate glass apparatus. In particular the assessor should look to see that the candidate 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
- follow enterprise procedures to document and communicate work details.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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.

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Assessment context and methods

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 time frame 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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLSCIG502B Perform glass coating, grinding and finishing operations
- PMLSCIG501B Design and manufacture glass apparatus and glass systems.

Resource implications

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.

This competency in practice

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, hand tools to the research laboratory and proceeds to link

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these components with various sizes of glass tubing and transition glass/metal vacuum flanges. Having completed the vacuum system, the glass blower assists with checking all joints and seals under vacuum conditions and undertakes any repairs and modifications. Finally they dispose of all waste appropriately and returns the equipment to the workshop.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLTEST501B Perform microbiological tests

UNIT DESCRIPTOR

This unit of competency describes the ability of technical personnel to contribute to the culture, isolation and identification of micro-organisms for investigating the physiology and pathology of plants and animals; for monitoring the natural environment; and to assist in the production of foods, pharmaceutical goods and other manufactured materials.

This unit of competency provides for the development of skill in procedures that can be applied in investigations of bacteria, fungi, viruses, protozoans, algae and parasites, as well as addressing the broader needs of biotechnology and tissue culture applications.

This unit of competency has the following prerequisites:

- *PMLTEST407A Perform biological procedures*

This unit of competency is applicable to laboratory technicians and technical officers working in biomedical, biotechnology, environmental, manufacturing and food/beverage processing industry sectors. Although a supervisor may not always be present, the technician will follow standard operating procedures 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.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Receive samples and process associated request forms	1.1 Check samples and request form details before they are accepted
	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

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		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, reporting 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 samples to concentrate material for subsequent staining or microscopy	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
		4.4	Sub culture on suitable media to optimise production of pure cultures
5.	Sub culture on suitable media to optimise production of pure	5.1	Select staining techniques to demonstrate required cellular characteristics

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	cultures	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
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 recording or transcribing required 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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes aspects of work conducted by supervised laboratory technicians.

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.

All work will assume the potential infectivity of samples and materials presented for laboratory processing. Facilities, equipment and processes will conform to the recommendations of AS/NZS 2243.3 Safety in laboratories, Part 3 — Microbiology.

Information sources could include:

- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- test procedures (validated and authorised)
- sampling procedures (labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products, MSDS
- cleaning, hygiene, personal hygiene requirements
- quality system and continued improvement processes
- incident and accident/injury reports
- schematics, work flows, laboratory layouts
- instructions to comply with new legislation, standards, guidelines and codes
- waste minimisation, containment, processing and disposal procedures
- current guidelines for small scale genetic manipulation work, from the Office of the Gene Technology Regulator (OGTR).

Equipment, materials and systems could include:

- protective and physical containment facilities and equipment for safe handling of micro-organisms (AS/NZS 2243.3 Safety in laboratories, Part 3 — Microbiology)
- personal protective equipment, such as gloves, gown, mask and safety glasses, gloves for working with extremes of heat and cold
- carbon dioxide cabinets, incubators

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- 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, stereomicroscopes
- counting chambers for micro-enumeration
- colony counting devices
- bunsen burners, bench incinerators
- incubators, water baths
- anaerobic jars, fermentation chambers, continuous culture systems and other devices for controlling growth environments of micro-organisms
- laboratory information management systems, 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 ultra-violet (UV) lamps
- materials suitable for the safe containment, collection, processing and disposal of biological and non-biological wastes
- autoclaves.

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 (for example, NATA).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of

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infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular the assessor should look to see that the candidate:

- safely performs tasks for the culture, isolation, identification and use of micro-organisms
- does not contaminate him/herself, other people, the work area, equipment or the samples or materials under test
- does not contaminate media or reagents during manipulations involving transfer of cultures
- identifies artefact or image aberration 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
- is consistently accurate in the identification of Gram reactions
- is consistently accurate in the description of bacterial colony forms on common media used in bacteriological investigations
- prepares documentation that is accurate, concise and in accordance with enterprise requirements
- reports all incidents or accidents
- disinfects any spillage and safely disposes of all contaminated materials
- decontaminates the work area upon completion of work.

Underpinning knowledge

Competency includes the ability to apply and explain:

- relevant microbiological terminology, including, where relevant that of bacteriology, parasitology, virology, mycology
- use of protective clothing and biological safety cabinets
- disinfection and sterilisation as applied to practical aspects of microbiology
- microbial diversity

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- micro-organisms of importance in medicine, in production of foods and other manufactured goods, 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 (for example, Most Probable Number (MPN) technique)
- need for accurate identification of sample source (for example, body, specimen, process line, 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 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 environment protection agencies

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- 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 miroorganisms in site remediation
- identification of micro-organisms to assist in determining the cause, time or nature of pollution.

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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 industry
- importance of 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLQUAL401B Apply quality system and continuous improvement processes.

Resource implications

Resources may include:

- standard microbiology laboratory with relevant equipment, samples and reagents
- enterprise procedures, test methods, 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 2243.3.

This competency in practice

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 coverslipped 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 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 standard operating procedure had been followed and sufficient product rejected.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

PMLTEST502B Perform haematological tests

UNIT DESCRIPTOR

This unit of competency describes 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. This unit of competency does not cover the laboratory aspects of transfusion science; these are covered in the unit *PMLTEST509A Perform immunohaematological tests*. While this unit focuses on the laboratory investigation of human physiology and pathology, it reasonably describes aspects of work performed in veterinary settings.

This unit of competency has the following prerequisites:

- PMLTEST407A Perform biological procedures

This unit of competency is applicable to laboratory technicians and technical officers working in the biomedical industry sector. Although a supervisor may not always be present, the technician will follow standard operating procedures 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.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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		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 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

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.

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.

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It is expected that all work would conform to statutory and enterprise occupational health and safety Codes of Practice.

Information sources could include:

- AS/NZS 2243.3 Safety in laboratories, Part 3 — Microbiology
- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- test procedures (validated and authorised)
- sampling procedures (labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products
- cleaning, hygiene and personal hygiene requirements
- quality system and continued improvement processes
- incident and accident/injury reports
- schematics, work flows, laboratory layouts
- instructions to comply with new legislation, standards, guidelines and codes
- stock records and inventory
- training program contents
- waste minimisation and disposal.

Equipment, materials and systems could 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, waterbaths, incubators
- volumetric glassware and measuring devices
- cell counting chambers
- microscopes for bright field and phase contrast examinations

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- 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.

Communication may involve:

- supervisors and managers (laboratory, quality and customer service)
- other laboratory or clinical personnel
- patients and clients
- personnel of accreditation agencies (for example, NATA).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate 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

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- 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).

Competency also includes contribution to the general maintenance of equipment and processes to ensure ongoing compliance with enterprise and laboratory accreditation. In particular, the assessor should look to see that the candidate:

- recognises problems in systems and documentation
- uses enterprise information system efficiently
- critically analyses information in enterprise documents
- prepares documentation that is accurate, easily understood by the intended audience and in accordance with enterprise requirements
- manages tasks and organises work to ensure the timely completion of tasks
- uses samples, reagents and materials economically and disposes of wastes safely
- uses equipment safely
- maintains equipment, recording and reporting malfunctions appropriately.

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Underpinning knowledge

Competency includes the ability to apply and explain enterprise procedures relating to:

- 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
- accurate use of terms applied to:
  - relevant underpinning aspects of normal and abnormal anatomy, physiology, genetics, 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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

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- 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:

– 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA500B Analyse data and report results
- PMLQUAL401B Apply quality system and continuous improvement processes.

Resource implications

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 viruses. However, this does not reduce the need for universal precautions in the use of these samples.

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This competency in practice

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; to 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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST503B Perform histological tests

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. 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 has the following prerequisites:

- *PMLTEST310A Perform histological techniques.*

This unit of competency is applicable to laboratory technicians and technical officers in the biomedical sector and particularly histopathology. Although a supervisor may not always be present, the technician will follow standard operating procedures 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.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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	2.1 Arrange tissues and request forms in cut-up area

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	cut-up	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 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

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		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

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		6.9	Attach permanent label giving specimen details as required by enterprise
7.	Contribute to efficient provision of histological services	7.1	Monitor and maintain resources for pathologists in 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, mortuary
		7.3	Monitor and maintain volumes of fixatives in areas, such as wards, theatres, 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 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 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

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information, and laboratory data and records.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency assumes that the technical officer would perform tests and procedures under the close supervision of scientific and/or medical staff.

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.

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.

It is expected that all work would conform to statutory and enterprise occupational health and safety Codes of Practice.

Information sources could include:

- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- AS/NZS 2243.3 Safety in laboratories
- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- test procedures (validated and authorised)
- medico-legal and laboratory accreditation requirements for traceability of specimens and records
- sampling procedures (labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products
- cleaning, hygiene and personal hygiene requirements
- quality system and continuous improvement processes
- incident and accident/injury reports
- schematics, work flows and laboratory layouts
- instructions to comply with new legislation, standards, guidelines and codes
- stock records and inventory
- material data safety sheets
- waste minimisation and disposal protocols.

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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, 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, 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 may involve:

- supervisors and managers (laboratory, quality and customer service)
- other laboratory or clinical personnel (pathologists, nursing staff, pathology registrars, other medical staff and clerical staff)
- clients
- external auditors and accreditation agencies (for example, NATA).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence**.**

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and

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Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate performs manual and automated histological tests and procedures for:

- preparation, safe storage and disposal of stains and reagents
- cutting of paraffin embedded sections, free of wrinkles, scores and folds, at the specified thickness to demonstrate tissue and cellular structures, granules, inclusions and organelles if required
- cutting and staining of frozen sections at the specified thickness to demonstrate tissue and cellular structures and inclusions as required
- staining of paraffin embedded sections to demonstrate normal and abnormal tissue structure
- specialised staining, for example to demonstrate connective tissue, musclestriations, central nervous system, glands, basement membrane, micro-organisms, pigments and deposits
- histochemical stains, for example to demonstrate carbohydrates, amyloid and mucins
- specialised techniques, such as polarising microscopy, fluorescent staining and use of microwave ovens in histopathology
- basic immunohistochemical staining
- cover slipping of slides, ensuring that no air bubbles are formed and material is preserved for the life of the slide
- clear labelling of slides with case, specimen and stain details.

In particular, the assessor should look to see that the candidate:

- recognises problems in systems and documentation, and troubleshoots under direction and/or where appropriate
- uses enterprise information system efficiently
- critically analyses information in enterprise documents
- prepares documentation that is accurate, concise and in accordance with enterprise requirements
- manages tasks and organises work to ensure the timely completion of tasks

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- uses samples, reagents and materials economically and disposes of wastes safely
- uses equipment safely
- maintains equipment, recording and reporting malfunctions appropriately.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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 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 worked)
- effects of the presence of artefacts in sections on microscopic examination of tissues.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- inspection of stained tissue sections/slides prepared by the candidate

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- 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.

Interdependent assessment of unit

This unit of competency may be assessed with:

6. PMLQUAL401A Apply quality systems and continuous improvement processes.

Resource implications

Resources may include:

- standard histology/laboratory with relevant equipment, samples and reagents
- enterprise procedures, test methods, 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 AS2243.3.

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This competency in practice

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 work sheet 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST504B Perform chemical pathology tests

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 to disease through the identification and quantifying of chemical components. The unit covers tests and procedures that are usually associated with the laboratory discipline of clinical biochemistry. They are performed in a full or partial computerised and automated environment where large numbers of samples must be managed, analysed and their results recorded. The unit principally refers to human pathology but many aspects are relevant to veterinary pathology.

This unit of competency has the following prerequisites:

- *PMLTEST407A Perform biological procedures.*

The unit of competency describes aspects of work conducted by supervised technical staff. Although a supervisor may not always be present, the technical worker will follow standard operating procedures (SOPs) that clearly describe his or her 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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		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 records	4.1	Make entries on report forms or into computer systems, accurately recording or transcribing required data as required
		4.2	Maintain instrument logs as required by accreditation checklists
		4.3	Maintain security and confidentiality of all clinical information, laboratory data and records.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency assumes that the technical officer would perform tests and procedures under the close supervision of scientific and/or medical staff.

This unit of competency describes the testing of tissues, blood, bodily fluids (cerebrospinal fluid, peritoneal and wound aspirates, sweat, 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.

Information sources could include:

- AS/NZS 2243.3 Safety in laboratories, Part 3 — Microbiology
- AS ISO/IEC 17025 General requirements for the competency of testing and calibration laboratories
- enterprise procedures, SOPs and operating manuals
- test procedures (validated and authorised)
- sampling procedures (for example, labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products
- cleaning, hygiene, personal hygiene requirements
- quality system and continued improvement processes
- incident and accident/injury reports
- schematics, work flows and laboratory layouts
- instructions to comply with new legislation, standards, guidelines and codes
- waste minimisation and disposal procedures.

Equipment, materials and systems could include:

- centrifuges, waterbaths and incubators
- manual and automated spectrometers and other related measurement devices
- various discrete and multi-channel analysers for chemical analytes
- laboratory information management systems, 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

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- materials suitable for the safe collection and disposal of biological and non-biological wastes.

Communication may include:

- supervisors and managers (laboratory, quality and customer service)
- other laboratory or clinical personnel
- patients and clients
- external auditors and accreditation agencies (for example, NATA).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard.

Whilst testing blood and body fluids, including excreta, testing should focus on:

- the identification of chemical substances that are associated with organ dysfunction or indications of success or failure of treatment
- biological activity (for example, assessment of enzyme activity indicative of organ/ tissue damage)
- monitoring humoral immune system components
- the application of DNA techniques
- evidence of prior exposure to infective agents, as in the case of identifying plasma changes that are consequent to or associated with immune responses.

In particular, the assessor should look to see that the candidate:

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- recognises problems in systems and documentation
- discriminates between significant data and artefact
- uses enterprise information system efficiently (for example, networks or ordering for consumable materials)
- critically analyses information or documents and respond appropriately to an abnormal result
- prepares documentation that is accurate, concise and in accordance with enterprise requirements
- uses samples, reagents and materials correctly and economically
- disposes of wastes safely
- communicates appropriately with a diverse range of internal and/or external customers
- reports equipment malfunction or liaises with contracted service technician to ensure equipment downtime is minimised.

Underpinning knowledge

Competency includes the ability to apply and explain:

- enterprise procedures relating to selection and use of testing procedures, in terms of the supposed or defined clinical problem
- range of tests 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
- the central place the patient, client or customer occupies in the business of the enterprise
- application of enterprise occupational health and safety and environmental policies.

Competency includes:

- the ability to accurately use scientific, medical, clinical, technical and workplace terminology relevant to job role/function
- sufficient knowledge of the relevant terminology and normal and abnormal anatomy, physiology, biochemistry and immunology to enable efficient communication with laboratory and clinical staff.
- relevant health, safety and environment requirements.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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.

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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLQUAL401B Apply quality system and continuous improvement processes.

Resource implications

Resources may include:

- enterprise documents, standard chemical pathology laboratory with relevant equipment, samples and reagents
- enterprise procedures, test methods, 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 viruses, but this does not preclude the use of universal precaution in the use of blood samples.

This competency in practice

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

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST505B Conduct sensory analysis

UNIT DESCRIPTOR

This unit of competency covers the ability to set up and co-ordinate test panels and assess the results obtained from a sensory analysis.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory technicians and technical officers generally working for food and beverage processing industries. Although a supervisor may not always be present, the technician will follow standard operating procedures 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Select panellists for sensory analysis	1.1 Develop and use a questionnaire for initial screening of potential panellists based on testing brief
	1.2 Determine the ability of panellists to distinguish the desired sensory characteristics
	1.3 Analyse and report results used to establish 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
	3.3 Apply food safety procedures in the preparation and presentation of samples
4. Conduct routine sensory analysis	4.1 Select appropriate test materials for the information required

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		4.2 Ensure tests are conducted according to enterprise procedures
		4.3 Analyse data to obtain statistically reliable results
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

Tests may be performed to determine the following aspects of a sample: flavour, appearance, aroma, texture.

Testing methods may include:

- triangular test, duo-trio test, ranking test, paired comparison test, blending test
- flavour profile
- threshold analysis
- discriminative testing, descriptive testing, affective testing.
- Group attributes could relate to:
- age, gender, ethnicity

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- smoking
- qualifications, trained/untrained
- random panel
- cultural background, as related to food preferences/food styles.
- The primary flavour characteristics include: sweet/sour, umarmic, bitter/salty.
- The results obtained from the sensory analysis may be applied in the following fields:
- marketing studies
- purchasing requirements
- quality assurance
- quality control and troubleshooting
- research and development.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Appropriate methods of sensory testing must be applied, along with a thorough analysis of data and completion of the necessary documentation.

In particular, the assessor should look to see that the candidate:

- performs initial screening of panellists and determines their suitability
- communicates appropriately and recognises the significance of cultural and social contexts
- selects appropriate test procedures
- accurately prepares evaluation samples by dosing or processing
- communicates the significance of results, including the discussion of any errors and/or unexpected variation to appropriate personnel.

Underpinning knowledge

Competency includes the ability to apply and explain:

- anatomy, physiology and functions of taste and smell
- interaction of sensory activity
- associated characteristics of mouth feel and appearance
- principles of effective control of the sensory testing environment
- 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.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLDATA500B Analyse data and report results.

Resource implications

Resources may include:

- statistical data sheets and charts, logbook, scientific calculator
- relevant ISO standards and AS standards
- sensory evaluation panel room and group of panellists
- access to a range of chemicals and samples.

This competency in practice

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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST509B Perform immunohaematological tests

UNIT DESCRIPTOR

This unit of competency describes 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.

This unit of competency has the following prerequisites:

- PMLTEST407A Perform biological procedures.

This unit of competency is applicable to technical officers and laboratory technicians working in transfusion or immunohaematology laboratories. Although a supervisor may not always be present, the technician will follow standard operating procedures 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.

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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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		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 records	4.1	Make entries on report forms or into computer systems, accurately recording or transcribing 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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work of the technical officer in the transfusion or immunohaematology laboratory.

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.

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.

Information sources could include:

- latest edition of Guidelines for Pretransfusion Testing, published by the Australasian Society of Blood Transfusion Inc
- Human Tissue Acts and regulations operable in Australian jurisdictions
- guidelines, policies and business rules of the Australian Red Cross Blood Service that are operable from time to time
- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- test procedures (validated and authorised)
- sampling procedures (labelling, preparation, storage, transport and disposal)
- safety requirements for equipment, materials or products
- cleaning, hygiene, personal hygiene requirements
- quality system and continued improvement processes
- incident and accident/injury reports
- schematics, work flows, laboratory layouts
- instructions to comply with new legislation, standards, guidelines and codes
- stock records and inventory
- waste minimisation and disposal.

Equipment, materials and systems could include:

- centrifuges, light boxes, calibrated pipettes, waterbaths, incubators, microscopes
- laboratory information/management systems, computer databases, record and filing systems

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- general laboratory glassware and equipment identified with a serology laboratory
- antisera and phenotyped red cells and other relevant reagents
- gel systems.

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 (for example, NATA)
- couriers.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- detects and records accurate evidence of blood group antigen and antibody reactions.

Such reactions 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 perinatal period (as evidence of sensitisation of foetal red cells by transplacental maternal antibody)

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- 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 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.

In particular, the assessor should look to see that the candidate:

- recognises problems in systems and documentation
- uses enterprise information systems efficiently
- critically analyses information/documents
- prepares documentation that is accurate, concise and in accordance with enterprise requirements
- manages tasks and organises work to ensure the timely release of blood and blood products, as they complete routine tasks
- uses samples, reagents and materials economically and disposes of wastes safely
- uses equipment safely
- maintains equipment, recording and reporting malfunctions appropriately.

Underpinning knowledge

Competency includes the ability to apply and explain enterprise procedures relating to:

- selection and application of appropriate testing procedures in terms of the suspected or known nature of the antibody and its documented possible range of testing behaviours
- selection, testing and issuance of blood cleared for transfusion
- discussion of antigen/antibody reactions with colleagues to elucidate likely causes and to select and apply confirmatory tests as required
- selection and issuance of blood products for therapeutic or prophylactic use
- relevant health, safety and environment requirements.

Competency includes the ability to correctly use scientific, medical, clinical, technical and workplace terminology relevant to:

- normal and abnormal anatomy, physiology, biochemistry and immunology
- immunohaematology.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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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; record keeping
- integrated assessment with a case focus, such as the routine pre-transfusion crossmatch; 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.

Assessment should establish the candidate's ability to perform tests accurately and to organise work so that the needs of all relevant patients and clients are met in a timely fashion.

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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLQUAL401B Apply quality system and continuous improvement processes
- PMLTEST501B Perform microbiological tests.

Resource implications

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 viruses, but this does not preclude the use of universal precautions in the use of blood samples.

This competency in practice

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

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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 crossmatching. They complete the required documentation and labels and then store the compatible blood units for possible later use.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 2

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PMLTEST511B Supervise earthworks inspection, sampling and testing operations

UNIT DESCRIPTOR

This unit of competence covers the ability to supervise and direct earthworks operations based on observation and testing. This competency is typically performed by experienced technicians or para-professionals, who often supervise or direct less experienced technical personnel.

This unit of competency has the following prerequisites:

- PMLTEST403B Assist with geotechnical site investigations

or

- PMLSAMP400B Obtain representative samples in accordance with a sampling plan, and
- PMLTEST406A Perform physical tests.

This unit of competency is applicable to technical officers working in the construction 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 support personnel as required
	1.5 Record description of the job to be undertaken, compare with specification and resolve any variations
	1.6 Select suitable transport for site access
	1.7 Brief support personnel on job-specific requirements
2. Establish on-site	2.1 Consult with the site superintendent to determine

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	operations		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 earthworks operations	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	Analyse project data and report to client
		4.2	Report test results to site superintendent at specified frequency
5.	Maintain enterprise records	5.1	Record observations, data and results 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.

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RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competence describes the work conducted by experienced technicians and engineering para-professionals.

Operations are performed in accordance with laboratory and/or enterprise procedures and appropriate legislative requirements. These procedures and requirements include or have been prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Tools and equipment used may include:

- hand and power augers
- hand tools, including shovels, crowbars, scoops, spanners, wrenches, tape measure
- consumables, including sample bags, labels
- documentation, including maps, plans, contract documents, worksheets
- field test equipment, including sand replacement apparatus, nuclear soil moisture/density gauge, dynamic cone penetrometer
- still/video camera
- two-way radio, mobile telephone
- levelling equipment (dumpy, automatic levels).

Site hazards may include:

- solar radiation, dust and noise

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- manual handling of heavy materials and equipment
- working in/on trenches, confined spaces, wet and uneven surfaces, heights, slopes
- vehicular and pedestrian traffic.

