Australian Government

Department of Education, Employment and Workplace Relations

MSL977008A Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis

Release: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MSL977008A Apply specialised knowledge of inductively coupled plasma spectroscopy to analysis

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using instruments that use inductively coupled plasmas to produce excited atoms and ions that can be analysed using mass spectrometry (ICP-MS) or optical/atomic emission spectroscopy (ICP-OES or ICP-AES). The unit includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical instrument and procedure problems and perform routine instrument maintenance.

Application of the Unit

Application of the unit	This unit of competency is applicable to experienced laboratory technical officers/technicians, laboratory supervisors and technical specialists who conduct instrumental analysis in laboratories providing consultancy, research and development and quality assurance services. These services may be provided for a wide range of industry sectors, such as biomedical and forensic science (toxicology), environmental monitoring (soil and water), industrial analysis (cement, glasses, ceramics, metals and oil), geological analysis (ores, rocks, minerals and petroleum products) and food and beverage (trace metals) testing. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting, at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

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

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine sample characteristics and appropriate analytical methods	1.1. Interpret client request and/or perform presumptive tests to identify sample characteristics that may affect analysis 1.2. Liaise with client or sample provider to review client needs, testing requirements and sample history, if necessary 1.3. Identify analytical standards, reference materials, test methods and enterprise procedures that may be applicable 1.4. Select the most appropriate standard test method that is consistent with testing requirements and instrument availability 1.5. If no standard method exists, adapt or modify a test method to suit the sample characteristics 1.6. If necessary, seek advice from supervisor about any proposed variations and document all approved changes to test methods 1.7. Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1. Log sample into instrument software 2.2. Obtain a representative analytical portion of the laboratory sample 2.3. Prepare sample in accordance with selected test method 2.4. Prepare validation checks and/or calibration standards for analytical portions 2.5. Use specialised procedures for ultra-trace sample and standard preparation as required
3. Set up instrument and perform trial analysis	3.1. Configure the sample introduction, torch and detector sub-systems according to the selected test method 3.2. Check vacuum pressures, gas flow and torch cooling before igniting torch and allow the system to fully equilibrate 3.3. Perform other pre-use, calibration and safety checks using enterprise procedures 3.4. Set instrumental parameters in accordance with those specified in selected test method 3.5. Check and optimise each instrument sub-system 3.6. Conduct performance tests using standards and samples 3.7. Assess instrument performance in terms of response and resolution
4. Optimise instrument	4.1. Apply an understanding of analyte chemistry,

ELEMENT	PERFORMANCE CRITERIA
performance	plasma reactions and interferences to determine strategies for enhancing detection of required species 4.2. Adjust instrumental parameters in a logical and efficient sequence to optimise performance

ELEMENT	PERFORMANCE CRITERIA
5. Perform analysis	5.1. Measure analyte response for standards, validation checks and samples using optimised instrument settings 5.2. Conduct sufficient measurements to obtain reliable data 5.3. Use system software to produce calibration graphs, optical/emission or mass spectra, confirm data quality and calculate uncertainties 5.4. Check that results are consistent with estimations and expectations 5.5. Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.6. Return instrument to standby or shutdown condition in accordance with enterprise procedures 5.7. Report results with the appropriate accuracy, precision, uncertainty and units
6. Perform routine maintenance and troubleshoot instruments	6.1. Regularly check the condition of pumps, gas cylinders, filters and traps and service/replace as necessary 6.2. Regularly check the condition of sample/waste tubing on peristaltic pump lines and replace as necessary 6.3. Regularly clean the sample/nebuliser tips, injector tubes, spray chamber, torch, sample/skimmer cones and ion lenses as appropriate 6.4. Replace user serviceable components as necessary and ensure that the system is free of leaks and properly conditioned before re-use 6.5. Investigate possible causes for response and resolution problems and apply recommended remedial actions 6.6. Investigate possible causes for instability and non-reproducible data and apply recommended remedial actions 6.7. Identify the need for repairs or servicing and determine whether local repair/maintenance is technically possible and economic 6.8. Arrange for repair or servicing from an accredited agent or other appropriate personnel in accordance with enterprise procedures
7. Maintain a safe work environment	7.1. Identify risks, hazards, safety equipment and control measures associated with sample handling/preparation and test method 7.2. Use personal protective equipment and safety

ELEMENT	PERFORMANCE CRITERIA
	procedures specified for test method and materials to be tested 7.3. Minimise the generation of wastes and environmental impacts 7.4. Ensure the safe collection/disposal of laboratory wastes 7.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
8. Maintain laboratory records	8.1. Enter approved data and results into laboratory information management system (LIMS) 8.2. Maintain logs of instrument calibration checks, use and maintenance in accordance with enterprise procedures 8.3. Maintain security, integrity and traceability of samples, results and documentation 8.4. Communicate results to appropriate personnel in accordance with enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- establishing client needs for routine and non-routine samples
- interpreting client requests, test methods and procedures accurately
- selecting, adapting and modifying standard test methods for unknown samples
- preparing samples and standards, optimising procedures and equipment to suit sample/test requirements
- setting up, starting up and shutting down equipment
- checking the calibration/qualification status of equipment
- selecting, configuring, checking and optimising instrument sub-systems
- performing routine instrument maintenance and replacement of consumables
- obtaining valid and reliable data
- calculating analyte concentrations with appropriate accuracy, precision, uncertainty and units
- recognising atypical data/results and troubleshooting common analytical procedure and equipment problems
- recording and reporting data/results using enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- assessing