Safety procedures may include:

- location of site services before investigations commence
- use of material safety data sheets (MSDSs)
- use of personal protective equipment, such as hard hat, hearing protection, sunscreen, gloves, masks, goggles, coveralls, safety boots, 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, traffic control.

Typical skills may include:

- working safely with equipment and around earthmoving plant
- driving safely on- and off-road
- working safely in field conditions
- setting up and maintaining tools and equipment
- using tools and equipment to perform sampling and in-situ testing
- cleaning equipment before leaving site in compliance with environmental authority requirements
- reading site plans, specifications and codes to determine sampling locations and frequencies
- measuring and estimating elevations, lengths, areas and volumes
- identifying of soil and rock materials
- observing and recording project information
- handling and storing samples appropriately
- comparing test results with specifications
- resolving problems without creating confrontational environments
- using computer software to create/maintain databases and produce detailed reports.

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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, construction activities.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competence must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to direct earthworks operations, as well as sampling and testing of materials. In particular the assessor should look to see that the candidate:

- reads and interprets maps, drawings, specifications and Codes of Practice
- identifies and locates sampling and testing sites
- measures and estimates elevations, lengths, areas and volumes
- determines sampling and testing frequencies
- takes representative samples

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- identifies and describes materials
- records project details in writing, by sketching and photography
- handles and transports samples correctly
- records sampling and testing information
- compares test results with specifications and draws valid conclusions on compliance
- uses tools and equipment effectively and efficiently
- observes, interprets and reports atypical situations
- communicates problems to appropriate personnel
- records and communicates work results
- works safely
- resolves problems constructively.

Underpinning knowledge

Competency includes the ability to apply and explain:

- engineering properties of soil and rock materials
- techniques used in civil construction
- plant and equipment used in earthworks
- in-situ and laboratory test methods and their application to various materials
- roles and responsibilities for different levels of supervision
- relevant health, safety and environment requirements.

Assessment context and methods

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.

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

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLORG500B Schedule laboratory work for a small team
- PMLCOM500B Provide information to customers
- PMLDATA500B Analyse data and report results.

Resource implications

Resources may include:

- access to construction sites, tools, equipment and materials
- enterprise procedures, sampling plans, test methods and equipment manuals.

This competency in practice

Construction materials

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 in-situ 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 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

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showing all filled areas and reviews the information as a guide to planning and costing future projects.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 2	Level 3	Level 2

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PMLTEST512A Apply electrophoretic techniques

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.

This unit of competency is based on, but is not equivalent to, the unit *PMLTEST507A Apply chromatographic and electrophoretic techniques* in PML99.

This unit of competency has the following prerequisites:

- *PMLTEST303B Prepare working solutions* ***OR*** *PMLTEST402A Prepare, standardise and use solutions*
- *PMLTEST404A Perform chemical tests and procedures.*

This unit of competency is applicable to laboratory technical officers and analysts working in all industry sectors, government agencies and research laboratories. 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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			requirements
		2.3	Prepare validation checks for analytical portion(s)
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

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		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
	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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243.2 Safety in laboratories — chemical aspects
  - AS 2830.1 Good laboratory practice — chemical analysis
- Codes of Practice, such as GLP and GMP
- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals

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- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Electrophoretic methods, include both analytical and preparative procedures, may use:

- vertical or horizontal apparatus
- support materials, such as cellulose acetate
- gels, such as agarose, polyacrylamide
- buffer solutions
- 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 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, drying
- determination of and, if appropriate, removal of any contaminants, impurities or interfering substances.

Tests may include methods for:

- control of starting materials, in-process materials and finished products (for example, food, manufacturing)
- therapeutic drug analysis
- forensic testing
- diagnostic pathology tests
- determination of chemical analytes
- special conditions for handling minute sample volumes
- environmental monitoring

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- problem solving techniques for non-routine samples
- troubleshooting enterprise processes.

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, buffers, pH
- problems with obtaining adequate sample volume.

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
  - mycotoxins
- chemicals, such as:
  - acrylamide
  - acids for example, sulphuric, perchloric, hydrofluoric
  - hazardous materials, heavy metals, pesticides
- sharps, broken glassware
- aerosols from broken centrifuge tubes, pipetting
- flammable liquids and gases
- cryogenics, such as dry ice and liquid nitrogen
- sources of ignition
- disturbance or interruption of services.

Addressing hazards may involve:

- use of material safety data sheets (MSDS)
- labelling of samples, reagents, aliquoted samples and hazardous materials
- personal protective equipment, such as gloves, safety glasses, coveralls

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- 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
- use of Class PCII, PCIII and PCIV physical containment laboratories
- handling and storage of all hazardous materials and equipment in accordance with labelling, materials safety data sheets and manufacturer's instructions.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client request, test methods and procedures accurately
- can safety set up and shut down equipment using enterprise procedures
- checks calibration/qualification status of equipment
- prepares standards and samples appropriately
- chooses and optimises procedures and equipment settings to suit sample/test requirements
- operates equipment to obtain valid and reliable data
- makes approved adjustments to procedures for non-routine samples
- recognises atypical data/results
- troubleshoots common analytical procedure and equipment problems
- applies theoretical knowledge to interpret data and makes relevant conclusions
- records and reports data/results in accordance with enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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

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- effects on results of modifying instrumental variables, such as field strength, constant current, constant power
- procedures for optimising separation through changing operation parameters, such as buffers, pH, 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 and units
- 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, in the biomedical and environmental services sector:

- techniques that capitalise on biological properties to assist in electrophoretic separations.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 candidate
- feedback from peers and supervisors
- observation of candidate applying a range of electrophoretic techniques
- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

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Resource implications

Resources may include:

- standard laboratory equipped with routine electrophoresis equipment, laboratory reagents and equipment
- standard operating procedures (SOPs) and testing methods.

This competency in practice

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

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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 3

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PMLTEST513A Apply routine chromatographic techniques

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.

This unit of competency is based on, but is not equivalent to, the unit *PMLTEST507A Apply chromatographic and electrophoretic techniques* in PML99.

This unit of competency has the following prerequisite(s):

- *PMLTEST303B Prepare working solutions* ***OR*** *PMLTEST402B Prepare, standardise and use solutions*
- *PMLTEST404A Perform chemical tests and procedures.*

This unit of competency is applicable to laboratory technical officers and analysts working in all industry sectors, government agencies and research laboratories. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe his/her 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”.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the level of performance required to demonstrate achievement of the element.
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

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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(s)
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

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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
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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

All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243.2 Safety in laboratories – chemical aspects
  - AS 2830.1 Good laboratory practice – chemical analysis
- codes of practice such as GLP and GMP

- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Routine chromatographic techniques, include both analytical and preparative procedures, and may use:

- 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, Size Exclusion SEC.

Tests may include methods for:

- control of starting materials, in-process materials and finished products (for example, manufacturing, petroleum, biotechnology)
- selection of appropriate separation technique such as suitable substrate and support solvent, buffer, temperature, flow rate, column length, detection method
- forensic testing
- environmental monitoring of pollutants in air, water and soil
- troubleshooting enterprise processes.

Sample preparation may include:

- identification of any hazards associated with samples and/or analytical chemicals

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- grinding, dissolving, extraction, filtration, refluxing, centrifuging, evaporation, washing, drying
- determination of and, if appropriate, removal of any contaminants, impurities or interfering substances.

Common procedure and equipment problems may include:

- problems with interfering substances
- poor resolution of peaks
- inappropriate selection of column or operating parameters (flow rate, temperature)
- unsuitable substrate or support solvent
- lack of suitable reference standards.

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
- transformed cultures/organisms, genetically altered organisms
- chemicals such as acids, phenol, benzene, ammonium persulphide
- sharps, broken glassware
- sources of ignition, hot surfaces such as burners
- aerosols from broken centrifuge tubes, pipetting
- flammable liquids and gases (for example, hydrogen)
- cryogenics such as dry ice and liquid nitrogen
- disturbance or interruption of services

Addressing hazards may involve:

- use of material safety data sheets (MSDS)
- labelling of samples, reagents, aliquoted samples and hazardous materials
- use of personal protective equipment such as gloves, safety glasses, 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

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- handling and storage of all hazardous materials and equipment in accordance with labelling, materials safety data sheets and manufacturer's instructions.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client request, test methods and procedures accurately
- can safety set up and shut down equipment using enterprise procedures
- checks calibration/qualification status of equipment
- prepares standards and samples appropriately
- can install and maintain a variety of chromatographic columns
- chooses and optimises procedures and equipment settings to suit sample/test requirements
- operates equipment to obtain valid and reliable data
- makes approved adjustments to procedures for non-routine samples
- recognises atypical data/results
- troubleshoots common procedure and equipment problems
- applies theoretical knowledge to interpret data and makes relevant conclusions
- records and reports data/results in accordance with enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

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Underpinning knowledge

Competency includes the ability to apply and explain:

- 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 (for example, injection temperature, gas flow rate, column pressures, column type, detector type)
- procedure for optimising separation through changing operation parameters (for example, injection technique, solvent type, sample size, 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, in the biomedical and environmental services sector:

- techniques that capitalise on biological properties to assist in chromatographic separations.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 candidate

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource Implications

Resources may include:

- standard laboratory equipped with routine chromatographic equipment, laboratory reagents and equipment
- standard operating procedures (SOPs) and test methods.

This competency in practice

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 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.

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Environment

An Environmental Protection Authority (EPA) 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.

Key competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing & organising information	Communicating ideas & information	Planning & organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 3

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PMLTEST514A Perform fire assay techniques

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.

This unit of competency has the following prerequisites:

- *PMLSAMP401A Prepare mineral samples for analysis.*

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 sample(s), 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, 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 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

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		2.4	Assemble all required equipments, materials, reagents and check they are fit for purpose
3.	Recover precious metal(s) 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 collector
		3.6	Maintain sequencing in order to track samples, buttons and prills throughout the recovery process
		3.7	Separate 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	Chose 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	5.1	Segregate and dispose of wastes in accordance with

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equipment		enterprise requirements
	5.2	Grade and inspect pots using established criteria prior to storage for re-use
	5.3	Inspect furnaces for cracks, unserviceable components and remove slag
	5.4	Inspect and clean extractive systems
	5.5	Report defective equipment and consumable requirements to appropriate personnel.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS3895.1 Methods for the analysis of copper, lead, zinc, gold and silver ores
  - Determination of gold (Fire Assay — Flame AAS method)
- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs) and published preparation methods
- quality manuals, equipment and procedures manuals
- enterprise recording and reporting procedures
- production and laboratory schedules.

Samples may include:

- solids, such as rocks, minerals, soils, sands, stream sediments
- core and other drill samples (RAB, RC, aircore)
- slurries, powder concentrates, metallurgical solutions
- dump samples, grab samples.

Client requests/documentation may include:

- client profile, sample identification, sample receipt, storage, analyses

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- required preparation method/and service charges.

Assay equipment could include:

- ovens, furnaces, temperature sensors
- compressed air service, extraction systems, fuel supply lines
- pots, cupelles
- pouring equipment, trolleys, moulds, tongs, hammers.

Hazards may include:

- dust, silica, slag, glass shards, molten flux
- chemicals, such as hydrofluoric acid, bromine, perchloric acid, aquaregia, cyanide, lead-based compounds, free-mercury, nickel compounds
- noise, vibration
- crushing, entanglement, cuts associated with moving machinery
- manual handling of heavy loads, such as pots, racks, trolleys
- heat, exhaustion, stress, fatigue.

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, fumehoods
- guards for moving machinery parts
- noise insulation
- using personal protective equipment, such as mask, heat resistant mittens, boots, goggles, coats, ear muffs, safety boots, heat reflective clothing
- following established manual handling procedures
- regular cleaning of equipment and work areas using enterprise procedures
- antidotes for specific hazards, such as hydrofluoric acid, cyanide
- 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 may include:

- bulk fluxes containing PbO, borax, soda ash, silica, silver nitrate, flour

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- non-standard flux additives, such as:

– 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, soda ash).

Pots may be ceramic, acidic/basic, alumina, zirconia, graphite.

Collectors may include Pb, NiS, Bi, Sn.

Criteria for an ‘acceptable’ button could include:

- one piece, mass >20g

- malleable

- separates cleanly from slag

- free of undecomposed ore, matte and speiss.

Sequencing of pots in a rack could involve:

- addition of coloured salts (for example, Cu)

- position of reagent blanks, standards, check samples.

Separation of collectors may involve:

- cupellation

- digestion

- parting and annealing.

Contamination could be caused by:

- base metals — Cu, Ni

- arsenic, sulphur, antimony, selenium, tellurium.

Documentation could include:

- pour sheets — date, time, client, pour number, preparation method

- number of pots, positions of sample, blank, check in rack

- analytical method

- assay data.

Indicators of potential loss and the corrective action include:

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- viscous slag — check furnace temperature, adjust flux
- lead shotting — adjust flux to compensate for high oxides/sulphides, add Cr, adjust fusion time
- matte, speiss — adjust sample weight and/or flux
- incomplete fusion — adjust fusion time, adjust sample weight and/or flux, roasting
- unacceptable button — adjust sample weight and/or flux, scorification, roasting
- contaminants — scorification, roasting
- inquart — add Ag to prill and recupel.

Assay equipment includes the door, floor and vents of ovens; cupel furnaces, muffle liners, mixing equipment, balances, hotplates and dispensers.

Wastes include rejected pots, cupels, slag, disposable personal protective equipment.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- recognises hazards and works safely at all times
- interprets and follows standard recovery methods
- maintains close attention to technical and safety requirements in a physically demanding/hazardous environment
- maintains sequential control of samples through all recovery stages

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- optimises work flow to ensure efficiency of recovery for multiple client samples
- identifies indicators of poor recovery
- selects logical corrective actions to improve recovery rates
- minimises rework, waste and environmental impacts
- disposes of all waste responsibly.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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
- feedback from peers, clients and supervisors
- written/oral questioning about precious metal recovery steps, typical problems and corrective actions.

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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 levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLTEST524A Apply routine spectrometric techniques.*

Resource implications

Resources may include:

- a variety of precious metal ore samples
- fire assay methods
- fire assay equipment, materials, reagents
- safety equipment.

This competency in practice

Mineral processing

Fire assay techniques are suitable for determining the concentration of gold in mineral exploration samples, particularly where a ‘total’ gold content is required. An assay technician is preparing a rack of samples for the day’s first pour. They monitor the furnace temperature, pre-warms suitable pots and cupelles and then assembles the necessary assay equipment. They check the client specification for the first sample which is dark grey. The technician recognises that the colour indicates a high sulphide content and adds extra nitre to the flux recipe to compensate. They carefully mix 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 and pour is obtained for all samples except the sample which shows some ‘lead shotting’. The technician adjusts the flux and fusion time and repeats the process. The repeat sample provides an acceptable button. They cupel the button to separate the precious metal from the collector. After parting, the prill is dissolved in a multi-acid digest and placed in a labelled container for subsequent analysis by Atomic Absorption Spectrophotometry (AAS).

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLTEST515A Design and supervise complex environmental field surveys

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.

This unit of competency has to follow prerequisite:

- PMLTEST408A Undertake environmental field-based monitoring.

This unit of competency is applicable to technical, field and environmental officers working in the environmental services 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 field activities with senior management and key stakeholders

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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

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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 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements.

Statutory and enterprise field survey requirements may include:

- existing plans covering environmental field activities
- policies and statutory requirements
- environmental protection and conservation legislation
- consultation (for example, with traditional owners)
- Codes of Practice, field protocols
- environmental standards (for example, air, water, noise)
- data quality assurance procedures.

Field survey activities may include but not be limited to:

- meteorology, geology, soils, hydrology, geomorphology, water quality, noise, vegetation, wildlife, climate, land uses, land resources, agriculture, forestry, mining, conservation, recreation.

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Clients and stakeholders may include but not be limited to:

- Commonwealth, State and Local Government agencies
- organisation with monitoring and/or survey responsibilities
- regulatory authorities
- private companies
- developers.

The purpose or objectives of field survey activities will define/target information, collection needs and 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 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.

Field survey protocols, Codes of Practice, permits, plans and methodologies may include:

- field survey plans
- fieldwork procedures, standard operating procedures (SOPs)
- industry based protocols
- permits for wildlife capture and handling

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- permits for access to land (for example, Aboriginal reserves)
- consultation with traditional owners
- animal welfare codes and ethics committee approval
- safety and accident/injury plans
- emergency plans
- risk-management plans
- environmental impact assessment procedures
- environmental audits.

Hazards may include:

- solar radiation, dust, noise
- personnel getting lost
- accidents, emergencies, 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 may include:

- use of personal protective equipment, such as sunscreen, hat, safety glasses, gloves, coveralls, safety boots
- 'stay with vehicle' and other survival techniques
- regular communication schedule
- GPS, maps, aerial photos
- handling, storage and disposal of all hazardous materials/waste in accordance with MSDS, labels, enterprise procedures, codes and regulations.

Administrative requirements and approvals may include: travel requisitions, authority for use of vehicles and equipment, insurance, permits.

Field survey resources may include:

- staff with appropriate competencies
- transport systems (for example, vehicles, boats, aircraft)
- navigation and communication equipment

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- 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 may include:

- samplers (for example, air, surface and groundwater, bottom sediments, soils, animals)
- meters (for example, dissolved oxygen, conductivity, pH, turbidity, liquid flow, light, rainfall, humidity, temperature, oxides of carbon, oxides of sulphur, oxides of nitrogen, particulates, ozone, hydrocarbons)
- associated information, such as equipment operating manuals, field instrument operating instructions, calibration procedures, instrument fault-finding procedures, general maintenance and repair procedures, first aid and survival manuals.

Field procedures may include:

- sampling
- field testing (validated and authorised)
- animal trapping (and release), tagging, keeping
- emergency response, safety and survival aspects
- data collection, analysis, reporting
- protection of the environment.

Typical problems may include:

- unexpected restriction on access to site(s)
- seasonal conditions
- equipment failure or loss
- communication failure/difficulties
- unforseen environment impacts
- contact with hazardous wastes.

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- demonstrates understanding of the purpose and objectives of the activity including:
  - information and analysis required
  - end users of information
  - significance of outcomes for broader program(s)
- demonstrates 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
  - risk-management requirements
  - enterprise field emergency plans
  - enterprise environmental requirements
  - field survey protocols
- communicates effectively with senior staff and stakeholders
- can modify existing field survey protocols
- supervises junior staff, where appropriate
- develops, documents and supervises field survey work program
- manages day-to-day field surveys and associated activities
- adapts field activities to suit changing circumstances
- completes field survey planning and documentation clearly and accurately within specified time frame
- accurately communicates to all relevant staff their specific activities as part of the total field survey work program
- negotiates effectively with staff and stakeholders and resolves conflict(s), where possible.

Underpinning knowledge

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Competency includes the ability to apply and explain:

- field survey protocols
- specific field survey practices and techniques
- correct terminology relevant to the defined field survey activity
- selection and application of appropriate field survey practices
- data quality procedures
- field survey activities, such as:
  - identification and use of equipment and instruments
  - survey principles and practices
  - field safety, environmental and emergency requirements
  - data recording, storage
  - sample collection, preservation, labelling, packaging, storage, transportation
  - environmental planning and assessment procedures
  - current developments in field instrumentation, survey equipment and communication systems
  - project management
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of environmental field survey plan designed by candidate
- observation of fieldwork performed by 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 enterprise procedures were clearly and accurately followed

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLMAIN502A Maintain instruments and equipment.

Resource implications

Resources may include:

- legislation, regulations, Codes of Practice, enterprise procedures, field protocols
- vehicles, survey equipment, sampling/monitoring equipment, consumables, manuals.

This competency in practice

Environmental

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

A technical officer is part of a team preparing an Environmental Impact Statement (EIS) for a large 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 workplan, and associated time-line, 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.

Key Competencies

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The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 3	Level 3	Level 2	Level 2	Level 2

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PMLTEST516A Provide input to production trials

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, collection and testing of samples and analysis of the 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.

This unit of competency has the following prerequisites:

Any ONE unit from:

- *PMLTEST404A Perform chemical tests and procedures*
- *PMLTEST405A Perform food tests*
- *PMLTEST406A Perform physical tests*
- *PMLTEST411A Perform mechanical tests.*

This unit of competency is applicable to laboratory technicians, technical officers, analysts working in the process manufacturing, biotechnology, construction materials, pharmaceuticals, 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 can be found at the end of this unit of competency under the section ‘This competency in practice’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 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

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		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

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that of other personnel

4.2 Minimise the generation of wastes and 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, Acts and regulations, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - Australia New Zealand Food Standards Code 2002 and amendments
  - ISO9000 series Quality management and quality assurance standards
  - Therapeutic Goods Act
  - AS2830 Good Laboratory Practice
- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- quality, 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.

Trial specifications may include:

- product specifications

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- recipe/formulations
- processing parameters
- trial size, production target and timeline
- trial schedule, resources required
- required product samples and tests
- analysis of relevant OHS, food safety and environmental hazards and controls
- storage requirements.
- Hazards could include:
- electric shock
- microbiological organisms and agents associated with soil, air, water
- solar radiation, dust, noise
- chemicals, such as acids, heavy metals, pesticides, hydrocarbons
- aerosols from broken centrifuge tubes, pipetting
- radiation, such as gamma, 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 in confined spaces
- crushing, entanglement, cuts associated with moving machinery or falling objects
- pedestrian and vehicular traffic.
- 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

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- handling and storage of hazardous materials and equipment in accordance with labelling, materials safety data sheets 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, gown, body suits, respirators and safety boots
- machinery guards
- signage, barriers, flashing lights, 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 may include:

- operators and personnel from affected work areas and functions
- production, testing and sampling equipment
- enterprise procedures and standard methods for sampling, testing
- raw materials/ingredients, packaging components and consumables
- trial documentation, such as technical specifications, plant or production line layout, MSDSs, trial request and result forms.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- analyses trial objectives and specifications to accurately determine resource requirements
- liaises with relevant personnel to ensure trials are organised and conducted efficiently
- follows all safety requirements on the production floor
- works within production constraints, priorities and pressures
- communicates effectively with personnel from diverse cultural backgrounds
- collects accurate trial data and samples in the time available
- recognises, interprets and reports problems, atypical situations or unacceptable products
- recommends product modifications and improvements within scope of responsibility
- reports trial outcomes in accordance with enterprise procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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
- general function of product properties, process stages and unit operations involved in he trial, such as:

– classification of samples — screening, sieving
– milling
– mixing
– separation — distillation, sieves, filtration, solvent extraction, chromatography
– drying
– concentrating
– diluting
– depositing — injecting, forming, extrusion
– retorting
– cooling, freezing, refrigeration, heat transfer
– closure — vacuum sealing
– weighing and packaging

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- materials handling and transport
- warehousing
- relationship between temperature and viscosity
- friction, pumping, fluid flow
- expected nature/condition of materials at each process stage
- causes and remedies for common processing problems associated with trial products
- sampling and test methods for trial products
- OHS, food safety and /or environmental management procedures relevant to trial.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *relevant PMLTEST400 and 500 series units of competency*
- *PMLDATA400A Process and interpret data.*

Resource implications

Resources may include:

- access to operating plant or pilot plant for duration of trials
- trials, sampling, testing enterprise procedures for:
- sampling containers, sampling equipment
- test equipment, laboratory instruments and reagents.

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This competency in practice

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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level2	Level 2	Level 2	Level 2

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PMLTEST517A Perform tissue and cell culture techniques

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 set-up, media and growth techniques. They are required to detect and investigate contamination and take preventative and/or corrective actions under supervision.

This unit of competency has the following prerequisites:

- *PMLTEST407A Perform biological procedures*
- *PMLTEST412A Prepare tissue and cell cultures.*

This unit of competency is applicable to laboratory technicians and technical officers working in laboratories in the biomedical, environmental, biotechnology and education sectors of the industry who have responsibility for ensuring cell lines are maintained.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 framework	2.1 Ensure work practices and personal actions conform to regulations, codes, guidelines and enterprise 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

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		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 sub culturing 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

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		6.2	Preserve the cell lines or tissue in accordance with the method
		6.3	Check preserved cell lines regularly to ensure 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All work is performed according to the legal/regulatory framework of regulations, codes and guidelines including:

- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- ISO 9000 series Quality management and quality assurance standards
- AS 1678 Emergency procedures guide for hazardous materials
- AS 2243 Safety in laboratories
- AS 2243.3 Microbiology laboratories
- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- AS 2982 Hand washing facilities
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- AS 4187 Code of Practice for cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities.
- guidelines for the operation of classes of laboratories

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- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms
- Good Manufacturing Practice (GMP)
- Good Laboratory Practice (GLP)
- Therapeutic Goods Act.

Enterprise procedures may include:

- standard operating procedures (SOPs)
- quality assurance procedures
- verified test methods
- laboratory manuals.

Hazards may include:

- biohazards, such as infectious agents, oncogenic DNA
- chemical and radiation hazards
- allergenic factors
- cryogenic liquids, such as nitrogen
- heat from burners, molten agar
- ultraviolet light
- sharps
- contaminated clothing.
- 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, materials safety data sheets 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, respirators

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- 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 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, carbon dioxide
- binocular inverted microscope
- centrifuges
- cryogenic vessels and transfer equipment, liquid nitrogen.

Selection criteria for media, materials and equipment may include costs, ease of cleaning or sterilisation, maintenance of cell growth

Pre-use checks include:

- performing routine maintenance
- checks on raw materials and consumables include use by date, possible contamination and storage conditions.

Cells and tissues may include:

- animal cell lines, such as hybridoma, liver, epidermal, lymphoblastic, fibroblastic
- plant cell lines, such as tobacco, arabidopsis, soya bean, tomato, roses, meristomatic tissue
- yeasts
- fungi
- sperm, ova and embryos
- adherent and suspension cultures.

Preparing a primary culture may include:

- thawing of cryopreserved cells and monitoring of cell recovery

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- enzymatic disaggregation from tissue
- mechanical disaggregation from tissue
- primary explant technique
- pre treatment
- selection techniques, such as cloning, micromanipluation, use of selective media, density gradient centrifugation, selective adhesion techniques and selective detachment.

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 eg by Giemsa
- karyotype analysis.

Preservation of cell lines can include freezing, cryopreservation (dry ice, liquid nitrogen).

Records may involve:

- paper or Laboratory Information Management Systems (LIMS)
- cataloguing of all cell lines
- stock levels
- viability test results.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- works safely and satisfies all legal and regulatory requirements, including the use and care of safety cabinets
- demonstrates chain of custody for all cells, cell lines and tissues
- prepares, dilutes and sterilises reagents and culture media that are fit for purpose
- chooses and justifies appropriate media and substrate material based on cost, cleaning, sterilising and maintenance of cell growth
- successfully passages cell cultures by subculturing
- grows cell lines and tissue to specifications without contaminating the original sample and the environment
- counts cells, identifies a wide range of cell types and contaminants and recognises normal and abnormal cells
- monitors cell growth and recognises and troubleshoots problems, such as contamination
- stores cells so that they remain viable
- maintains accurate, traceable records of cell lines and tissues and logs of procedures and work completed.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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, viability
- cell biology — structure, physiology, function, physiological cell growth requirements, nutrient requirements, respiration, temperature, 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

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- techniques for characterising a cell line
- the differences between finite and continuous cell lines
- characteristics of cell culture media and substrates:
  - nature of the substrate (for example, solid, semi-solid, gel or sponge, glass, disposable plastics, three dimensional matrices)
  - techniques for pre treating substrates (for example, feeder layers, chemical treatments, such as poly D-lysine, collagen, gelatine and fibronectin)
  - role of ingredients in media — (for example, salts, carbohydrates, amino acids, vitamins, hormones, growth factors, serum, 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLMAIN300B Maintain the laboratory fit for purpose.*

Resource implications

Resources may include:

- laboratory equipped with appropriate test equipment/instruments, standards and reagents
- enterprise procedures and standard methods

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- relevant tissues and cell lines.

This competency in practice

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 37C 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 2	Level 3	Level 2

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PMLTEST518A Perform molecular biology tests/procedures

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.

This unit of competency has the following prerequisite:

- *PMLTEST407A Perform biological procedures.*

This unit of competency is applicable to technical officers and technical specialists using molecular biology techniques under supervision in industry sectors, such as: manufacturing (eg macro, micro, nanotechnology, pharmaceutical, blood product), food and beverage processing, biomedical (eg forensics, pathology, and veterinary), environmental, plant and animal based agriculture and pure and applied research. 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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, 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	3.1 Set up equipment/instrumentation in accordance with test method requirements and perform pre-use and

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	reagents		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 biomolecule 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 environment	6.1	Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel

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		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant regulations, Codes of Practice, standards, test methods and enterprise procedures. These procedures include or have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 9000 series Quality management and quality assurance standards

– AS/NZS 2243.3 Safety in laboratories Part 3 Microbiology — protective and physical containment facilities and equipment for safe handling of microorgansims and genetically modified organisms

– SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)

– AS 2252 Biological safety cabinets

– AS 2830 Good laboratory practice

– AS 2162.1 General — Volumetric glassware

– AS 3753 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry

- standards, guidelines and Codes of Practice, such as:

– National Association of Testing Authorities (NATA)

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- Good Laboratory Practice
- Good Manufacturing Practice
- National Registration Authority (NRA)
- Therapeutic Goods Administration (TGA)
- Australian Quarantine Inspection Service (AQIS)
- Office of the Gene Technology Regulator (OGTR) guidelines for working with genetically altered organisms
- guidelines for the operation of classes of laboratories
- National Health and Medical Research Council (NHMRC)
- European Union (EU)
- World Health Organisation (WHO)
- United States Food and Drug Administration (USFDA)
- material safety data sheets (MSDSs)

- validated and authorised test methods
- quality manuals and equipment and procedure manuals
- equipment start up, operation and shutdown procedures
- calibration and maintenance schedules
- production and laboratory schedules
- material, production and product specifications.
- Hazards may include:
- electric shock (for example, electrophoresis power packs)
- microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals, such as acrylamide, temed, phenol, ammonium persulphate
- mutagens, such as ethidium bromide, tumour promoters, cytotoxic materials
- genetically altered organisms, transformed cultures and organisms
- allergenic proteins
- radioisotopes
- transilluminators and other UV light sources
- aerosols from broken centrifuge tubes, pipetting

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- sharps, 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 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, materials safety data sheets 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, 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 may include:
- pipettes, tubes and racks
- heating blocks, Polymerase Chain Reaction (PCR) thermal cyclers
- swabs
- centrifuges, shakers
- electrophoresis tanks and power supplies
- incubation cabinets for micro-organisms and cell culture
- liquid nitrogen containers
- autoclaves
- water baths

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- waste containers
- fume hoods
- analytical instruments, such as spectrophotometers.
- Reagents may include:
- DNA, RNA, proteins
- enzymes — restriction, ligation, polymerisation
- buffers
- agarose, starch and polyacrylamide for electrophoresis gels
- commercial kits for extraction and manipulation of DNA/RNA
- phenol, chloroform
- ethidium bromide
- cell and culture media
- DNA, protein stains
- specialised probe materials, such as radioactive, chemical, chemiluminescent labels
- blotting membranes
- chromatographic media.
- Molecular biology tests and procedures may include:
- generic skills, such as:

– sample digestion, extraction, filtration, separation, dialysis, precipitation and centrifugation.

– accurate and reliable use of micropipettes

– application of aseptic techniques

– labelling (for example, digoxin, fluorescence, enzymes, radioactivity, antibodies)

– production, labelling and use of DNA probes

– preparation of competent bacterial cells

- preservation and storage of samples (for example, freezing)
- extraction of nucleic acids, such as:

– 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

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- mini-prep and rapid method isolation of plasmid DNA

- purification of nucleic acids and proteins, such as:

- purification of DNA using cesium gradients, commercial purification buffer kits and columns

- purification of recombinant protein by chromatography

- production of nucleic acids, such as:

- 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, such as:

- 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, such as:

- 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, microsatellites

- detection of protein products by measuring activity, including a range of immunological assays

- assistance with hybridisations, such as:

- hybridisation to screen cDNA libraries

- blotting — southern blots for DNA, Western blots for protein

- cloning, such as:

- cloning and subcloning of genes and fragments of DNA

- applications of techniques, such as:

- 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

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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 may involve purification, dilution and/or additional extraction steps.

Records may include:

- test and calibration results
- equipment use, maintenance and servicing history
- photoimages of gels, radioisotopes, digital images
- chain of custody from sample to result
- supplier certificates of analysis
- quality control/analysis data.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

conducts work practices in an ethical and professional manner and in accordance with relevant legislation, regulation and Codes of Practice

- maintains security, integrity, traceability and identity of samples, sub-samples and work records
- obtains purified biomolecules from samples

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- prevents/minimises DNA/RNA contamination
- performs tests/procedures, such as PCR, ligation, restriction enzyme digestion with appropriate controls
- follows enterprise safety standards, procedures and practices
- follows enterprise procedures and test methods consistently and accurately
- operates test equipment to enterprise standards and/or manufacturer's specification
- identifies atypical results as out of normal range or an artefact
- traces and sources obvious causes of artefacts
- communicates identified problem(s) to a supervisor
- records and communicates results as per enterprise procedures.

Underpinning knowledge

This competency includes the ability to apply and explain:

- 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
  - 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, cohesive vs 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, stem cells

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- *in vitro* fertilisation
- forensic testing of populations
- importance of commercial confidentiality, protection of intellectual property, 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLTEST409A Capture and manage scientific images*
- *PMLTEST501B Perform microbiological tests*
- *PMLTEST524A Apply routine spectrometric techniques*
- *PMLTEST512A Apply electrophoretic techniques*
- *PMLTEST513A Apply routine chromatographic techniques*
- *PMLTEST517A Perform tissue and cell culture techniques.*

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Resource implications

Resources may include:

- laboratory equipped with appropriate test equipment/instruments, standards and reagents
- enterprise procedures, standard methods, manuals, supplier documentation.

This competency in practice

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 polymerase chain reaction 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 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 Polymerase Chain Reaction (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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 2	Level 2	Level 2	Level 2	Level 3	Level 2

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PMLTEST519A Prepare animal and plant material for display

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 animal care and ethics regulations. The enterprise will need to equip its personnel with relevant animal handling skills should they be required.

This unit of competency has the following prerequisite:

- *PMLTEST407A Perform biological procedures.*

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 parks.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 method(s) of collection, preservation and display in order to meet the display 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

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3.	Collect plants and animal material	3.1	Assemble equipment required for collection and preservation
		3.2	Collect specimen(s) to meet display requirements
		3.3	Check identification of specimen(s) and assess their suitability for the display
		3.4	Label specimen(s) and accurately record data to ensure traceability of specimen from the source through to the final display
		3.5	Store specimen(s) during transportation to ensure it retains the required characteristics
4.	Preserve plant and animal material	4.1	Confirm the identification of specimen(s) and suitability for the purpose
		4.2	Examine the specimen(s) and record data
		4.3	Take samples from the specimen(s) and prepare them for preservation
		4.4	Preserve the specimen(s) 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency is relevant to technicians who may work individually or as part of a team.

Legislative and regulatory requirements may involve:

- National Parks
- Australian Quarantine and Inspection Service
- local government
- customs

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- heritage
- threatened species.

Staff include the curator, conservator, design exhibition project officer and project manager.

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, additions to existing showcase
- 2- or 3-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 may include:

- collecting live specimens from the wild
- accessing specimens from existing collections in the base or other institutions
- netting, trapping, light traps
- use of euthanasia techniques, such as shooting, stunning, anaesthetics, gases, chemicals.

Hazards may include:

- electric shock
- microbiological organisms and agents associated with soil, air, water, animal tissue and fluids
- solar radiation, dust, noise
- chemicals, such as preservatives, stains
- sharps, broken glassware and hand tools
- flammable liquids and gases
- cryogenics, such as dry ice and liquid nitrogen
- disturbance or interruption of services

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- slips, trips and falls
- manual handling, working at heights
- crushing, entanglement, cuts associated with moving machinery or falling objects
- pedestrian and vehicular traffic
- vehicle and boat handling.

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, materials safety data sheets 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, gown 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 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 may include:

- whole or part
- sex, age, breeding condition
- type, characteristics
- level of preservation

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- whether dead or alive
- inclusion of features for identification, such as flowers, fruit, roots and leaves.

Data to be recorded may include:

- collection information, such as location, time, date, collector, behaviour, environment, depth, altitude, weather, habitat
- reference photographs of the environment in the field
- reference drawings to characterise colour, shape
- identification number, collection access number, collection data base, catalogue details
- ossification of bird skulls
- characteristics of the specimen (for example)
  - standard measurements — mass, length, size
  - plumage characteristics — age, pattern, colour
  - flesh characteristics — skin tone, naked flesh texture, internal organs
  - sex
- X-rays, scans
- manual or electronic data.

Temporary preservation may include freezing.

Samples may include DNA, tissue, bone fragments, stomach contents.

Preparation for preservation may include:

- treatment of the specimen — dissection, mounting, pinning, use of backing boards, fixing, staining, colour retention, latex injection, 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.

Preservation may include:

- wet — whole mounts in formalin, 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, pressing of plants
- skeletal — maceration, degreasing, bleaching, articulation, mounting or sectioning (eg whale skeletons)

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- mould and cast — alignate, plaster, stone plaster, polyester, latex, silicone, Vinamould, gelatine, urethane elastomers, glass and carbon fibre (eg fish, amphibians and reptiles)
- embedding — encapsulation in clear plastic or resin, can be wet or dry techniques.

Detailing of specimens includes: cleaning, touch up and addition of false eyes.

Conservation involves minimisation of deterioration which can be caused by pests, light or humidity.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- can select appropriate collection, preservation and display techniques to suit particular display requirements
- can recognise, identify and collect suitable animal and plant specimens
- stores and transports specimens safely while maintaining their wellbeing, viability and/or integrity, as appropriate
- complies with all legislative, regulatory and enterprise requirements
- can preserve and prepare animal and plant specimens for a range of display purposes
- can complete a variety of displays that meet client and security requirements (could be part of a team)
- keeps records to provide chain of custody of specimens and samples through collection, storage, preservation and display.

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Underpinning knowledge

Competency may include the ability to apply and explain:

- 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.

Assessment context and methods

This unit of competency is to be assessed.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLTEST521A Perform laboratory based ecological techniques.*

Resource implications

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.

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This competency in practice

Education

A laboratory technician at a university botany school is required to prepare display material for 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 1	Level 2	Level 2

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PMLTEST520A Perform complex tests to measure engineering properties of materials

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.

This unit of competency has the following prerequisite(s):

- *PMLTEST411A Perform mechanical tests.*

This unit of competency is applicable to laboratory personnel in the construction materials 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, at the end of this unit of competency under the section “This competency in practice”.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the level of performance required to demonstrate achievement of the element.
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
	1.2 Identify hazards and enterprise control measures associated with the sample, preparation/testing methods and equipment
	1.3 Inspect sample(s), 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

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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 consistent with estimations and expectations

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	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	Trouble shoot 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- 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 asphalt

– DIN 19683-series Soil testing in agricultural hydrology- Physical laboratory tests

- material safety data sheets (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 may include:

- moisture conditioning and compaction of soil
- trimming to required size and shape
- orientation of test pieces
- polishing
- curing concrete test pieces.

Tests and procedures could include:

- consolidation of soil (for example, one-dimensional, triaxial)
- shear testing of soil and rock (for example, total stress, effective stress, direct stress, triaxial stress)
- permeability of soil, rock and concrete (for example, falling head, constant head)
- stability and flow of asphalt
- fatigue and creep of metals, polymers and concrete.

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, hydraulics
- disturbance or interruption of services

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- crushing, entanglement, cuts associated with moving machinery or falling objects.

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, materials safety data sheets 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.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- selects test methods, operating parameters and test ranges to suit the material and its intended use
- prepares and orients test pieces precisely
- safely sets up, starts up and shuts down equipment
- maintains close attention to measurement procedures, accuracy and precision during lengthy complex tests
- calculates/determines required engineering properties with appropriate accuracy, precision and units
- recognises atypical data/results and traces artefacts and problems with procedures or equipment
- records and reports data/results in accordance with enterprise procedures
- maintains security, integrity and traceability of all samples, test pieces and documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

- principles and concepts underpinning test procedure such as:
  - stress, strain, pressure including total and effective stress
  - properties of materials
  - failure modes of materials
- application of results to engineering design and construction
- sample preparation procedures
- 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
- basic equipment/method troubleshooting procedures
- use of calibration charts
- calculation steps to give results in appropriate units and precision
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of results obtained by the candidate over a 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource implications

Resources may include:

- engineering materials testing laboratory with appropriate test equipment, instruments and samples, standard operating procedures and test methods.

This competency in practice

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 laboratory technician checks the client request and inspects the soil sample, noting that it is plastic, clay and fissured. The technician checks the dam design parameters and notes that the overburden pressure will be 500 kPa.

They decide to use a triaxial permeability test using a constant head configuration. The technician 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 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

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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 technician prepares plots of permeability and time and reports the steady state values. After completing the test, the technician shuts down the equipment in the recommended sequence, cleans and restores all items. He/she removes the test piece and determines the after-test moisture content.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing & organising information	Communicating ideas & information	Planning & organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level	Level 2	Level 3	Level 3

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PMLTEST521A Perform laboratory based ecological techniques

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.

The unit does not cover procedures related to the handling of vertebrates that are subject to national and State animal care and ethics regulations. The enterprise will need to equip its workers with relevant animal handling skills should such be required.

The ability to undertake field activities that may complement aspects of this competency are described in the unit *PMLTEST408A Undertake environmental field-based monitoring.*

This unit of competency has the following prerequisites:

- PMLTEST407A Perform biological procedures.

This unit of competency is applicable to laboratory technicians and technical officers working in biological, biotechnology 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 can be found at the end of this unit of competency under the section ‘This competency in practice’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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			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
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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency assumes that the technical officer would perform tests and procedures under the close supervision of scientific staff. It is expected that all work would conform to statutory and enterprise occupational health and safety Codes of Practice.

Information sources may include:

- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- test procedures (validated and authorised)
- laboratory sampling procedures (labelling, preparation, storage, transport and disposal)
- safety procedures to minimise contraction of zoonoses
- safety requirements for equipment, materials or products
- quality system and continued improvement processes
- incident and accident/injury reports
- schematics, work flows, laboratory layouts
- instructions to comply with new legislation, standards, guidelines and codes
- stock records and inventory
- waste minimisation, disposal protocols and environment protection procedures.

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

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- physiological monitors for temperature, respiration
- monitors for experimental variables, such as temperature, humidity
- hand held microtomes and microtome knives (non-disposable or disposable)
- tissue processors
- incubators, water baths, 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, databases, record and filing systems, including specimen accessioning.

Communication may involve:

- scientists
- field workers
- local government professionals or representatives of State authorities, such as environmental protection agencies
- supervisors, managers (laboratory, quality and customer service)
- clients.

Hazards may include:

- microbiological organisms and agents, associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- solar radiation, dust and noise
- chemicals, such as acids, solvents and stains
- sharps, broken glassware
- flammable liquids and gases
- fluids under pressure, such as steam, industrial gases

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- disturbance or interruption of services.

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, materials safety data sheets 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, gown, hearing protection, safety boots
- 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 may include:

- collection for sterilization by autoclaving (for example, autoclaving of microbiological plates)
- appropriate storage (for example, of waste containing radioactive isotopes)
- use of biohazard waste containers.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. The candidate must be able to contribute to the identification and classification of animals and plants for scientific and experimental purposes and to participate in the monitoring of the physiology and interactions of plants and animals and their environments.

In particular, the assessor should look to see that the candidate:

- relates field and laboratory data for the generation of meaningful results
- takes representative samples for analysis
- works safely for the protection of him/herself and coworkers
- communicates appropriately with customers and is cognisance of cultural and social contexts
- does not contaminate sterile environments or specimens when performing aseptic manipulations in microbiological procedures and tissue culture
- disposes of wastes carefully for the protection of those who may handle and process wastes and to minimise contamination of the environment.

Underpinning knowledge

Competency includes the ability to apply and explain the:

- 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
- 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.

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Competency includes the ability to communicate relevant scientific and technical concepts and terminology accurately to supervisors, peers and clients.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST408A Undertake environmental field-based monitoring
- PMLDATA500B Analyse data and report results.

Resource implications

Resources may include:

- equipment and resources for investigating the physiology of plants and animals in the laboratory
- enterprise procedures, sampling plans, test methods, equipment manuals
- computers and programs for simulated experiments or data analysis.

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This competency in practice

Environmental

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

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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLTEST522A Perform complex tests to measure chemical properties of materials

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 a 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.

This unit of competency has the following prerequisites:

- *PMLTEST513A Apply routine chromatographic techniques, OR*
- *PMLTEST524A Apply routine spectrometric techniques.*

This unit of competency is applicable to technical officers and analysts working in all industry sectors, government agencies and research laboratories. 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 method(s), 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

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		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
4.	Perform analysis	4.1	Set up and optimise instrument(s) 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 instrument(s) 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 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 test method(s)
		6.2	Use personal protective equipment and safety procedures as specified for test method and materials

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			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
		7.2	Maintain security, integrity and traceability of samples and documentation
		7.3	Maintain equipment and logs in accordance with enterprise procedures.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– ISO 9000 series Quality management and quality assurance

– AS 2243.2 Safety in laboratories — chemical aspects

– AS 2830.1 Good laboratory practice — chemical analysis

– AS 2162.1 General — volumetric glassware

– AS 2134.1 Flame atomic absorption spectroscopy

- Codes of Practice, such as GMP and GLP
- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals

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- equipment startup, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Test requirements may include:

- specification of concentration and limits of analytes
- time and cost limitations
- use of specific standards, such as AS, APHA, AOAC, ASTM, US EPA.

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, centrifugation
- solid-phase micro extraction
- determination of, and if appropriate, removal of any contaminants or impurities
- ultratrace procedures requiring high purity solvents, clean rooms, ultra clean glassware, specialised glassware

Quantification techniques may include:

- matrix matched standards
- standard additions
- international standards.

Analytical techniques may include:

- spectrometric techniques, such as ICP-OES, ICP-MS
- chromatographic techniques, such as GC-MS, Ion Chromatography
- electrometric techniques, such as ion selective electrodes, voltammetry (polarography), anodic stripping voltammetry
- electrophoretic techniques, such as capillary electrophoresis.

Typical analytes and samples requiring complex tests may involve:

- contaminants in food, such as heavy metals, afflotoxins

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- trace level (microgram and nanogram/litre) analytes
- forensic testing, drug testing in body tissues and fluids
- multiple analytes, such as organochlorines, polyaromatic hydrocarbons
- environmental contaminants in water, soil and air (such as pesticides)
- sludge, wastewater, sewage
- samples with matrix interferences.

Validation checks may include recovery checks and use of standard/certified samples.

Common analytical procedure and equipment problems may include:

- matrix interference
- spectral interference
- problems associated with the physical state of the analyte, such as blockages, viscosity changing flow rates to instruments.

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
  - mycotoxins
- chemicals, such as:
  - acids for example, sulphuric, perchloric, hydrofluoric
  - heavy metals, pesticides
  - anions for example, fluoride
  - hydrocarbons for example, mono-aromatics
- radiation (nuclear, lasers, UV)
- sharps, broken glassware
- aerosols from broken centrifuge tubes, 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

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- high temperature ashing processes
- disturbance or interruption of services.

Addressing hazards may include:

- use of material safety data sheets (MSDS)
- labelling of samples, reagents, aliquoted samples and hazardous materials
- use of 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, materials safety data sheets and manufacturer's instructions
- minimising exposure to radiation ionising, such as lasers, electromagnetic and ultraviolet radiation.

Tests for completeness of sample preparation may include:

- visual inspection for colour, solids
- odour
- pH, conductivity
- chemical tests for interferents, such as precipitation, colour forming
- basic screening instrumental tests, such as IR, UV/VIS, and GC.

Modifiers may include:

- ionisation suppressants, such as Caesium for Ca, Na, K in AAS
- ionic strength and pH buffers, such as TISAB for fluoride in ISE
- releasing agents, such as Lanthanum and Strontium for Ca in AAS
- volatility suppressants, such as phosphate for Pb in electrothermal AAS.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of

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infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client request, test methods and procedures accurately
- can safely set up, start up and shut down equipment using enterprise procedures
- checks calibration/qualification status of equipment
- prepares samples and standards appropriately
- optimises procedures and equipment to suit sample/test requirements
- maintains close attention to measurement procedures, accuracy and precision during lengthy complex tests
- calculates analyte concentrations with appropriate accuracy, precision and units
- recognises atypical data/results
- troubleshoots common analytical procedure and equipment problems
- records and reports data/results using enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- principles and concepts underpinning the analysis, such as:
  - effects of interferents with analyte behaviour, such as ionisation, complexation, precipitation, masking, association
  - quantification methods, such as internal standards, standard additions, Gran's Plot, 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 and precision
- enterprise and/or legal traceability requirements
- basic procedure and equipment troubleshooting techniques
- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

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Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource implications

Resources may include:

- standard laboratory with appropriate analytical instruments, laboratory reagents and equipment
- standard operating procedures (SOPs) and test methods.

This competency in practice

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 macronutrients, such as nitrate, phosphate and potassium as well as micronutrients, such as metals (including Cu, Se Mo, 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 micronutrients, 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 macronutrients, such as phosphate, is performed in several ways due to the enormously variable processes involved in weathering of parent material into soil. One common macronutrient 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

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Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLTEST523A Apply complex instrumental techniques

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.

This unit of competency has the following prerequisite(s):

- *PMLTEST513A Apply routine chromatographic techniques, OR*
- *PMLTEST524A Apply routine spectrometric techniques.*

This unit of competency is applicable to laboratory technical officers and analysts working in all industry sectors, government agencies and research laboratories. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe his/her 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”.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the level of performance required to demonstrate achievement of the element.
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

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			standards for analytical portion(s)
		2.4	Use specialised procedures for ultratrace 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 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

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			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
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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

All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243.2 Safety in laboratories – chemical aspects
  - AS 2830.1 Good laboratory practice – chemical analysis
- codes of practice such as GLP and GMP

- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Specialised analytical instruments may include:

- spectrometric instruments such as:
  - 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
  - ICP-MS
- chromatographic instruments such as:
  - GC-MS
  - GC sampling devices (for example, headspace, thermal desorption)
  - specialised GC detection devices (for example, ECD, FPD, NPD)
  - specialised GC detection devices (for example, fluorescent, diode array, electrochemical)
  - LC-MS, electro spray MS
  - GC-FTIR
- electrometric instruments such as anodic stripping voltammetry
- flow injection analytical equipment.

Tests requiring specialised instruments may include:

- trace analysis

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- non destructive testing
- multi-analyte determination
- analysis involving high sample throughput.
- Instrument sub systems may include:
- sample introduction units, auto sampling equipment
- detectors, signal conditioning units
- temperature control devices such as cryostats, ovens, thermostat baths
- software control/interface.

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, centrifugation
- solid-phase micro extraction
- determination of, and if appropriate, removal of any contaminants or impurities
- ultratrace procedures requiring high purity solvents, clean rooms, ultra clean glassware, specialised glassware.

Common analytical procedure and equipment problems may include:

- sample introduction blockages
- incomplete atomisation of analyte
- poor resolution of peaks
- poor sensitivity.

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
  - mycotoxins
- chemicals such as:
  - acids for example, sulphuric, perchloric, hydrofluoric
  - heavy metals, pesticides

- anions for example, fluoride
- hydrocarbons for example, mono-aromatics

- radiation (alpha, beta, gamma, X-ray, neutron)
- sharps, broken glassware
- aerosols from broken centrifuge tubes, 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
- high temperature ashing processes
- disturbance or interruption of services

Addressing hazards may include:

- use of material safety data sheets (MSDS)
- 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, materials safety data sheets and manufacturer's instructions
- minimising exposure to radiation ionising such as lasers, electromagnetic and ultraviolet radiation.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client request, test methods and procedures accurately
- can safely set up, start up and shut down equipment using enterprise procedures
- assembles checks and optimises instrument sub systems
- checks calibration/qualification status of equipment
- prepares samples and standards appropriately
- optimises procedures and equipment to suit sample/test requirements
- operates equipment to obtain valid and reliable data
- calculates analyte concentrations with appropriate accuracy, precision and units
- recognises atypical data/results
- troubleshoots common analytical procedure and equipment problems
- applies theoretical knowledge to interpret data and makes relevant conclusions
- records and reports data/results using enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- principles and concepts related to instrument operation, material preparation and testing, such as:
  - mechanisms for absorption/emission
  - distinction between SIM and TIC mode in GC-MS
  - sequence of steps required for successful 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

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- 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
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDTA500B Analyse data and report results.*

Resource Implications

Resources may include:

- standard laboratory with specialised analytical instruments
- laboratory reagents and equipment

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- standard operating procedures (SOPs) and test methods.

This competency in practice

Environmental

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 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 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

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

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 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

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 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.

Key competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

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Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing & organising information	Communicating ideas & information	Planning & organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLTEST524A Apply routine spectrometric techniques

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.

This unit of competency is based on, and is equivalent to, the unit *PMLTEST506A Apply spectrometric techniques* in PML99.

This unit of competency has the following prerequisites:

- *PMLTEST303B Prepare working solutions* ***OR*** *PMLTEST402B Prepare, standardise and use solutions*
- *PMLTEST404A Perform chemical tests and procedures.*

This unit of competency is applicable to laboratory technical officers and analysts working in all industry sectors, government agencies and research laboratories. 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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			requirements
		2.3	.3Prepare validation checks for analytical portion(s)
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

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		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
	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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243.2 Safety in laboratories — chemical aspects
  - AS 2830.1 Good laboratory practice — chemical analysis
  - AS 2134.1 Flame atomic absorption spectroscopy
  - AS 3753 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry
- Codes of Practice, such as GLP and GMP
- material safety data sheets (MSDSs)

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- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Routine spectrometric methods may include:

- ultraviolet/visible
- infrared, including Fourier transform infrared and near infrared
- flame atomic absorption spectroscopy (AAS)
- fluorescence
- flame emission spectroscopy.

Tests may include methods for:

- control of starting materials, in-process materials and finished products (for example, petroleum, food, mining, manufacturing)
- environmental monitoring pollutants in air, water, soil and vegetation
- forensic tests
- therapeutic drug analysis
- diagnostic pathology tests
- determinations of enzyme activity
- routine chemical analytes, such as starch, glucose, DNA, therapeutic degradation products
- troubleshooting enterprise processes.

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, washing

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- determination of and, if appropriate, removal of any contaminants, impurities or interfering substances.

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 may include:

- electric shock
- radiation (ultraviolet)
- biohazards, such as:
  - microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
  - mycotoxins
- acids (for example, sulphuric, nitric)
- hazardous materials (for example, heavy metals, pesticides)
- hydrocarbons (for example, phenol, benzene, toluene, complex mixtures)
- aerosols from broken centrifuge tubes, pipetting
- sharps, broken glassware
- flammable liquids and gases
- fluids under pressure, such as acetylene in atomic absorption spectrometry
- sources of ignition
- high temperature ashing processes
- disturbance or interruption of services.

Addressing hazards may involve:

- use of material safety data sheets (MSDS)
- labelling of samples, reagents, aliquoted samples and hazardous materials

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- use of personal protective equipment, such as gloves, safety glasses, 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, materials safety data sheets and manufacturer's instructions.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client request, test methods and procedures accurately
- can safety set up and shut down equipment using enterprise procedures
- checks calibration/qualification status of equipment
- prepares standards and samples appropriately
- chooses and optimises procedures and equipment settings to suit sample/test requirements (such as selection of wavelength maxima, position of burner)
- operates equipment to obtain valid and reliable data
- makes approved adjustments to procedures for non-routine samples
- recognises atypical data/results
- troubleshoots common analytical procedure and equipment problems

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- applies theoretical knowledge to interpret data and makes relevant conclusions
- records and reports data/results in accordance with enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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, 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 and units
- enterprise and/or legal traceability requirements
- basic equipment maintenance procedures
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 candidate
- feedback from peers and supervisors

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource implications

Resources may include:

- standard laboratory equipped with appropriate spectrometers, laboratory reagents and equipment
- standard operating procedures (SOPs) and test methods.

This competency in practice

Manufacturing

Ultraviolet 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.

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.

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Food processing

A technician was determining the amount (by mass) of β-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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 3

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PMLTEST525A Apply routine electrometric techniques

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.

This unit of competency has the following prerequisite(s):

- *PMLTEST303B Prepare working solutions **OR** PMLTEST402B Prepare, standardise and use solutions*
- *PMLTEST404A Perform chemical tests and procedures.*

This unit of competency is applicable to laboratory technical officers and analysts working in all industry sectors, government agencies and research laboratories. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe his/her 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”.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the level of performance required to demonstrate achievement of the element.
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

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		2.3	Prepare validation checks for analytical portion(s)
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 be tested

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	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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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

All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2243.2 Safety in laboratories – chemical aspects
  - AS 2830.1 Good laboratory practice – chemical analysis
- codes of practice such as GLP and GMP
- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- quality manuals, equipment and procedure manuals
- equipment start-up, operation and shutdown procedures

- calibration and maintenance schedules
- data quality procedures
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Routine electrometric techniques may include use of:

- ion selective electrodes
- potentiometric titrations
- conductometric titrations
- amperometry
- polarography.

Tests may include methods for:

- 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, quinine
- troubleshooting enterprise processes.

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, centrifugation
- determination of and, if appropriate, removal of any contaminants or impurities.

Common analytical procedure and equipment problems may include:

- matrix interferences such as formation of complexes
- physical damage to electrodes.

Hazards may include:

- electric shock

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- biohazards such as microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids
- chemicals such as:
  - acids for example, sulphuric, perchloric, hydrofluoric
  - heavy metals, pesticides
  - anions for example, fluoride
  - hydrocarbons for example, phenol, toluene, benzene, mono-aromatics
  - ammonium persulphide
- sharps, broken glassware
- aerosols from broken centrifuge tubes, pipetting
- flammable liquids and gases
- cryogenics such as dry ice and liquid nitrogen
- sources of ignition
- disturbance or interruption of services.

Addressing hazards may involve:

- use of material safety data sheets (MSDS)
- labelling of samples, reagents, aliquoted samples and hazardous materials
- use of 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, materials safety data sheets and manufacturer's instructions.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and

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Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client request, test methods and procedures accurately
- can safety set up and shut down equipment using enterprise procedures
- checks calibration/qualification status of equipment
- prepares standards and samples appropriately
- chooses and optimises procedures and equipment settings to suit sample/test requirements
- operates equipment to obtain valid and reliable data
- makes approved adjustments to procedures for non-routine samples
- recognises atypical data/results
- troubleshoots common analytical procedure and equipment problems
- applies theoretical knowledge to interpret data and makes relevant conclusions
- records and reports data/results in accordance with enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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

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- 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 and units
- enterprise and/or legal traceability requirements
- basic equipment maintenance procedures
- relevant health, safety and environment requirements.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDATA500B Analyse data and report results.*

Resource Implications

Resources may include:

- standard laboratory equipped with routine electrometric equipment, laboratory reagents and equipment
- standard operating procedures (SOPs) and test methods.

This competency in practice

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

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analyse multiple samples on a carousel and to perform 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing & organising information	Communicating ideas & information	Planning & organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 3

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PMLTEST526A Perform food analyses

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. The test results contribute to optimising production processes; nutritional information and labeling requirements; food safety and the establishment, monitoring and trouble-shooting of the HACCP process. The unit covers tests and procedures that are usually performed in a full or partially computerised and automated laboratory environment.

This unit of competency has the following prerequisite(s):

- *PMLTEST405A Perform food tests , OR*
- *PMLTEST407A Perform biological procedures.*

This unit of competency is applicable to laboratory technical officers and analysts working in the food and beverage processing industry sectors. Although a supervisor may not always be present, the technical worker will follow standard operating procedures (SOPs) that clearly describe his/her 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”.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the level of performance required to demonstrate achievement of the element.
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

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			requirements
		2.3	Prepare validation checks and/or calibration standards for analytical portion(s)
		2.4	Use specialised procedures for ultratrace sample and standard preparation as required
3.	Setup, 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 problems which have led to atypical data or results

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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
		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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

All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:

- Australian and international standards such as:

– AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

– Food Standards Code 2002 Australia New Zealand (FSANZ) and amendments

– AQIS Export Control Orders

– NATA accreditation procedures

– AOAC standards

– Dairy Food Safety standards

- ISO 9000 series Quality management and quality assurance standards
- AS 2243 Safety in laboratories
- AS 2830 Good laboratory practice
- AS 2134.1 Flame atomic absorption spectroscopy
- AS/766 Food microbiology
- Therapeutic Goods Act

- codes of practice such as GLP and GMP
- material safety data sheets (MSDSs)
- National Measurement Act
- test methods and standard operating procedures (SOPs) involving for example: sampling, sample preparation, storage, disposal, transport; data quality; waste minimisation; cleaning and hygiene; safety
- nutrient analysis or food composition tables
- quality manuals, equipment and procedure manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Analytical instruments may include:

- spectrometric instruments such as:
  - ultraviolet/visible
  - infrared including Fourier transform infrared and near infrared
  - atomic absorption including flame and flameless
  - fluorescence, flame emission, ICP optical emission, ICP-MS (inductively coupled plasma-mass spectrometry)
- chromatographic techniques and instruments such as:
  - paper such as ascending and descending
  - thin layer such as ascending, high performance, radical and descending
  - column chromatography
  - affinity chromatography and gel filtration chromatography

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- gas liquid and gas solid chromatography
- high performance liquid chromatography such as Liquid-Liquid (LLC), Liquid-Solid (LSC), Ion (IC), Size Exclusion (SEC)
- GC-MS

- electrophoretic techniques such as capillary electrophoresis
- electrometric techniques such as:
  - ion selective electrodes
  - potentiometric titrations
  - conductometric titrations
  - amperemetry
- polarography.

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, temperature equilibration
- culturing of micro-organisms
- determination of, and if appropriate, removal of any contaminants or impurities
- ultratrace procedures requiring high purity solvents, clean rooms, ultra clean glassware, specialised glassware.

Nutrient analysis may include:

- percentage composition of foods for major macronutrients such as starch, sugars, fats, protein and fibre
- percentage composition of foods for saturated, unsaturated (mono, poly and omega3) fats and trans fatty acids
- soluble and insoluble fibre
- micronutrients with positive or negative health implications
- micronutrients that figure in Recommended Daily Intake (RDI) lists
- enzymic and immunological assays.

Ingredient composition, in order to comply with FSANZ labeling regulations, may include specification of:

- gluten free, lactose free, wheat free, cholesterol, salicylates, amines, monosodium glutamate, alcohol, nuts, additives such as maltodextrose, egg white, wheat varieties, antioxidants, flavins, soy and phytoestrogens, glycaemic index (GI)

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- probiotic claims
- genetically modified food, irradiation of foods or ingredients.

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 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 and loss of sale.

Hazards may include:

- electric shock
- biohazards such as microbiological organisms and agents associated with soil, air, water, animal tissue and fluids; mycotoxins
- chemicals such as:
  - acids for example, sulphuric, perchloric, hydrofluoric
  - hazardous materials such as heavy metals, pesticides
  - anions for example, fluoride
  - hydrocarbons for example, mono-aromatics
- sharps, broken glassware
- aerosols
- flammable liquids and gases

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- 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
- dusts
- high temperature ashing processes
- disturbance or interruption of services.

Addressing hazards may include:

- use of material safety data sheets (MSDS)
- 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, materials safety data sheets and manufacturer's instructions
- minimising exposure to radiation ionising such as lasers, electromagnetic and ultraviolet radiation.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potential hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- interprets client requests, test methods and procedures accurately
- can safely set up, start up and shut down equipment using enterprise procedures
- checks calibration/qualification status of equipment
- handles, prepares and stores samples and standards appropriately
- chooses and optimises procedures and equipment settings to suit sample/test requirements
- operates equipment to obtain valid and reliable data
- calculates analyte concentrations with appropriate accuracy, precision and units
- recognises atypical data/results
- troubleshoots common analytical procedure and equipment problems
- applies theoretical knowledge to interpret data and makes relevant conclusions
- records and reports data/results using enterprise procedures
- maintains security, integrity and traceability of samples and documentation
- follows OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- structure, properties and nutritional value of proteins, lipids, carbohydrates, vitamins and minerals, 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 and its significance

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- significance of digestion and absorption of macro and micronutrients in food and the implications of food additives and fortification on absorption of nutrients such as fortification of milks with Fe and Ca, 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
- relevant health, safety and environment requirements.

Knowledge is also required of:

- emerging character of pharmaceutical properties of foods and probiotics
- public perception of food safety including genetically modified foods and food irradiation
- role of 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

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- HACCP procedures for enterprise.

Specific industry

Additional knowledge requirements may apply for different food processing industry sectors such as: dairy, grains, fruit and vegetables, meat, cereals.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- *PMLDTA500B Analyse data and report results.*

Resource Implications

Resources may include:

- standard laboratory with appropriate analytical instruments, laboratory reagents and equipment, samples
- standard operating procedures (SOPs) and test methods.

This competency in practice

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,

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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 QA 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 on the ashed sample.

Key competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing & organising information	Communicating ideas & information	Planning & organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 2	Level 2	Level 2	Level 2	Level 2	Level 3	Level 3

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PMLCOM600B Develop and maintain laboratory documentation

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.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory personnel working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
	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

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency includes the following types of reference documentation:

- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- Australian and international standards (for example, AS 2243 Safety in laboratories, ISO 9001–3 Quality and Food Standards)
- guidelines (for example, ANZFA, infection control, OGTR guidelines for working with genetically altered organisms)
- Codes of Practice (for example, Australian Dangerous Goods Code)
- testing procedures and specific method collections for industry sectors (for example, AOAC Methods of Analysis).

This unit of competency includes the following types of workplace documentation:

- workplace procedures, SOPs and operating manuals
- test procedures
- sampling procedures (sampling, preparation, labelling, storage, transport and disposal)
- evaluation of materials or products
- instructions for equipment installation, commissioning, calibration and maintenance
- safety requirements for equipment, materials or products
- cleaning, hygiene, 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

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- 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.

This unit of competency includes the use of items of equipment and systems, such as:

- online information systems, databases, record and filing systems
- computer equipment.

This unit of competency may include communication 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 (for example, NATA).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to:

- 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.

In particular the assessor should look to see that the candidate:

- recognises problems in systems and documentation
- uses internal and external information sources efficiently
- critically analyses information
- prepares documentation that is accurate, free from editorial errors and omissions, and in accordance with requirements
- prepares documentation that is easily understood by the intended audience
- obtains and include relevant feedback on draft documentation
- communicates information and developments in the appropriate manner
- completes the preparation and distribution of documents in the given time.

Underpinning knowledge

Competency includes the ability to apply and explain workplace procedures relating to:

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

Competency includes the ability to apply the following knowledge when drafting documentation:

- accurate scientific, technical and workplace terminology
- OHS, environmental and other relevant legislative requirements, regulations, codes
- enterprise standard operating procedures (SOPs)
- technical developments in the sector (current methodologies, ranges and interpretations)
- relevant health, safety and environment requirements.

An awareness of the laboratory's business goals and key performance indicators is also required as a basis for developing documentation.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLOHS601A Implement and monitor OHS and environmental management systems
- PMLORG601B Maintain registration and statutory or legal compliance in work/functional area
- PMLQUAL600B Maintain quality system and continuous improvement processes within work/functional area.

Resource implications

Resources may include:

- information directories and databases
- enterprise documents and procedures.

This competency in practice

Environmental

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

After two senior technicians in the laboratory of a food processing company HACCP team, they suggested extensive changes to the way the laboratory functioned so that it better

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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 inhouse 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 2	Level 2	Level 2	Level 2	Level 2

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PMLOHS601A Implement and monitor OHS and environmental management systems

UNIT DESCRIPTOR

This unit of competency covers the ability to implement and monitor the environmental and OHS management systems (OHSMS) for a work group or laboratory, within the scope of a 'head officer's' responsibilities as defined in the Australian Standards AS 2243.1 Safety in laboratories. Where the OHSMS is already established then this competency may apply to the review of the system. At this level, personnel should be able to interpret and explain those sections of OHS legislation, codes, regulations and Australian standards that apply to the tasks undertaken in the workgroup. This unit assumes that expert OHS and environmental advice is available, as required, either internal or external to the enterprise.

The unit of competency is based on the National Occupational Health and Safety Commission (NOHSC) Generic Competency Standard C [NOHSC:7025(1998) 2nd Edition] and is equivalent to *PMLOHS600A Implement and monitor risk management processes associated with OHS and environmental policies and procedures* in PML99.

This unit of competency has no prerequisites.

The unit of competency is applicable to personnel in a senior technician or laboratory supervisor role.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Implement requirements for the management systems	1.1 Ensure environmental and OHS responsibilities and duties are documented and accountability processes are in place
	1.2 Ensure environmental and OHS policies and procedures are documented and that documents are accessible to all relevant personnel
	1.3 Ensure implications of any proposed changes to the OHSMS are identified and addressed
	1.4 Recognise limits of own professional expertise and 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

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		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 in accordance with procedures issue resolution
		2.4	Provide information about the outcomes of participation and consultation in a manner accessible to employees
3.	Implement and maintain OHS and environmental risk management processes	3.1	Ensure a 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 assessments
		3.3	Ensure risk controls and hazard specific procedures for risk control that 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 program to identify and fulfil employees' environmental and OHS training needs
		4.3	Coordinate with relevant OHS and environment specialists as necessary
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

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		6.3	Consult with stakeholders, key personnel and, as required, expert advisors
		6.4	Document and communicate outcomes of analysis to 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

The following variables may apply to all industry sectors covered by this Training Package.

OHSMS includes that part of the organisation's overall management system for developing, implementing, reviewing and maintaining the activities for managing OHS risks associated with the business of the organisation.

Procedures include all OHS specific procedures, such as for hazard and incident reporting, communication, consultation and issue resolution and risk management. Policies and procedures may include those which directly or indirectly cover:

- hazard policies and procedures
- standard operating procedures (SOPs)
- safety procedures
- work instructions
- maintenance schedules

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- emergency, fire and incident procedures
- environmental incident procedures
- personal protective clothing and equipment procedures
- monitoring and appropriate tasking of personnel with possible infections
- waste minimisation, recycling and waste disposal
- immunisation registers for employees at risk
- hazardous goods manifest and substance register
- handling and disposal of microorganisms and heavy metals
- supervision of analysis for mycotoxins and pesticide residues
- contractor and employee handbooks
- formulas
- batch sheets
- manufacturers' operating manuals
- industry Codes of Practice and guidelines.

Stakeholders may include: managers, supervisors, employees' OHS and other employee representatives, OHS committees, and in some cases, workers' families and the community.

Participative processes with employees and their representatives include:

- OHS committees and other committees, such as consultative, planning
- health and safety and other employee representatives
- employee and supervisor involvement in OHS activities, such as inspections, audits, risk assessments
- procedures for reporting hazards, raising and addressing OHS issues
- identification of hazards
- assessment of level of risk
- implementation of risk control measures and review of effectiveness
- participation in injury and incident investigation
- participation in the development of policies and procedures
- review of OHS records and statistics
- review of registers of hazardous substances and dangerous goods

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- audits and workplace inspections
- job safety analysis
- consultation with workers.

Personnel work in accordance with work instructions and standard operating procedures which incorporate all relevant aspects of OHS legislation and the codes, guidelines, regulations and Australian standards applying to environmental hazards and dangerous goods.

State based OHS legislation includes general OHS legislation, hazard and specific legislation especially that related to hazardous substances and dangerous goods

Industry standards include:

- AS 1678 Emergency procedures guide for hazardous materials
- AS 1940 Storage and handling of flammable and combustible liquids
- AS 2243 Safety in laboratories
- AS 2243.8 Fume hoods
- AS 2252 Biological safety cabinets
- AS 2500 Storage of goods
- AS 2503 Safety storage and handling information cards
- AS 2982 Hand washing facilities
- AS 3780 Storage and handling or corrosive liquids
- AS 4452 Storage and handling of toxic substances
- SAA HB9 Occupational personal protection, and other relevant standards for protective, clothing (for example, AS 2161, AS 2210, AS 1337 and AS 1338)
- standards for the segregation of wastes (for example, AS 2243.3 and AS 2243.4)
- AS/NEC/ISO 14000
- State/Federal Acts (for example, clean air and waterways)
- Australian Dangerous Goods Code
- Australian Code for Transport of Dangerous Goods
- guidelines for the operation of classes of laboratories
- Australian Quarantine Inspection Service guidelines for the importation of biological products
- Worksafe Australia National Code of Practice for the labelling of workplace substances (NOHSC:2012)

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- Genetic Manipulation Advisory Committee guidelines for working with genetically altered organisms.

Risk is the chance of something happening that will result in injury or damage. It is measured in terms of consequences and likelihood.

Risk management is the whole systematic process that is directed towards the identifying hazards, assessing the risk and developing controls to minimise the risk and monitoring the effectiveness of the controls (and taking action as required).

Hazard identification processes include:

- review of hazard and incident reports
- workplace inspections
- pre purchase risk assessments
- review of relevant internal documentation, including MSDS, manufacturer's manuals, minutes of meetings
- review of legislation, Codes of Practice, standards and guidelines
- review of publications by OHS regulators, industry bodies, journals, newsletter.

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 pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring 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 may include:

- hazard, incident and injury reports
- workplace inspections

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- audit reports
- formal and informal input of employees

Stakeholders include managers, the enterprise OHS committee, elected OHS representatives/health and safety representatives, laboratory and production personnel and external OHS agencies.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- accesses and interprets relevant sections of OHS and environmental legislation, regulations and Codes of Practice and updates
- analyses the work environment and judges OHS and/or environmental interventions
- consults employees and other stakeholders on safety and environmental issues, hazard identification, risk assessment, selection and implementation of control measures and their review
- raises issues related to concerns with safety of work systems and work environment through consultation with management and employees
- promptly addresses OHS and environmental management issues within their area of control
- develops and implements improvements in work practices and procedures to reduce the risk of illness and injury and meet OHS legislative requirements
- provides appropriate supervision, support and information in accordance with workplace procedures
- keeps OHS and environmental records complete, current and secure

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- communicates 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.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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
- knowledge of relevant National and Australian standards, including those related to OHS and environmental management systems
- knowledge of 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 in any particular situation (elimination, substitution, engineering controls, administrative controls, personal protective equipment)
- participative consultation processes, general or specific to occupational health and safety and environmental systems
- specific hazard policies and procedures (including housekeeping and inspections)
- occupational health and safety/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.

Knowledge is also required of the:

- how the characteristics and composition of the workforce impact on OHS and environmental management (for example, language and literacy, communication skills, cultural background, gender, workers with special needs, part time, casual or contract workers)
- sources of OHS and environmental management information, including specialist advisors
- nature of hazards relevant to the particular workplace

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- key personnel within enterprise management structure and the OHS and environmental management systems
- knowledge of organisational OHS and environmental management policies and procedures.

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example, in the biomedical sector:

- specific OHS policies and State/Territory health department guidelines regarding infection control in the health care setting and the types of infections likely to occur
- regulations pertaining to laboratories involved in gene manipulation (Office of the Gene Technology Regulator)
- procedures and control measures for spillage of infected material in the public or non-laboratory domain.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with units dealing with communication, supervision and training, for example:

- *PMLCOM500B Provide information to customers*
- *PMLORG600B Supervise laboratory operations in work/functional area*
- *PMLORG601B Maintain registration and statutory or legal compliance in work/functional area.*

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Resource implications

Resources may include relevant OHS and environmental legislation, regulations, Codes of Practice and workplace procedures.

This competency in practice

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 flamable 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 standard operating procedure (SOP) was developed for handling these enzymes. Individuals likely to come into close contact with the enzymes were required to regularly undergo an allergen sensitivity test.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 2	Level 3	Level 2

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PMLORG600B Supervise laboratory operations in work/functional area

UNIT DESCRIPTOR

This unit of competency covers the senior technician/supervisor's role in planning, allocation of tasks, coordination, quality assurance, recording and reporting of laboratory outputs. 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. Under broad direction from scientists/medical staff/engineers, the senior technician/supervisor accepts responsibility for the day-to-day operation of his/her functional area.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory personnel working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Program 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, 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 acting to prevent their recurrence
2. Manage personnel within work area	2.1 Develop and coordinate rosters to balance job requirements, laboratory efficiency and skill development opportunities
	2.2 Empower work groups/teams in dealing with technical and work flow problems and suggesting improvements

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		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.	Arrange for the recruitment and induction of personnel as appropriate	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

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5.5 Rectify sub-optimal utilisation of plant, equipment 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency applies to supervisors who prepare operational plans and monitor resource usage. Generally, they will have reference to:

- staff performance measures, such as:
  - internal auditing against standard operating procedures (SOPs)
  - three stage proficiency testing (external, interpersonal, replicate)
- customer needs, specific testing requirements, standards
- waste auditing and minimisation processes
- strategic plans, productivity/profit targets, 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
- relevant legislation, standards, codes and practices (for example, ethical and legal responsibilities of enterprise personnel relating to animal welfare, poisons, environmental protection)
- access/equity/ethics principles, processes and procedures
- technical standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - registration/licensing requirements
  - NATA accreditation

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- ISO 9001, 9002, 9003 series Quality management and quality assurance standards
- AS 2243 Safety in laboratories
- RTA test methods
- Standard Australian test methods (for example, Food Standards Code, AS sampling and test methods)

- batch cards, work schedules and rosters
- maintenance and housekeeping schedules.

This unit of competency may include the use of equipment and systems, such as:

- computer equipment
- information management systems
- financial accounting systems.

Problem solving could include:

- troubleshooting, fault finding
- risk analysis, root cause analysis, aspect/impact analysis
- non-routine operational/technical problems
- non-routine administrative and personnel related problems.

Communication could involve:

- supervisors and managers
- laboratory and production personnel and workteams
- members of the public, customers and suppliers.

This unit of competency includes supervision of:

- work practices within functional area, such as:
  - determining quality assurance sequences to 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, such as:
  - 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

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- operational plans, such as:

– 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, such as:

– recognising problems and initiating corrective actions

– continuously improving the skills of personnel in the workplace.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to supervise laboratory operations and personnel so that planned outcomes are achieved within agreed resource and budget parameters without compromising safety, quality and ethics. In particular, the assessor should look to see that the candidate:

- collects, analyses and reports information for enterprise operational plans, budgets and performance management

- organises and optimises the use of resources within agreed parameters to achieve planned outcomes

- revises plans to take account of the unexpected

- makes decisions within limits of responsibility and authority

- ensures that legislation, statutory and enterprise requirements are met in work operations

- monitors outputs, analyses processes and introduces ways to improve operations

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- uses effective consultative processes
- promotes a learning environment for personnel in immediate work area
- motivates and counsels personnel to improve performance.

Underpinning knowledge

The candidate requires sufficient knowledge of the enterprise's business, strategic and operational plans and key performance indicators; laboratory services; and enterprise products, services and customers to be able to supervise laboratory operations within a work or functional area.

Competency includes the ability to apply and explain:

- 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 (for example, seasonal, annual)
- auditing procedures
- team leadership and development techniques
- mentoring and coaching techniques
- relevant health, safety and environment requirements.

An awareness of the laboratory's business goals and key performance indicators is also required as a basis for decision making and actions.

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 Acts, Environmental Protection Agency, National Pathology Accreditation Advisory Council (NPAAC) and National Health and Medical Research Council (NHMRC).

Food processing

- Food Chemicals Codex, AOAC Methods of Analysis.

Assessment context and methods

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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.

Because of the comprehensive nature of this unit and the need to integrate a wide range of knowledge and skills, the assessment timeframe must allow for adequate assessment over a planning cycle and address a range of non-routine problems.

The following assessment methods are suggested:

- direct observation of the candidate's interactions with personnel
- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLOHS601A Implement and monitor OHS and environmental management systems
- PMLTEAM600B Manage and develop teams
- PMLORG601B Maintain registration and statutory or legal compliance in work/functional area.

Resource implications

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, quality manuals.

This competency in practice

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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 2	Level 3	Level 2

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PMLORG601B Maintain registration and statutory or legal compliance in work/functional area

UNIT DESCRIPTOR

This unit of competency covers the senior technician/supervisor's responsibility to ensure that her/his work or functional area complies with legislation and licensing, registration, ethical or accreditation requirements (for example, NATA) and enterprise policies and procedures. Under broad direction from scientists/medical staff/engineers, the senior technician/supervisor accepts responsibility for the day-to-day operation of his/her functional area.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory personnel working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 measuring equipment
	2.5 Empower team members through coaching and mentoring to manage their responsibilities
3. Monitor, analyse, adjust	3.1 Ensure that actual and potential problems are

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	and report performance		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

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. Statutory and legal requirements could include:

- general duty of care
- privacy legislation
- ethics committee requirements
- maintenance and confidentiality of records
- maintenance of records of breaches
- maintenance of certified reference materials and regulation 80 certificates

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- provision of information and training
- regulations and Codes of Practice relating to hazards present in the work area
- representative work groups/committees
- dispute resolution.

Statutory or legal compliance may include but is not limited to:

- OHS and environmental legislation
- NATA accreditation
- Australian standards, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - AS 2243 Laboratory safety
  - AS 2500 Storage of goods
  - AS 1514 Measurement terminology
  - AS 2415 and AS 2000 Calibration systems requirements
- Therapeutic Goods Administration, Code of GMP
- trade practices, weights and measures
- Environmental Protection Agency
- workers' compensation, WorkCover, industrial relations
- National Measurement Act.

Ethical considerations may include but are not limited to:

- 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, copyright
- provision of unbiased, accurate and appropriately qualified information results.

Communication could involve:

- managers and supervisors

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- laboratory and production staff
- regulating authorities
- explanation of legislation, codes, standards and work practices, such as:

– handling and use of animals (Animal Welfare Code 64)

– OGTR guidelines for working with genetically altered organisms

– obtaining permits as required for collection of botanical and animal specimens

– minimising potential infection and contamination hazards and disposal of biological materials (for example, blood, urine, body tissues) which may be infected with hepatitis B and C, HIV/AIDS

– Food Standards Code, export regulations governing enterprise products

– ethics committee requirements

– freedom of information

– equal opportunity and anti-discrimination

– privacy act

– intellectual property and copy right

– natural justice.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

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Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to supervise laboratory operations to ensure that the work or functional area complies with legislation and laboratory licensing, registration, or accreditation requirements (for example, NATA) and the enterprise's policies and procedures.

In particular, the assessor should look to see that the candidate:

- ensures work practices are conducted in and ethical and professional manner
- monitors and analyses work practices to ensure compliance and takes appropriate actions to rectify potential problems or instances of non-conformance
- provides information and training on roles and responsibilities and enterprise procedures dealing with legal/statutory requirements
- communicates appropriately with all customers (internal and external) and is aware of cultural and social contexts
- negotiates changes to work processes and procedures to meet statutory or legal requirements
- develops and introduces practices to improve the work environment
- provides coaching and mentoring support to personnel to change work practices
- keeps required records complete, current and secure.

Underpinning knowledge

Competency includes the ability to apply and explain:

- enterprise procedures governing document control, record management, communication and reporting, internal and external audits
- scientific technical terminology used to describe legislative, licensing, or registration requirements (for example, traceability)
- legal, ethical and welfare issues associated with laboratory and technical work
- role, structure and responsibilities of ethics committees
- statutory or legal compliance requirements, such as:
  - legislation governing laboratory operations
  - National Measurement Act
  - NATA accreditation
- relevant health, safety and environment requirements.

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Assessment context and methods

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.

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 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLCOM500B Provide information to customers
- BSZ404A Train small groups
- PMORG600B Supervise laboratory operations in work/functional area
- PMLCOM601B Develop and maintain laboratory documentation.

Resource implications

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, SOPs, quality manuals and quality system documentation.

This competency in practice

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

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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 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 standard operating procedures, 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

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Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 2	Level 3	Level 2

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PMLORG602B Manage complex projects

UNIT DESCRIPTOR

This unit of competency covers the ability to interpret a complex technical brief, determine project methodology and resource requirements, establish a project plan, manage the project to a successful conclusion and evaluate the outcomes.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory personnel working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 performance and outcomes

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

The focus of projects could involve:

- 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

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- restructuring of laboratory services
- reclassification of staff and staffing levels.

Records may take the form of:

- lists of potential costs, invoice and payments 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 may be computer generated, and may involve:

- customers, stakeholders, external authorities and project team
- reports, briefs, minutes, letters, oral briefings, advice and conversations, telephone calls.

Resources may include:

- personnel
- budget
- equipment, materials, facilities
- computer project planning programs.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to establish a project team and implement a project in response to a given brief. The project will contribute to the business needs of the enterprise.

In particular, the assessor should look to see that the candidate can:

- analyse a complex technical brief and prepare a feasible project implementation plan
- reach milestones within budget
- consult and communicate effectively to ensure the project outcomes are achieved
- maintain accurate records and documentation in accordance with the enterprise procedures
- select and establish operational systems for the project
- plan work activities, resources and finances to ensure the project outcomes are achieved within the timeframe and budget constraints
- monitor and evaluate the progress of the project.

Underpinning knowledge

Competency includes the ability to apply and explain:

- purpose and methods of planning
- techniques for monitoring timelines, expenditure, 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.

An awareness of the laboratory's business goals and key performance indicators is also required as a basis for managing complex projects in the laboratory.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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

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- 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEAM600B Manage and develop teams
- PMLQUAL600B Implement and monitor quality systems and continuous improvement processes.

Resource implications

Resources may include:

- procedures and documentation typically used by the enterprise
- scheduling charts/strategic plans
- GANTT charts
- operational reports
- financial plans
- sample budgets.

This competency in practice

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 getting approval for an implementation plan, team members were briefed and development samples produced for approval. Product

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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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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PMLQUAL600B Maintain quality system and continuous improvement processes within work/functional area

UNIT DESCRIPTOR

This unit of competency covers the senior technician/supervisor's responsibility to ensure that quality system requirements are met and to initiate continuous improvements within the work or functional area. Under broad direction from scientists/medical staff/engineers, the senior technician/supervisor accepts responsibility for the day-to-day quality of outputs for his/her work or functional area.

This unit of competency has no prerequisites.

This unit of competency is applicable to senior technical officers working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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3.	Provide training in quality systems and improvement processes	3.1	Analyse roles, duties and current competency of 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency is relevant to experienced technical officers and supervisors who initiate continuous improvements.

Quality audits and evaluations for the work area may be undertaken as an individual or as part of a team. Quality manuals and procedures may be based on standards, such as:

- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- ISO 9001, 9002 and 9003 series Quality management and quality assurance standards
- AS10010013–2003 Guidelines for quality management systems documentation
- National Association of Testing Authorities (NATA) requirements

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- Good laboratory practice (GLP), good manufacturing practice (GMP), the British Standard BS 5750 and the OECD Principles of good laboratory practice, Therapeutic Goods Administration — Code of GMP
- AS1199 Sampling procedures and tables for inspection by attributes
- AS1399 Guide to AS1199
- HACCP principles
- international testing methods (eg, AOAC, CODEX).

Quality audits could 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 may involve:

- supervisors, managers and quality managers
- laboratory and production personnel
- customers and suppliers
- auditors.

Reporting may involve:

- verbal responses
- data entry into laboratory or enterprise databases
- written reports.

Documentation could include:

- sampling plans
- enterprise quality manual
- quality (certification or registration) requirements
- audit documents
- performance plans and reports
- training records and/or plans
- workplace procedures relating to OHS, EO, environmental legislative requirements

- industrial awards, enterprise agreements.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to implement and monitor defined quality system requirements and initiate continuous improvements within the work area.

In particular, assessors should look to see that the candidate:

- applies effective problem identification and problem solving techniques
- strengthens customer service through a focus on continuous improvement
- implements, monitors and evaluates quality systems in the work area
- initiates quality processes to enhance the quality of performance of individuals and teams in the work area
- gains commitment of individuals/teams to quality principles and practices
- implements effective communication strategies
- encourages ideas and feedback from team members when developing and refining techniques and processes
- analyses training needs and implements training programs
- prepares and maintains quality and audit documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

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- relevant national and international quality standards and protocols
- the enterprise quality system
- continuous improvement principles
- enterprise organisational structure, delegations and responsibilities
- SOPs for the technical work performed in work area
- communication/reporting protocols
- policy and procedure development processes
- enterprise information systems management
- relevant health, safety and environment requirements.

The candidate also requires sufficient knowledge of enterprise business goals and key performance indicators to implement continuous improvement processes effectively.

Assessment context and methods

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.

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 aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLCOM500B Provide information to customers.

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Resource implications

Resources may include:

- quality manuals and documentation
- quality tools, such as Pareto charts, SWOT Analysis, PDCA (plan, do, check, act)
- quality and customer data.

This competency in practice

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 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

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 2	Level 3	Level 3

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PMLQUAL601B Conduct an internal audit of the quality system

UNIT DESCRIPTOR

This unit of competency covers the senior technician/supervisor's responsibility 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. Senior technician/supervisors often play a key role in audit teams because of their analytical and diagnostic skills and extensive knowledge of both quality systems and complex technical procedures.

This unit of competency has no prerequisites.

This unit of competency is applicable to technical officers working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 process
	2.3 Collect sufficient evidence to identify non-conforming aspects of the quality systems
	2.4 Analyse evidence to identify suitable corrective action(s).

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3.	Report findings	3.1	Document findings from the audit process in the required format
		3.2	Present recommendations for corrective action(s)
		3.3	Provide strategies for the implementation of the corrective action(s)
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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency represents a thorough examination of various aspects of the quality system. Often laboratory supervisors 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.

Elements of a quality system may include:

- responsibilities of personnel within quality system
- contract review
- inspection and test status
- control of nonconforming product
- design control
- document and data control
- purchasing
- control of customer-supplied product
- product identification and traceability
- process control

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- 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 may include:

- enterprise quality manual
- any documentation related to the quality elements being audited
- customer complaints
- training records
- data records
- certification documentation from clients/suppliers
- material/equipment specifications.

Quality manuals and procedures may be based on standards, such as:

- ISO 9001, 9002 and 9003 series Quality management and quality assurance standards
- AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- Good laboratory practice (GLP), good manufacturing practice (GMP), the British Standard BS 5750 and the OECD Principles of good laboratory practice
- OHS legislation and codes, regulations and Australian standards that apply to the tasks undertaken in the workplace.

Quality improvement tools and techniques may include:

- run charts, control charts, histograms and scattergrams to present QC data
- PDCA (plan, do, check, act)
- Ishikawa fishbone diagrams, cause and effect diagrams
- logic tree

- similarity/difference analysis
- Pareto charts and analysis
- forcefield/SWOT analysis
- process capability.

Communication may involve managers, customers and suppliers, laboratory and production personnel, other personnel with QA responsibilities.

Reporting may involve:

- verbal responses,
- judgement and recommendations
- written report, presentations
- data entry into laboratory or enterprise databases.

Documentation could include:

- audit documents
- enterprise quality manual, HACCP plans
- safety procedures, standard operating procedures (SOPs), work instructions
- quality (certification or registration) requirements.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to prepare and conduct an audit of the quality system following enterprise procedures. This includes the ability to implement corrective action and monitor its effectiveness

In particular, the assessor should look to see that the candidate:

- implements effective communication strategies before, during and after an audit
- collects and analyses all necessary data/documentation/records
- encourages suggestions and feedback from team members when developing and refining processes
- monitors and reviews the team's performance
- applies effective problem identification and problem solving techniques
- prepares and maintains quality and audit documentation
- makes recommendations based on the findings of non-conformance items
- initiates and evaluates corrective action and makes appropriate adjustments.

Underpinning knowledge

Competency includes the ability to apply and explain the:

- 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 requirement and procedures
- enterprise organisational structure, responsibilities and delegations
- relevant health, safety and environment requirements.

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An awareness of the laboratory's business goals and key performance indicators is also required as a basis for conducting internal audits.`

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example, in food processing:

- incorporate food safety and/or HACCP plan requirements into audit
- monitor and verify critical control limits.

Assessment context and methods

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.

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 aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLQUAL600B Maintain quality system and continuous improvement processes within work/functional area
- PMLTEAM600B Manage and develop teams.

Resource implications

Resources may include:

- quality manuals and documentation
- quality system requirements — AS/NZS ISO 9001:1994.

This competency in practice

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 assistants often could not identify the sample test code. Despite the instruction to seek assistance, they did not contact a supervisor if she/he 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

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Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 2

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PMLTEAM600B Manage and develop teams

UNIT DESCRIPTOR

This unit of competency covers the ability of senior technicians/supervisors to develop and empower team members through motivating, mentoring, coaching and promoting team cohesion to achieve planned outcomes.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory personnel working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
	2.3 Encourage the sharing of knowledge and skills through coaching, mentoring and shadowing

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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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

The team leader manages the team to improve its performance through leading, facilitating and empowering its members. The team may:

- be ongoing with responsibility for particular services or functions, or project based
- have a mixture of full and part-time employees and contractors
- be separated by distance and work at sites outside the laboratory.

The team operates 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
- agreed responsibility and accountability requirements
- appropriate goals, objectives
- given resource parameters.

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.

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Identifying individual potential may require:

- comparisons of work requirements against outputs
- competency based assessment against standards or enterprise requirements.

Communication within and between teams could involve issues, such as:

- critical events on shift
- urgent or abnormal results that require attention
- problems with instruments, reagents, tests and sampling
- equipment and material shortages
- changes to work priorities, schedules and rosters.

Documentation could include:

- job descriptions, person specifications
- workplace procedures, OHS and EO policies
- licensing/registration requirements
- industrial awards and enterprise agreements.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated by the ability to perform consistently at the required standard. Candidates must be able to work effectively with team members who may have diverse work styles, cultures, and perspectives.

In particular the assessor should look to see that the candidate:

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- promotes team cohesion by, for example:

– 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

– dealing with conflict before it adversely affects team performance

– treating people openly and fairly

– recognising individual and cultural differences

– recognising and rewarding achievement

- improves team and individual performance by, for example:

– 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.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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
- performance outcomes expected and key indicators

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- business goals
- operating budgets and plans for work area
- relevant health, safety and environment requirements.

Assessment context and methods

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.

The following assessment methods are suggested:

- review of record systems and documentation of team 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLORG600B Supervise laboratory operations in work/functional area.

Resource implications

Resources may include:

- relevant OHS, EO, licensing, registration policies and procedures
- workplace procedures and standard operating procedures (SOPs)
- industrial awards and enterprise agreements.

This competency in practice

Construction materials

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 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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 2	Level 3	Level 2

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PMLTEST601B Classify building sites

UNIT DESCRIPTOR

This unit of competence 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. This competency is typically performed by para-professionals who often guide the work of experienced testers.

This unit of competency has the following prerequisites:

- PMLTEST403B Assist with geotechnical site investigations
- PMLTEST406A Perform physical tests.

This unit of competency is applicable to senior technical officers working in the construction 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’.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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

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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
		5.2	Maintain confidentiality and security of client and enterprise information.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

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Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by para-professionals.

Operations are performed in accordance with laboratory and/or enterprise procedures, and appropriate legislative requirements. These procedures and requirements include or have been prepared from:

- industry Codes of Practice
- environmental legislation and regulations
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, 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 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.

Tools and equipment used include:

- hand and power augers
- hand tools, including shovels, scoops, spanners, wrenches, tape measure
- consumables, including sample bags, labels, thin-walled sampling tubes
- documentation, including maps, plans, worksheets
- field test equipment, including pocket penetrometer, dynamic cone penetrometer, sand penetrometer
- laboratory equipment, including balances, ovens, liquid limit apparatus, linear shrinkage troughs, vernier calipers, core swell testing cell, psychrometer
- camera, GPS receiver
- safety clothing and equipment, including helmet, boots, earmuffs, glasses.

Typical skills may include:

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- working safely in field conditions
- setting up and maintaining tools and equipment
- cleaning equipment before leaving site in compliance with environmental authority requirements
- performing disturbed and undisturbed sampling
- performing in-situ testing
- performing laboratory testing
- interpreting site plans, specifications and codes
- identifying soil and rock materials
- handling and storing samples
- analysing test results and observations.

Typical problems 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, contamination of stormwater.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competence must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to conduct site and laboratory operations, and analyse results to assign a site classification.

In particular the assessor should look to see that the candidate can:

- read and interpret maps, drawings, specifications and Codes of Practice
- conduct subsurface explorations and log strata
- conduct in-situ 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
- analyse test results and observations to assign a site classification
- observe, interpret and report atypical situations
- communicate problems to appropriate personnel
- report results to clients using enterprise procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- engineering properties of soil and rock materials
- in-situ 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.

Assessment context and methods

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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.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLCOM500B Provide information to customers
- PMLORG600B Supervise laboratory operations in work/functional area.

Resource implications

Resources may include:

- access to building sites; site tools, equipment and materials
- standard construction materials testing laboratory, samples, equipment, materials, test methods, 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.

This competency in practice

Construction materials

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 establishes that there is no local information available on

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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 takes 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 assigns 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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PMLTEST602A Prepare plans and quality assurance procedures for environmental field activities

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.

This unit of competency has the following prerequisite:

- *PMLTEST515A Design and supervise complex environmental field surveys.*

This unit of competency is applicable to supervisors and managers working in the field and or environmental services 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 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	2.1 Identify the type, quantity and quality of data needed to

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	under field conditions		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
		5.3	Identify competencies required to undertake all field

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activities and, if appropriate, develop appropriate training programs for all staff involved in field activities.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements.

Statutory and related enterprise requirements may include:

- government and enterprise OHS and environmental policies
- environmental protection and/or conservation legislation and regulations
- consultation (for example, with traditional owners)
- waste management policies and legislation
- animal care and ethics regulations
- specific environmental standards (for example, air, water, noise)
- permits and/or licences to undertake field activities (for example, animal trapping).

Environmental field activities may include but not be limited to investigations of:

- meteorology, geology, hydrology, ecology
- water quality, industrial waste streams, air quality, noise and vibration
- soils, flora, weeds, native fauna, exotic or pest species, threatened species
- land-use, cultural sites.

Clients and stakeholders may include but are not limited to:

- fee-for-service clients
- Commonwealth, State and Local Government Agencies
- enterprises with monitoring and/or survey responsibilities
- private companies
- regulatory authorities
- environment protection agencies
- developers.

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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
- research studies.

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.

Protocols, methodologies, Codes of Practice and procedures may include:

- field sampling plans, field monitoring or survey plans, industry based sampling and/or monitoring protocols
- access to land (for example, Aboriginal reserves)
- consultation with traditional owners
- safety and accident/injury plans, emergency plans, risk management plans
- environmental impact assessment procedures
- environmental audits.

Staff field tasks and roles may include:

- team or project leader, survey coordinator
- field sampling officer, field monitoring officer, data management officer
- safety and/or environmental officer
- field camp supervisor, field assistant or field-hand
- driver
- any combination of the above.

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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 (for example, compass, maps, global positioning systems, two-way radio, mobile phone)
- transportation systems (for example, vehicles, boats, aircraft).

Enterprise written requirements for field activities may include:

- fieldwork procedures, standard operating procedures (SOPs)
- site locations
- sampling procedures
- availability of required services
- equipment and field instrument operating instructions, calibration procedures, instrument fault finding procedures, and general maintenance and repair procedures
- field test procedures (validated and authorised)
- captured animal welfare and ethics Code of Practice
- staff travel arrangements and accommodation conditions
- emergency procedures, data quality procedures, and safety and survival aspects.
- requirements related to protection of the environment.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard.

In particular, assessors should look to see that the candidate:

- demonstrates understanding of the purpose of the activity, including:
  - information and analysis required
  - end users of information
  - significance of outcomes for broader program(s)
- communicates effectively and efficiently with clients, stakeholders, and other relevant parties
- documents the objectives of field activities accurately and clearly
- identifies and interprets policy and statutory requirements accurately
- analyses enterprise field procedures and drivers
- identifies type, quality and quantity of data needed for defined field activities
- reviews literature to identify existing and relevant field protocols
- develops and documents enterprise's field monitoring/survey procedures and practices
- reviews enterprise databases
- develops detailed budgets, work programs, resource requirements and staff training needs
- develops data quality procedures
- undertakes reconnaissance and evaluation of field sites
- develops and documents overall implementation plan
- responds effectively to changes or unforeseen circumstance
- negotiates effectively with stakeholders on multiple issues and, in general, reaches satisfactory agreements
- leads, supports and mentors junior staff.

Underpinning knowledge

Competency includes the ability to apply and explain:

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- general field monitoring and survey protocols
- specific field monitoring and survey practices and techniques
- correct terminology relevant to defined field activities
- design and documentation of field work plans
- effective staff training procedures
- current developments in field instrumentation, communication equipment and data storage/analysis systems
- environmental planning and assessment procedures
- emergency planning
- data quality procedures
- project management
- negotiation and conflict resolution techniques
- rights and responsibilities of employers and employees in terms of relevant legislation, such as OHS, environmental impact assessment, and environmental protection.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

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Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLORG602B Manage complex projects
- PMLTEAM600B Manage and develop teams.

Resource implications

Resources may include:

- legislation, regulations, policies, Codes of Practice, enterprise procedures, field protocols.

This competency in practice

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.

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Construction materials

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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 2	Level 3	Level 3	Level 2

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PMLTEST603A Evaluate and select appropriate test methods and/or procedures

UNIT DESCRIPTOR

This unit of competency covers the senior technician/supervisor's 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.

In any of these situations, senior technicians/supervisors 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.

This unit of competency is based on, and is equivalent to, the unit *PMLTEST600A Select appropriate test methods and procedures* in PML99.

This unit of competency has no prerequisites.

This unit of competency is applicable to senior technical officers, technical specialists and laboratory supervisors working in many 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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
1. Determine sample characteristics and testing requirements	1.1 Confirm drivers for evaluation and selection of test method(s) and/or procedure(s)
	1.2 Examine sample documentation and/or consult with sample supplier to determine nature of sample(s)
	1.3 Identify sample characteristics which may affect testing requirements
	1.4 Determine testing requirements and their compatibility with existing standard operating procedures (SOPs)

2.	Evaluate possible test method(s) and/or procedures(s)	2.1	Identify appropriate standards, reference materials, test method(s) and/or procedure(s) which may be applicable
		2.2	Assess suitability of available standards, reference materials, test method(s) and/or procedure(s) against testing requirements
		2.3	Identify environmental and 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 method(s) and/or procedure(s)	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 method(s) and/or procedure(s)	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	Determine if legal traceability is required and develop appropriate chain of custody procedures
		4.4	Document all safety, sample preparation, testing, data handling and reporting procedures
		4.5	Submit all documentation to appropriate personnel for review and approval.
5.	Determine sample characteristics and testing requirements	5.1	Confirm drivers for evaluation and selection of test method(s) and/or procedure(s)
		5.2	Examine sample documentation and/or consult with

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sample supplier to determine nature of sample(s)

5.3 Identify sample characteristics which may affect testing requirements

5.4 Determine testing requirements and their compatibility with existing standard operating procedures (SOPs)

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Test methods and procedures may be or have been prepared from:

- Australian and international standards, acts and regulations, such as:
  - AS ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
  - ISO 9000 series Quality management and quality assurance standards
  - AS 2830 Good laboratory practice
  - Food Standards Code 2002 Australia New Zealand and amendments
  - AS/NZS 2243 Safety in laboratories
  - Therapeutic Goods Act
  - National Measurement Act
- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs)
- standard precautions for handling hazardous and potentially infective biological materials
- standard operating procedures (SOPs), in house methods
- quality manuals, equipment and procedures manuals
- calibration and maintenance schedules
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Tests and procedures may be routine, infrequent, ‘one-off’, quantitative or qualitative and may be applied to:

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- 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 may include the:

- new or amended legislation, regulation, licensing, accreditation requirements
- public, political, 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
- 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 include:

- 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, availability of trained staff
- cost
- selectivity of method, range, accuracy, precision and acceptable uncertainty
- whether it is appropriate/ethical to perform the test.

The selection of appropriate test methods and procedures will depend on balancing customer, enterprise and/or regulatory/licensing requirements with laboratory resources available (including skilled personnel).

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to evaluate and select appropriate test methods and/or procedures to satisfy the range of testing situations normally encountered in the laboratory. In particular, the assessor should look to see that the candidate can:

- 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, linearity, selectivity, range, limit of detection and matrix characteristics in method selection
- clearly document method selection procedure(s)
- maintain records of published methods
- follow OHS procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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

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- scientific/technical principles underpinning test method and their application to selection of testing methods for different materials
- 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, in 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- completion of selection brief or selection proficiency test
- review of records completed by 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLORG600B Supervise laboratory operations in work/functional area.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment and reagents
- SOPs and test methods
- appropriate Australian and international regulatory standards.

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This competency in practice

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 procedure(s) 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 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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 2	Level 3	Level 3	Level 3

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PMLTEST700B Contribute to the development of products and applications

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.

This unit of competency has the following prerequisites:

- *PMLTEST603A Evaluate and select appropriate test methods and/or procedures.*

This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 members
	2.3 Identify quality requirements and quality standards
	2.4 Prepare project timelines given the constraints

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3.	Develop new product formulation	3.1	Prepare documentation for new product pilot batch(s)
		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 GMP/GLP protocols for approval by appropriate personnel
		4.6	Prepare standard operating procedures for quality and laboratory related procedures
		4.7	Prepare OHS procedures for the laboratory and manufacturing environment and submit for approval
5.	Document and report	5.1	Document and report project outcomes

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project outcomes	5.2	Complete project reporting requirements.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by technical specialists who evaluate product/application development briefs and contribute to the development of products and applications to meet the requirements of the brief.

Product/application briefs may be provided by external customers or internal customers, such as marketing or production.

At this level, personnel should be able to interpret and explain those sections of legislation, codes, regulations and Australian standards that apply to the tasks undertaken in developing products and applications. They should also be aware of enterprise business goals and the impact of their projects on these goals.

Materials used to manufacture products/applications may include: solvents, emulsifiers, thickeners, surfactants, disintegrants, fillers, moisturising materials, colouring materials, flavours, perfumes, opacifiers, propellants and sunscreens. These will depend on the development brief.

Calculations may be required to adjust properties, such as: assay/potency, viscosity, application payload, hardness, moisture content and colour.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements, such as:

- Australian and international standards
- Codes of Practice (such as GLP and GMP)
- relevant Acts and their regulations
- product formulation documentation
- suppliers of raw material catalogues
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- equipment and quality manuals
- calibration and maintenance schedules
- enterprise recording and reporting procedures
- material, production and product specifications.

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Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to evaluate a product/application brief and contribute to the development of products and applications to meet the requirements of the brief. In particular, the assessor should look to see that the candidate:

- interprets a brief to determine product/application development requirements
- applies theoretical knowledge of starting material and formulation principles to develop product/applications
- uses appropriate procedures to research alternative formulations
- uses ‘environment friendly’ strategies for formulations
- makes formulation recommendations for pilot batch manufacture
- manufactures pilot batches
- evaluates pilot batches against project brief
- evaluates product/application stability
- evaluates the OHS requirements to be observed for each ingredient during manufacture of product/application
- evaluates the OHS suitability of each ingredient for use in the formulation
- ensures that product/application meets regulatory requirements
- follows enterprise procedures to document development process.

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Underpinning knowledge

Competency includes the ability to apply and explain:

- knowledge of 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
- operating budgets and plans for work area
- relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of development work completed by the candidate
- review of development briefs completed by 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST701B Troubleshoot equipment and production processes
- PMLTEST702B Contribute to the validation of test methods
- PMLTEST703B Develop or adapt analyses and procedures.

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Resource implications

Resources may include:

- standard laboratory equipped with appropriate pilot batch manufacturing and testing equipment
- on line data search facilities
- starting material and product formulation information
- scheduling charts and project plans
- appropriate SOPs and enterprise guidelines.

This competency in practice

Manufacturing

Technical specialists who formulate cosmetics products must apply theoretical and practical knowledge during each stage of the formulation process. This is illustrated 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

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- 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 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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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PMLTEST701B Troubleshoot equipment and production processes

UNIT DESCRIPTOR

This unit of competency covers the senior technical officers ability to apply technical, instrumental and equipment knowledge and skills to troubleshoot testing equipment and testing issues related to production processes, to identify problems and to recommend corrective action.

This unit of competency has the following prerequisites:

- *PMLTEST603A Evaluate and select appropriate test methods and/or procedures.*

This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 substandard performance	2.1 Select appropriate technical process for 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

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	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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by technical specialists who troubleshoot laboratory and production problems and make recommendations on the basis of these investigations.

Troubleshooting is the process of using technical knowledge and skills to investigate abnormal performance and assay results. This 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.

All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. At this level a thorough knowledge of both theoretical and practical aspects of laboratory equipment and processes is required. These procedures may include or have been prepared from:

- Australian and international standards
- Codes of Practice (such as GLP and GMP)

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- material safety data sheets (MSDSs)
- National Measurement Act
- standard operating procedures (SOPs)
- equipment manuals
- equipment start-up, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- enterprise recording and reporting procedures
- production and laboratory schedules
- material, production and product specifications.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to troubleshoot testing equipment and testing issues related to production processes to identify causes of problems and recommend corrective action. In particular, the assessor should look to see that the candidate can:

- identify causes of faulty or substandard performance
- propose adjustments/rectifications/modifications
- test results of adjustments/rectifications/modifications

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- locate, interpret and apply relevant information
- maintain relevant workplace records
- identify and safely handle products and materials
- apply safety precautions appropriate to the task.

Underpinning knowledge

Competency includes the ability to apply and explain:

- detailed knowledge of 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

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Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST700B Contribute to development of products and applications
- PMLTEST703B Develop or adapt analyses and procedures
- PMLTEST702B Contribute to validation of test methods.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment, samples, reagents and test methods
- laboratory procedures and SOPs.

This competency in practice

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 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 double-checking 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

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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.

Analysis of the sugar content in the yoghurt indicated that the increased sugar content was due to the incorrect tare weight.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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PMLTEST702B Contribute to validation of test methods

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.

This unit of competency has the following prerequisites:

- *PMLTEST603A Evaluate and select appropriate test methods and/or procedures.*

This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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 as per manufacturer's specifications
	1.3 Confirm that equipment operating instructions exist and conform to manufacturer's specifications
	1.4 Confirm that equipment operates as per manufacturer's design specifications
	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

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		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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by technical specialists who validate analytical methods as part of their job.

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.

Test methods requiring validation include new recognised standard test methods and existing test methods which have been modified or new enterprise test methods.

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, limit of quantitation, accuracy, precision, recovery, ruggedness and robustness. Validation may also include an assessment of the clarity and completeness of the description of the method.

All operations are performed in accordance with laboratory and/or enterprise procedures. These procedures include or have been prepared from:

- Australian and international standards, such as '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
- United States Pharmacopoeia: General information (1225), Validation of Compendial Methods

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- ICH Q2 A&B Int. Conf. Harmonisation Guidelines for Method Validation
- NATA guidelines on validation
- Codes of Practice (such as GLP and GMP)
- National Measurement Act
- material safety data sheets (MSDSs)
- standard operating procedures (SOPs)
- enterprise recording and reporting procedures
- equipment manuals
- equipment startup, operation and shutdown procedures
- calibration and maintenance schedules
- quality manuals
- production and laboratory schedules
- material, production and product specifications.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to validate test methods as fit for purpose following a validation protocol established in consultation with appropriate personnel.

In particular, the assessor should look to see that the candidate:

- conducts literature searches on background chemistry/physics/biology/immunology of materials to be evaluated, including likely impurities and degradation products
- starts up, set up/optimise, calibrate and operate equipment to manufacturer's specifications
- prepares test samples and standards for validation
- carries out validation tests as per validation protocol
- applies theoretical knowledge and appropriate statistics to interpret validation data and reach correct conclusions
- records results and communicates recommendations as per enterprise procedures
- arranges large amounts of data into logical format so other technical personnel can review and reach the same valid conclusions
- follows OHS and environmental management procedures and GLP.

Underpinning knowledge

Competency includes the ability to apply and explain:

- principles, concepts and enterprise/regulatory requirements related to method validation
- traceability –, including legal requirements for traceability
- detailed knowledge of 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.

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Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- completion of validation brief or validation proficiency test
- review of workplace validation briefs completed by 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 aspects of competency which are difficult to assess directly. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST700B Contribute to the development of products and applications
- PMLTEST703B Develop or adapt analyses and procedures
- PMLTEST701B Troubleshoot equipment and production processes.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment, reagents, samples and test methods
- validation protocol.

This competency in practice

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 high-performance 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.

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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 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 spectrometer for colour analysis
- high performance liquid chromatography 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 are 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, as per enterprise requirements, and provides detailed reference for accreditation, audit and future laboratory use.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

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Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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PMLTEST703B Develop or adapt analyses and procedures

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.

This unit of competency has the following prerequisites:

- *PMLTEST603A Evaluate and select appropriate test methods and/or procedures.*

This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
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

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	2.4	Evaluate resource requirements for proposed methods/procedures
	2.5	Ensure that methods/procedures meet 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 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 as per enterprise procedures.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the work conducted by technical specialists who develop or adapt analyses and procedures to meet enterprise needs. This work may involve developing new testing methods or adapting existing methods to satisfy a testing need.

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All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. When developing new methods of analyses, the following information sources may be used:

- Australian and international standards
- local or international enterprise sites
- equipment manufacturer's specified methods
- appropriate journals and Internet sites
- National Measurement Act
- Codes of Practice (such as GLP and GMP)
- material safety data sheets (MSDSs)
- 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.

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 could include:

- non-instrumental methods, such as gravimetric, titrimetric and qualitative tests

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- spectrometric methods, such as UV/visible, IR (including FTIR), NIR, AA, fluorescence
- chromatographic methods, such as thin layer, paper, GC, HPLC, ion chromatography and electrophoresis
- electrochemical methods, such as ion selective electrodes and polarography
- assays based on biological properties or cell properties for enzyme antibody activity.

Procedures are directions for conducting analyses, either in hard copy or online format.

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 may also include:

- economic factors
- safety considerations
- resource factors, including equipment and personnel
- regulatory, accreditation and registration considerations.

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

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EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. Candidates must be able to develop or adapt analyses and procedures to meet requirements. In particular, the assessor should look to see that the candidate:

- interprets a brief to determine testing requirements
- applies theoretical concepts and practical principles to develop or adapt methods to meet requirements
- evaluates existing testing procedures against new testing requirements
- uses appropriate procedures to research alternative methods
- makes recommendations for modification of existing procedures or development of new procedures based on sound principles
- follows enterprise procedures to document and circulate new procedures.

Underpinning knowledge

Competency includes the ability to apply and explain:

- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

- review of development or adaptation of methods completed by candidate

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- review of workplace development briefs completed by candidate
- feedback from supervisors and/or clients
- oral or written questioning to assess underpinning knowledge of analyses, instrument operation, procedures and problem solving techniques.

Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST700B Contribute to the development of products and applications
- PMLTEST701B Troubleshoot equipment and production processes
- PMLTEST702B Contribute to validation of test methods.

Resource implications

Resources may include:

- standard laboratory equipped with appropriate equipment, reagents, samples and test methods
- online data search facilities.

This competency in practice

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 conditions.

Food processing

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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.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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PMLTEST704B Integrate data acquisition and interfacing systems

UNIT DESCRIPTOR

This unit of competency covers the ability to automate experimental processes for instrument control and the acquisition and communication of data.

This unit of competency has the following prerequisites:

- *PMLDATA501B Use laboratory application software.*

This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industries.

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'.

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance Criteria describe the level of performance required to demonstrate achievement of the element.
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
	3.4 Implement software to automate laboratory and/or field systems

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4.	Document procedures and constraints	4.1 Prepare standard operating procedures 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.

RANGE STATEMENT

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.

Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.

This unit of competency describes the automation of laboratory systems, particularly the integration of laboratory processes with computer systems. A technical specialist would be expected to implement and troubleshoot the interconnection of laboratory and field equipment. This unit of competency covers only the interconnection, not the design and construction, of scientific equipment or laboratory computer systems.

Information sources could include:

- operation manuals for computer ware, laboratory instruments and field equipment
- maintenance agreements with suppliers
- specifications of laboratory instruments and field equipment
- safe operation requirements for computers and equipment used
- environment, safety and emergency procedures
- national and international standards covering hardware and software.

Equipment, materials and systems could 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.

Information sources could include:

- specifications of laboratory instruments and field equipment
- hardware interface standards (for example, EIA RS232, IEEE 488 or IEEE 1394)

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- data format and management standards (for example, National Pathology Accreditation Advisory Council's Laboratory Assessment Checklist: Computer Services Section and Analytical Data Interchange protocols).

Equipment, materials and systems could include:

- temperature, pressure, light displacement and stress sensors
- representative laboratory and field equipment (for example, pH meters, balances, spectrometers or data loggers).

Health, safety and environment

All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

EVIDENCE GUIDE

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, assessors should look to see that the candidate:

- collects relevant information from manuals, specification sheets, diagnostic equipment and software
- constructs and correctly routes interconnections
- implements successful data transfer
- manages data transfer
- documents operational procedures and implementation details
- troubleshoots exiting data collection and communication between laboratory processes and computer systems
- captures data from non-automated laboratory processes
- interconnects laboratory and/or field equipment with computers using both serial and parallel digital communication

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- integrates laboratory workstations into networked laboratory computer systems
- programs and interrogates stand alone monitoring equipment.

Underpinning knowledge

Competency includes the ability to apply and explain:

- appropriate technical terminology to communicate effectively with others
- relevant numbering systems (binary, decimal and hexadecimal)
- basic computer hardware and software concepts
- 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.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

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. Questioning techniques should suit the language and literacy levels of the candidate.

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Interdependent assessment of unit

This unit of competency may be assessed with:

- PMLTEST703B Develop or adapt analyses and procedures.

Resource implications

Resources may include:

- workplace documents, such as manuals, specification sheets, laboratory notebooks and standard operating procedures
- relevant equipment and components, including computer network, suitable instruments and equipment, specimens and samples
- equipment generated data.

This competency in practice

Manufacturing

A manufacturing plant was monitoring wastewater before discharging it from its treatment plant. A multiprobe 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 multiprobe 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 backup 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 RS232. By inspection of the connectors and from knowledge of the RS232 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 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.

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Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to levels in the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3

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BSZ401A Plan assessment

Unit Descriptor This unit covers the requirements for planning an assessment in a specific context. The unit details the requirements for determining evidence requirements, selecting appropriate assessment methods and developing an assessment tool in a specific context.

Competency Field Human Resource Management

ELEMENT	PERFORMANCE CRITERIA
1. Establish evidence required for a specific context	1.1 The evidence required to infer competency from the industry/enterprise competency standards, or other standards of performance, is established for a specified context
	1.2 Relevant unit(s) of competency is read and interpreted accurately to identify the evidence required
	1.3 Specified evidence requirements assure valid and reliable inferences of competency, authenticate the performance of the person being assessed and confirm that competency is current
	1.4 Sufficient evidence is specified to show consistent achievement of the specified standards
	1.5 The cost of gathering the required evidence is established
2. Establish suitable assessment method(s)	2.1 Assessment methods are selected which are appropriate for gathering the type and amount of evidence required
	2.2 Opportunities to consolidate evidence gathering activities are identified
	2.3 Allowable adjustments in the assessment method are proposed to cater for the characteristics of the person(s) being assessed
3. Develop assessment tools appropriate to a specific assessment context	3.1 An assessment tool is developed to gather valid, reliable and sufficient evidence for a specific assessment context
	3.2 The assessment tool is designed to mirror the language used to demonstrate the competency in a specific context
	3.3 Clear instructions (spoken or written) are prepared including any adjustments which may be made to address the characteristics of the person(s) being assessed

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ELEMENT	PERFORMANCE CRITERIA
	3.4 The assessment tool is checked to ensure flexible, fair, safe and cost-effective assessment to occur
4. Trial assessment procedure	4.1 Assessment methods and tools are trialled with an appropriate sample of people to be assessed
	4.2 Evaluation of the methods and tools used in the trial provides evidence of clarity, reliability, validity, fairness, cost effectiveness and ease of administration
	4.3 Appropriate adjustments are made to improve the assessment method and tools in light of the trial
	4.4 Assessment procedures, including evidence requirements, assessment methods and tools, are ratified with appropriate personnel in the industry/enterprise and/or training organisation where applicable

RANGE STATEMENT

The Range Statement provides advice to interpret the scope and context of this unit of competence, allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables may be present for this particular unit:

Legislation, codes and national standards relevant to the workplace which may include:	• award and enterprise agreements and relevant industrial instruments • relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination • relevant industry codes of practice
OHS considerations may include:	• establishment and maintenance of OHS training, records, induction processes • performance against OHS legislation and organisation's OHS system, especially policies, procedures and work instructions
Assessment system may be developed by:	• the industry through the endorsed component of Training Packages Assessment Guidelines • the enterprise • a Registered Training Organisation • a combination of the above

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RANGE STATEMENT

The assessment system should specify the following:

- the purpose of assessment
- competencies required of assessors
- record keeping procedures and policies
- any allowable adjustments to the assessment method which may be made
- the appeal/review mechanisms and procedures
- the review and evaluation of the assessment process
- the linkages between assessment and training qualifications/awards
- employee classification
- remuneration
- progression
- relevant policies
- quality assurance mechanisms
- apportionment of costs/fees (if applicable)
- marketing/promotion of assessment
- verification arrangements
- auspicing arrangements, if applicable
- partnership arrangements, if applicable

Specific assessment context may be determined by:

- purpose of the assessment such as
  - to gain a particular qualification or a licence
  - to determine employee classification
  - to recognise prior learning/current competencies
  - to identify training needs or progress.
- location of the assessment such as:
  - on the job or off the job
  - combination of both.
- assessment guidelines of training package or other assessment requirements

Characteristics of persons being assessed may include:

- language, literacy and numeracy needs
- cultural, language and educational background
- gender
- physical ability
- level of confidence, nervousness or anxiety
- age
- experience in training and assessment
- previous experience with the topic

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RANGE STATEMENT

Appropriate personnel many include:

- assessors
- person(s) being assessed
- employee/union representatives
- consultative committees
- users of assessment information such as training providers, employers, human resource departments
- state/territory training/recognition authorities
- training and assessment coordinators
- relevant managers/supervisors team leaders
- technical specialists

Appropriate procedure:

- the assessment procedure is developed (and endorsed) by person(s) responsible for the implementation of the assessment process in:
  - the industry
  - the enterprise
  - the training organisation
- a combination of the above
- the assessment procedure should specify the following:
  - recording procedure
  - appeal/review mechanism
  - assessment methods to be used
  - instructions/materials to be provided to the person(s) being assessed
  - criteria for making decisions of competent, or not yet competent
  - number of assessors
  - assessment tools
  - evidence required
  - location of assessment
  - timing of assessment
  - assessment group size
- allowable adjustments to the assessment procedure depending on the characteristics of the person being assessed

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RANGE STATEMENT

Assessment methods may include:	• direct observation of performance, products, practical tasks, projects and simulation exercises • review of log books/or and portfolios of evidence • consideration of third party reports and authenticated prior achievements • written, oral or computer managed questioning • these methods may be used in combination in order to provide sufficient evidence to make a judgement
Assessment tools may include:	• specific instructions to be given relating to the performance of practical tasks or processes or simulation exercises • specific instructions to be given in relation to the production of projects and exercises • sets of verbal/written/computer based questions to be asked • performance checklists • log books • descriptions of competent performance. • a number of these tools may be used in combination in order to provide enough evidence to make judgements
Assessment environment and resources to be considered include:	• time • location • personnel • finances/costs • equipment • materials • OHS requirements • enterprise/industry standard operating procedures
Allowable adjustments may include:	• provision of personal support services (e.g. Auslan interpreter, reader, interpreter, attendant carer, scribe) • use of adaptive technology or special equipment (e.g. word processor or lifting gear) • design of shorter assessment sessions to allow for fatigue or medication • use of large print version of any papers

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EVIDENCE GUIDE

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competence for this unit. This is an integral part of the assessment of competence and should be read in conjunction with the Range Statement.

Critical Aspects of Evidence

Assessment requires evidence of the following products to be collected:

- Documentation in relation to:
  - specific assessment context, including the purpose of assessment
  - features of the assessment system
  - characteristics of the person being assessed
  - evidence of competency required
  - plan of opportunities for gathering the evidence required
  - assessment methods selected including any allowable adjustments to meet characteristics of person(s) being assessed
- An assessment tool(s) for the specific assessment context which ensures valid, reliable, flexible and fair assessment including any allowable adjustments.
- An assessment procedure for the specific context

- Assessment requires evidence of the following processes to be provided:
- How the context of assessment was specified
- How the characteristics of the person(s) being assessed were identified
- Why a particular assessment method was selected
- How the assessment was planned to ensure that language, literacy and numeracy issues were taken into consideration
- How evidence was evaluated in terms of validity, authenticity, sufficiency, currency and consistent achievement of the specified standard
- How the assessment tool was developed for the specified context
- How the assessment tool was validated and ratified by appropriate personnel

Required Knowledge and Skills*

- Relevant legislation from all levels of government that affects business operation, especially in regard to

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EVIDENCE GUIDE

* At this level the learner must demonstrate understanding of a broad knowledge base incorporating some theoretical concepts.

Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination

- Knowledge of standards of performance including industry or enterprise competency standards and assessment guidelines
- Knowledge of legal and ethical responsibilities including occupational health and safety regulations and procedures, equal employment and anti-discrimination requirements relevant to the specified context
- Understanding of the assessment principles of reliability, validity, fairness, flexibility, authenticity, sufficiency and consistency
- Knowledge of the Assessment Guidelines of the Training Package Assessment and Workplace Training
- Skills in the application of various assessment methods, relevant to workplace context
- Planning of own work including predicting consequences and identifying improvements
- Language, literacy and numeracy skills required to:
  - read and interpret relevant information to plan assessment
  - give clear and precise information/instructions in spoken or written form
  - adjust spoken and written language to suit target audience
  - write assessment tools using language which mirrors the language used to demonstrate the competency in the specific context
  - prepare required documentation using clear and comprehensible language and layout
  - calculate and estimate costs
- Communication skills appropriate to the culture of the workplace and the individual(s)
- Ability to relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities

Resource Implications

The learner and trainer should have access to appropriate documentation and resources normally used in the workplace

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EVIDENCE GUIDE

Consistency of Performance

In order to achieve consistency of performance, evidence should be collected over a set period of time which is sufficient to include dealings with an appropriate range and variety of situations

Context/s of Assessment

- Competency is demonstrated by performance of all stated criteria, including paying particular attention to the critical aspects and the knowledge and skills elaborated in the Evidence Guide, and within the scope as defined by the Range Statement
- Assessment must take account of the endorsed assessment guidelines in the Business Services Training Package
- Assessment of performance requirements in this unit should be undertaken in an actual workplace or simulated environment
- Assessment should reinforce the integration of the key competencies and the business services common competencies for the particular AQF level. Refer to the Key Competency Levels at the end of this unit

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KEY COMPETENCY LEVELS

NB: These levels do not relate to the Australian Qualifications Framework. They relate to the seven areas of generic competency that underpin effective workplace practices.

Collect, analyse and organise information	Communicate ideas and information	Plan and organise activities	Work with others and in teams	Use mathematical ideas and techniques	Solve problems	Use technology
Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 2

Three levels of performance denote level of competency required to perform a task.

1. Perform 2. Administer 3. Design

- **Collecting, analysing and organising information** – type and amount of evidence of competency required
- **Communicating ideas and information** – giving clear and precise information and instructions(spoken or written) and appropriate to the culture of the workplace and the individual
- **Planning and organising activities** – developing assessment methods and tools which are valid, reliable, flexible, fair and safe
- **Working with teams and others** – participants and personnel in industry/enterprise and training organisations
- **Using mathematical ideas and techniques** – calculating and estimating cost effective methods
- **Solving problems** – making allowable adjustments to assessment methods to meet characteristics of person being assessed
- **Using technology** – developing assessment methods including computer managed questioning, and use of adaptive technology and other special equipment

Please refer to the Assessment Guidelines for advice on how to use the Key Competencies

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BSZ402A Conduct assessment

Unit Descriptor The unit covers the requirements for conducting an assessment in accordance with an assessment procedure in a specific context

Competency Field Human Resource Management

Element	PERFORMANCE CRITERIA
1. Identify and explain the context of assessment	1.1 The context and purpose of assessment are discussed and confirmed with the person(s) being assessed
	1.2 The relevant performance standards to be used in the assessment (e.g. current endorsed competency standards for the specific industry) are clearly explained to the person being assessed
	1.3 The assessment procedure is clarified and expectations of assessor and candidate are agreed
	1.4 Any legal and ethical responsibilities associated with the assessment are explained to the person(s) being assessed
	1.5 The needs of the person being assessed are determined to establish any allowable adjustments in the assessment procedure
	1.6 Information is conveyed using language and interactive strategies and techniques to communicate effectively with the person(s) being assessed
2. Plan evidence gathering opportunities	2.1 Opportunities to gather evidence of competency, which occurs as part of workplace or training activities, are identified covering the dimensions of competency
	2.2 The need to gather additional evidence which may not occur as part of the workplace or training activities are identified
	2.3 Evidence gathering activities are planned to provide sufficient, reliable, valid and fair evidence of competency in accordance with the assessment procedure
3. Organise assessment	3.1 The resources specified in the assessment procedure are obtained and arranged within a safe and accessible assessment environment
	3.2 Appropriate personnel are informed of the assessment

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Element	PERFORMANCE CRITERIA
	3.3 Spoken interactions and any written documents employ language and strategies and techniques to ensure the assessment arrangements are understood by all person(s) being assessed and appropriate personnel
4. Gather evidence	4.1 Verbal and non-verbal language is adjusted and strategies are employed to promote a supportive assessment environment to gather evidence 4.2 The evidence specified in the assessment procedure is gathered, using the assessment methods and tools 4.3 Evidence is gathered in accordance with specified allowable adjustments where applicable 4.4 The evidence gathered is documented in accordance with the assessment procedure
5. Make the assessment decision	5.1 The evidence is evaluated in terms of: • validity • authenticity • sufficiency • currency • consistent achievement of the specified standard 5.2 The evidence is evaluated according to the dimensions of competency: • task skills • task management skills • contingency management skills • job/role environment skill • transfer and application of knowledge and skills to new contexts 5.3 Guidance is sought, when in doubt, from a more experienced assessor(s) 5.4 The assessment decision is made in accordance with the criteria specified in the assessment procedure
6. Record assessment results	6.1 Assessment results are recorded accurately in accordance with the specified record keeping requirements 6.2 Confidentiality of assessment outcome is maintained and access to the assessment records is provided only to authorised personnel

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Element	PERFORMANCE CRITERIA
7. Provide feedback to persons being assessed	7.1 Clear and constructive feedback in relation to performance is given to the person(s) being assessed using language and strategies to suit the person(s) including guidance on further goals/training opportunities is provided to the person(s) being assessed 7.2 Opportunities for overcoming any gaps in competency, as revealed by the assessment, are explored with the person(s) being assessed 7.3 The person(s) being assessed is advised of available reassessment opportunities and/or review appeal mechanisms where the assessment decision is challenged
8. Report on the conduct of the assessment	8.1 Positive and negative features experienced in conducting the assessment are reported to those responsible for the assessment procedure 8.2 Any assessment decision disputed by the person(s) being assessed is recorded and reported promptly to those responsible for the assessment procedure 8.3 Suggestions for improving any aspect of the assessment process are made to appropriate personnel

RANGE STATEMENT

The Range Statement provides advice to interpret the scope and context of this unit of competence, allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables may be present for this particular unit:

Legislation, codes and national standards relevant to the workplace which may include:	• award and enterprise agreements and relevant industrial instruments • relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination • relevant industry codes of practice
OHS considerations may include:	• establishment and maintenance of OHS training, records, induction processes

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RANGE STATEMENT

	• performance against OHS legislation and organisation's OHS system, especially policies, procedures and work instructions
Assessment system may be developed by:	• the industry • the enterprise • a Registered Training Organisation • a combination of the above
The assessment system should specify the following:	• the purpose of assessment • competencies required of assessors • record keeping procedures and policies • any allowable adjustments to the assessment method which may be made • the appeal/review mechanisms and procedures • the review and evaluation of the assessment process • the linkages between assessment and training qualifications/awards, employee classification, remuneration, progression • relevant policies • quality assurance mechanisms • apportionment of costs/fees (if applicable) • marketing/promotion of assessment • verification arrangements • auspicing arrangements, if applicable • partnership arrangements, if applicable

Specific assessment context may be determined by:	• purpose of the assessment, such as
	  • to gain a particular qualification or a licence
	  • to determine employee classification
	  • to identify training needs or progress
	  • to recognise prior learning/current competencies
	• location of the assessment, such as
	  • on the job or off the job
	  • combination of both.
	• assessment guidelines of the relevant training package or other assessment requirements
	• features of assessment system

Characteristics of persons being assessed may include:	• language, literacy and numeracy needs • cultural, language and educational background

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RANGE STATEMENT

- gender
- physical ability
- level of confidence, nervousness or anxiety
- age
- experience in training and assessment
- previous experience with the topic

Appropriate personnel may include:

- assessors
- person(s) being assessed
- employee/union representatives
- consultative committees
- users of assessment information such as training providers, employers, human resource departments
- state/territory training/recognition authorities
- training and assessment coordinators
- relevant managers/supervisors/team leaders
- technical specialists

Assessment procedure may include:

- the assessment procedure is developed (and endorsed) by person(s) responsible for the implementation of the assessment process in:
  - the industry
  - the enterprise
  - the training organisation
  - a combination of the above
- the assessment procedure should specify the following:
  - recording procedure
  - appeal/review mechanism
  - assessment methods to be used
  - instructions/materials to be provided to the person(s) being assessed
  - criteria for making decisions of competent, or not yet competent
  - number of assessors
  - assessment tools
  - evidence required
  - location of assessment
  - timing of assessment
  - assessment group size
  - allowable adjustments to the assessment

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RANGE STATEMENT

procedure depending on the characteristics of the person(s) being assessed

Assessment methods may include:

- work samples and /or simulations
- direct observation of performance, products, practical tasks, projects and simulation exercises
- review of log books and portfolios
- questioning
- consideration of third party reports and authenticated prior achievements
- written, oral or computer managed questioning
- these methods may be used in combination in order to provide sufficient evidence to make a judgement

Assessment tools may include:

- specific instructions to be given relating to the performance of practical tasks or processes or simulation exercises
- specific instructions to be given in relation to projects and exercises
- sets of oral/written/computer based questions to be asked
- performance checklists
- log books
- marking guides
- descriptions of competent performance
- a number of these tools may be used in combination in order to provide enough evidence to make judgements

Allowable adjustments may include:

- provision of personal support services (e.g. Auslan interpreter, reader, interpreter, attendant carer, scribe)
- use of adaptive technology or special equipment (e.g. work processor or lifting gear)
- design of shorter assessment sessions to allow for fatigue or medication
- use of large print version of any papers

Assessment environment and resources to be considered may include:

- time
- location
- personnel
- finances/costs

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RANGE STATEMENT

- equipment
- materials
- OHS requirements
- enterprise/industry standard operating procedures

Recording procedures may include:

- forms designed for the specific assessment result (paper or electronic)
- checklists for recording observations/process used (paper or electronic)
- combination of the above

Assessment reporting:

- Final assessments will record the unit(s) of competency in terms of code, title and endorsement date
- Summative assessment reports, where issued, will indicate units of competency where additional learning is required

NB: Statutory and legislative requirements for maintaining records may vary in States/Territories

EVIDENCE GUIDE

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competence for this unit. This is an integral part of the assessment of competence and should be read in conjunction with the Range Statement.

Critical Aspects of Evidence

Assessment requires evidence of the following products to be collected:

- description of the assessment context, including the purpose of assessment,
- the relevant competency or other performance standard and assessment procedure used
- description of how evidence gathered is valid, authentic, sufficient, fair and reliable to ensure competency
- conduct of assessment in accordance with competency requirements
- recording of the assessment results in accordance with the specified assessment procedure and record keeping requirements
- report on the conduct of the assessment, including

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positive and negative features and suggestions for improving any aspect of the assessment process

- Assessment requires evidence of the following processes to be provided:
  - how agreement was sought with the person(s) being assessed on the conduct of the assessment
  - how opportunities to gather evidence were identified as part of workplace or training activities
  - how evidence was gathered in accordance with the assessment procedure
  - how evidence gathering activity covered the dimensions of competency
  - how resources were arranged according to the assessment procedure
  - how appropriate personnel were consulted
  - how evidence was gathered in accordance with allowable adjustments to the assessment method where applicable
  - how evidence was evaluated in terms of validity, authenticity, sufficiency, currency and consistent achievement of the specified standard
  - how the assessment was conducted to ensure that:
    - all arrangements and activities were understood by all parties
    - the person was put at ease and the supportive assessment environment was created
    - language, literacy and numeracy issues were taken into consideration
  - how constructive feedback was provided to the person(s) being assessed including instances of not yet competent
  - how guidance was provided to person(s) being assessed on how to overcome gaps in competency revealed

Required Knowledge and Skills*

* At this level the learner must demonstrate understanding of a broad knowledge base incorporating some theoretical concepts.

- Relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination
- Knowledge of workplace application of relevant standards of performance including industry or enterprise competency standards and assessment

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EVIDENCE GUIDE

guidelines

- Knowledge of legal and ethical responsibilities including occupational health and safety regulations and procedures, equal employment and anti-discrimination requirements relevant to the specified context
- Understanding of policies and procedures of the workplace and/or job role together with any related legislation or regulatory requirements
- Understanding of the assessment principles of reliability, validity, fairness, flexibility, authenticity, sufficiency and consistency
- Assessment guidelines of the Training Package Assessment and Workplace Training
- Planning of own work including predicting consequences and identifying improvements
- Skills in the application of various assessment methods/tools, relevant to workplace context
- Language, literacy and numeracy skills required to:
  - give clear and precise instructions and information in spoken or written form
  - seek confirmation of understanding from the person(s) being assessed
  - adjust language to suit target audience
  - prepare required documentation using clear and comprehensible language and layout
  - ask probing questions and listen strategically to understand responses of the person being assessed
  - seek additional information for clarification purposes
  - use verbal and non-verbal language to promote a supportive assessment environment
  - use language of negotiation and conflict resolution to minimise conflict
- Communication skills appropriate to the culture of the workplace and the individual(s)
- Ability to relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities

Resource Implications

The learner and trainer should have access to appropriate documentation and resources normally used in the workplace

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EVIDENCE GUIDE

Consistency of Performance

In order to achieve consistency of performance, evidence should be collected over a set period of time which is sufficient to include dealings with an appropriate range and variety of situations

Context/s of Assessment

- Competency is demonstrated by performance of all stated criteria, including paying particular attention to the critical aspects and the knowledge and skills elaborated in the Evidence Guide, and within the scope as defined by the Range Statement
- Assessment must take account of the endorsed assessment guidelines in the Business Services Training Package
- Assessment of performance requirements in this unit should be undertaken in an actual workplace or simulated environment
- Assessment should reinforce the integration of the key competencies and the business services common competencies for the particular AQF level. Refer to the Key Competency Levels at the end of this unit

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KEY COMPETENCY LEVELS

NB: These levels do not relate to the Australian Qualifications Framework. They relate to the seven areas of generic competency that underpin effective workplace practices.

Collect, analyse and organise information	Communicate ideas and information	Plan and organise activities	Work with others and in teams	Use mathematical ideas and techniques	Solve problems	Use technology
Level 3	Level 2	Level 2	Level 2	Level 2	Level 2	Level 3

Three levels of performance denote level of competency required to perform a task.

1. Perform 2. Administer 3. Design

- **Collecting, analysing and organising information** –type of evidence covering the dimensions of competency including any allowable adjustments to meet the needs of the person being assessed
- **Communicating ideas and information** – clearly explaining and/or clarifying the context of assessment, giving constructive feedback, appropriate to the culture of the workplace and the individuals
- **Planning and organising activities** – evidence gathering activities
- **Working with teams and others** – participants, appropriate personnel involved and/or responsible for the assessment procedures, including more experienced assessors
- **Using mathematical ideas and techniques** – apportioning of assessment costs/fees
- **Solving problems** – making allowable adjustments, and use of appeal/review mechanisms
- **Using technology** – computer managed questioning and use of adaptive technology or special equipment and recording results

Please refer to the Assessment Guidelines for advice on how to use the Key Competencies

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BSZ403A Review assessment

Unit Descriptor The unit covers requirements to review assessment procedures in a specific context.

Competency Field Human Resource Management

Element

PERFORMANCE CRITERIA

Element	Performance Criteria
1. Review the assessment procedure(s)	1.1 Appropriate personnel are given the opportunity to review the assessment outcomes and procedure using agreed evaluation criteria
	1.2 The review process established by the enterprise, industry or registered training organisation is followed
	1.3 The assessment procedure(s) is reviewed at a specified site in cooperation with person(s) being assessed, and any appropriate personnel in the industry/enterprise/training establishment and/or any agency identified under legislation
	1.4 Review activities are documented, findings are substantiated and the review approach evaluated
2. Check consistency of assessment decision	2.1 Evidence from a range of assessments is checked for consistency across the dimensions of competency
	2.2 Evidence is checked against the key competencies
	2.3 Consistency of assessment decisions with defined performance standards are reviewed and discrepancies and inconsistencies are noted and acted upon
3. Report review findings	3.1 Recommendations are made to appropriate personnel for modifications to the assessment procedure(s) in light of the review outcomes
	3.2 Records are evaluated to determine whether the needs of appropriate personnel have been met
	3.3 Effective contributions are made to system-wide reviews of the assessment process and feedback procedures and are reviewed

RANGE STATEMENT

The Range Statement provides advice to interpret the scope and context of this unit of

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RANGE STATEMENT

competence, allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables may be present for this particular unit:

Legislation, codes and national standards relevant to the workplace which may include:

- award and enterprise agreements and relevant industrial instruments
- relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination
- relevant industry codes of practice

OHS considerations may include:

- establishment and maintenance of OHS training, records, induction processes
- performance against OHS legislation and organisation's OHS system, especially policies, procedures and work instructions

Assessment system may be developed by:

- the industry
- the enterprise
- the Registered Training Organisation
- a combination of the above

the assessment system should specify the following:

- the purpose of assessment
- competencies required of assessors
- record keeping procedures and policies
- any allowable adjustments to the assessment method which may be made for the person being assessed who have special needs
- the appeal/review mechanisms and procedures
- the review and evaluation of the assessment process
- the linkages between assessment and training qualifications/awards, employee classification, remuneration, progression
- relevant policies
- quality assurance mechanisms
- apportionment of costs/fees (if applicable)
- marketing/promotion of assessment
- verification arrangements
- auspicing arrangements, if applicable
- partnership arrangements, if applicable

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RANGE STATEMENT

Specific assessment context may be determined by:

- purpose of the assessment such as
  - to gain a particular qualification or a licence
  - to determine employee classification
  - to identify training needs or progress
  - to recognise prior learning/current competencies
- location of the assessment such as
  - on the job or off the job
  - combination of both
- assessment guidelines of training package or other assessment requirements
- features of assessment system

Evaluation criteria in review process should include:

- number of persons being assessed
- duration of the assessment procedure
- organisational constraints within which assessors must operate
- occupational health and safety factors
- relationship of the assessor to other appropriate personnel in the assessment process
- frequency of assessment procedure
- budgetary restraints
- information needs of government and other regulatory bodies
- support needs and professional development needs of assessors
- characteristics of persons being assessed
- human resource management implications
- consistency of assessment decisions
- levels of flexibility in the assessment procedure
- fairness of the assessment procedure
- efficiency and effectiveness of the assessment procedure
- difficulties encountered during the planning and conduct of the assessment
- motivation of the person(s) being assessed
- location and resource suitability
- reliability, validity, fairness and flexibility of the assessment tool(s)
- relevance of assessment to specified context

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- grievances/challenges to the assessment decision by the person(s) being assessed or their supervisor/manager/employer
- ease of administration
- access and equity considerations
- practicability

Characteristics of persons being assessed may include:

- language, literacy and numeracy needs
- cultural and language background
- educational background or general knowledge
- gender
- age
- physical ability
- previous experience with the topic
- experience in training and assessment
- level of confidence, nervousness or anxiety
- work organisation or roster

Appropriate personnel may include:

- assessors
- person(s) being assessed
- employee/union representatives
- consultative committees
- users of assessment information such as training providers, employers, human resource departments
- state/territory training/recognition authorities
- training and assessment coordinators
- relevant managers/supervisor/team leaders
- technical specialists

Assessment procedure:

- the assessment procedure is developed (and endorsed) by person(s) responsible for the implementation of the assessment process in:
  - the industry
  - the enterprise
  - the training organisation
  - a combination of the above

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The assessment procedure should specify the following:

- recording procedure
- appeal/review mechanism
- assessment methods to be used
- instructions/materials to be provided to the person(s) being assessed
- criteria for making decisions of competent, or not yet competent
- number of assessors
- assessment tools
- evidence required
- location of assessment
- timing of assessment
- assessment group size
- allowable adjustments to the assessment procedure depending on characteristics of person(s) being assessed

Assessment methods may include a combination of:

- work samples and or simulations
- direct observation of performance, products, practical tasks, projects and simulation exercises
- review of log books and portfolios
- questioning
- consideration of third party reports and authenticated prior achievements
- written, oral or computer managed questioning
- these methods may be used in combination in order to provide sufficient evidence to make a judgement

Assessment tools may include:

- specific instructions to be given relating to the performance of practical tasks or processes or simulation exercises
- specific instructions to be given in relations to the production projects and exercises
- sets of oral/written/computer based questions to be asked
- performance checklists
- log books
- marking guides
- descriptions of competent performance
- a number of these tools may be used in combination in order to provide enough evidence to make judgements

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Allowable adjustments may include:	• provision of personal support services (e.g. Auslan interpreter, reader, interpreter, attendant carer, scribe) • use of adaptive technology or special equipment (e.g. work processor or lifting gear) • design of shorter assessment sessions to allow for fatigue or medication • use of large print version of any papers
Assessment environment and resources to be considered:	• time • location • personnel • finances/costs • equipment • materials • OHS requirements • enterprise/industry standard operating procedures

EVIDENCE GUIDE

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competence for this unit. This is an integral part of the assessment of competence and should be read in conjunction with the Range Statement.

Critical Aspects of Evidence

- Assessment requires evidence of the following products to be collected:
  - documented process for the review of the assessment procedure(s)
  - a report on the review of the operations and outcomes of the assessment procedure(s) including substantiation of findings and any recommendations for modifications
- Assessment requires evidence of the following processes to be provided:
  - how the review process for evaluating the assessments in the enterprise, industry or organisation was implemented
  - why particular review/evaluation methodologies were chosen
  - how cooperation and input from the person(s) assessed and appropriate personnel was sought as part of the review

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Required Knowledge and Skills*

* At this level the learner must demonstrate understanding of a broad knowledge base incorporating some theoretical concepts.

- Relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination
- Knowledge of the review process established by the industry, enterprise or training organisation
- Knowledge of evaluation methodologies relevant to the assessment context
- Relevant standards of performance including industry or enterprise competency standards and assessment guidelines
- Knowledge of legal and ethical responsibilities including occupational health and safety regulations and procedures, equal employment and anti-discrimination requirements
- Knowledge of relevant organisational policies and procedures of the workplace and/or job roll
- Understanding of the assessment principles of reliability, validity, fairness, flexibility, authenticity, sufficiency and consistency
- Skills in the application of various assessment methods/tools in a relevant workplace context
- Planning own work including predicting consequences and identifying improvements
- Language, literacy and numeracy skills required to:
  - read and interpret review procedures
  - participate in discussions and listen strategically to evaluate information critically
  - gather, select and organise findings from a number of sources
  - document findings in summary form, graphs or tables
  - present findings in a short report to relevant personnel
  - make recommendations based on findings
  - determine cost effectiveness
- Communication skills appropriate to the culture of the workplace and the individual(s)
- Ability to relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities

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EVIDENCE GUIDE

Resource Implications

The learner and trainer should have access to appropriate documentation and resources normally used in the workplace

Consistency of Performance

In order to achieve consistency of performance, evidence should be collected over a set period of time which is sufficient to include dealings with an appropriate range and variety of situations

Context/s of Assessment

- Competency is demonstrated by performance of all stated criteria, including paying particular attention to the critical aspects and the knowledge and skills elaborated in the Evidence Guide, and within the scope as defined by the Range Statement
- Assessment must take account of the endorsed assessment guidelines in the Business Services Training Package
- Assessment of performance requirements in this unit should be undertaken in an actual workplace or simulated environment
- Assessment should reinforce the integration of the key competencies and the business services common competencies for the particular AQF level. Refer to the Key Competency Levels at the end of this unit

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KEY COMPETENCY LEVELS

NB: These levels do not relate to the Australian Qualifications Framework. They relate to the seven areas of generic competency that underpin effective workplace practices.

Collect, analyse and organise information	Communicate ideas and information	Plan and organise activities	Work with others and in teams	Use mathematical ideas and techniques	Solve problems	Use technology
Level 3	Level 2	Level 3	Level 3	Level 3	Level 3	Level 3

Three levels of performance denote level of competency required to perform a task.

1. Perform 2. Administer 3. Design

- **Collecting, analysing and organising information** – evidence from a range of assessments and from a number of sources
- **Communicating ideas and information** – documenting and reporting on the review process and findings
- **Planning and organising activities** – choosing review/evaluation methodologies
- **Working with teams and others** – review in cooperation with participants and appropriate personnel in the industry/enterprise/training establishment and/or agency
- **Using mathematical ideas and techniques** – to determine cost effectiveness of assessment procedures
- **Solving problems** – modifying assessment procedures in light of review outcomes
- **Using technology** – computer based tools, adaptive technology and documenting findings using graphs and tables

Please refer to the Assessment Guidelines for advice on how to use the Key Competencies

BSZ404A Train small groups

Unit Descriptor The unit covers the requirements for planning, delivering and reviewing training provided for the purposes of developing competency on a one-to-one or small group basis.

Competency Field Human Resource Management

Element	PERFORMANCE CRITERIA
1. Prepare for training	1.1 Specific needs for training are identified and confirmed through consultation with appropriate personnel
	1.2 Training objectives are matched to identified competency development needs
	1.3 Training approaches are planned and documented
2. Deliver training	2.1 Training is conducted in a safe and accessible environment
	2.2 Training delivery methods are selected appropriate to training participant(s) needs, trainer availability, location and resources
	2.3 Strategies and techniques are employed which facilitate the learning process
	2.4 Objectives of the training, sequence of activities and assessment processes are discussed with training participant(s)
	2.5 A systematic approach is taken to training and the approach is revised and modified to meet specific needs of training participant(s)
3. Provide opportunities for practices	3.1 Practice opportunities are provided to ensure that the participant achieves the components of competency
	3.2 Various methods for encouraging learning are implemented to provide diverse approaches to meet the individual needs of participants
4. Review training	4.1 Participants are encouraged to self evaluate performance and identify areas for improvement
	4.2 Participants readiness for assessment is monitored and assistance provided in the collection of evidence of satisfactory performance
	4.3 Training is evaluated in the context of self-assessment, participant feedback, supervisor

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Element	PERFORMANCE CRITERIA
	comments and measurements against objectives
	4.4 Training details are recorded according to enterprise and legislative requirements
	4.5 Results of evaluation are used to guide further training

RANGE STATEMENT

The Range Statement provides advice to interpret the scope and context of this unit of competence, allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables may be present for this particular unit:

Legislation, codes and national standards relevant to the workplace which may include:

- award and enterprise agreements and relevant industrial instruments
- relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination
- relevant industry codes of practice

OHS considerations may include:

- establishment and maintenance of OHS training, records, induction processes
- performance against OHS legislation and organisation's OHS system, especially policies, procedures and work instructions

Relevant information to identify training needs includes:

- industry/enterprise or other performance competency standards
- endorsed components of relevant industry training package
- industry/workplace training practices
- job descriptions
- results of training needs analyses
- business plans of the organisation which identify skill development requirements
- standard operating and/or other workplace procedures

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RANGE STATEMENT

Appropriate personnel may include:

- team leaders/supervisors/ technical experts
- managers/employers
- training and assessment coordinators
- training participants
- representative government regulatory bodies
- union/employee representatives
- consultative committees
- assessors

Training delivery methods and opportunities for practice may include:

- presentations
- demonstrations
- explanations
- problem solving
- mentoring
- experiential learning
- group work
- on the job coaching
- job rotation
- a combination of the above

Components of competency include:

- task skills
- task management skills
- contingency management skills
- job/role environment skills
- transfer and application of skills and knowledge of new contents

Characteristics of training participant may include information in relation to:

- language, literacy and numeracy needs
- cultural, language, and educational background
- gender
- physical ability
- level of confidence, nervousness or anxiety
- age
- previous experience with the topic
- experience in training and assessment

Training sessions may include:

- one to one demonstration
- small group demonstration (2 to 5 persons)

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RANGE STATEMENT

Resources may include:

- time
- location
- personnel
- materials and equipment
- OHS and other workplace requirements
- enterprise/industry standard operating procedures
- finances/costs

Strategies and techniques may include:

- active listening
- targeted questioning
- points of clarification
- group discussions

EVIDENCE GUIDE

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competence for this unit. This is an integral part of the assessment of competence and should be read in conjunction with the Range Statement.

Critical Aspects of Evidence

- Assessment requires evidence of the following products to be collected:
  - description of the specific training need and required competency outcomes
  - outline of the training approach and steps to be followed
  - description of training participant(s) and delivery method(s) to be used
  - specific resources required
  - outline of the evidence to be collected for monitoring training participant progress
  - trainer's self assessment of training delivery
  - participant evaluation of training delivery
  - evaluation of review comments against plan of training
  - records/documentation for monitoring progress of training participant(s).
- Evidence may be collected using proformas or template

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- Assessment requires evidence of the following processes to be provided:
  - how the specific training need was determined
  - how the sequence of the training was determined
  - how appropriate personnel were identified
  - why particular delivery method(s) were selected
  - how the characteristics of training participant(s) as identified
  - how the resource requirements were established
  - how participant progress was monitored
  - why and how the training resources were selected
  - how appropriate personnel confirmed training arrangements
  - how participant(s) were informed of:
    - intended training outcomes
    - competencies to be achieved
    - on and/or off the job practice opportunities
    - benefits of practices
    - learning activities and tasks
    - assessment tasks and requirements
  - how constructive feedback was provided to training participant about progress toward competency to be acquired
  - how training participant readiness for assessment was determined and confirmed
  - how records were maintained to ensure confidentiality, accuracy and security.
  - evidence may be provided verbally or in written form

Required Knowledge and Skills*

* At this level the learner must demonstrate understanding of a broad knowledge base incorporating some theoretical concepts.

- Relevant legislation from all levels of government that affects business operation, especially in regard to Occupational Health and Safety and environmental issues, equal opportunity, industrial relations and anti-discrimination
- Competency in the units being taught
- Workplace application of the relevant competencies
- Identification of evidence of competency
- Planning of own work including predicting consequences and identifying improvements
- Application of relevant workplace policies (e.g. OHS

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and EEO) and any relevant legislative or regulatory requirements

- Correct use of equipment, and any other processes and procedures appropriate for the training
- Ethical handling of performance issues
- Language, literacy and numeracy required skills to:
  - conduct discussions and ask probing questions to review the training
  - gather information (in spoken or written form) for review purposes
  - make verbal recommendations for delivery of future training
  - adjust language to suit target audience (training participant/appropriate personnel)
  - complete records on training
  - provide verbal feedback & report on training outcomes
  - follow and model examples of written texts
  - promote training in verbal or written form
- Communication skills appropriate to the culture of the workplace, appropriate personnel and training participants
- Ability to relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities

Resource Implications

The learner and trainer should have access to appropriate documentation and resources normally used in the workplace

Consistency of Performance

In order to achieve consistency of performance, evidence should be collected over a set period of time which is sufficient to include dealings with an appropriate range and variety of situations

Context/s of Assessment

- Competency is demonstrated by performance of all stated criteria, including paying particular attention to the critical aspects and the knowledge and skills elaborated in the Evidence Guide, and within the scope as defined by the Range Statement
- Assessment must take account of the endorsed assessment guidelines in the Business Services Training Package
- Assessment of performance requirements in this unit

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should be undertaken in an actual workplace or simulated environment

- Assessment should reinforce the integration of the key competencies and the business services common competencies for the particular AQF level. Refer to the Key Competency Levels at the end of this unit

KEY COMPETENCY LEVELS

NB: These levels do not relate to the Australian Qualifications Framework. They relate to the seven areas of generic competency that underpin effective workplace practices.

Collect, analyse and organise information	Communicate ideas and information	Plan and organise activities	Work with others and in teams	Use mathematical ideas and techniques	Solve problems	Use technology
Level 3	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2

Three levels of performance denote level of competency required to perform a task.

1. Perform 2. Administer 3. Design

- **Collecting, analysing and organising information** – pertaining to the training needs and competency outcomes of participants
- **Communicating ideas and information** – using training strategies and techniques which facilitates the learning process
- **Planning and organising activities** – selecting delivery methods appropriate to training participants' needs, location and resources
- **Working with teams and others** – participants, supervisor and trainer review training against objectives
- **Using mathematical ideas and techniques** – training delivery methods appropriate to finances/costs
- **Solving problems** – using training review results to guide further training
- **Using technology** – recording training details according to enterprise and legislative requirements

Please refer to the Assessment Guidelines for advice on how to use the Key Competencies

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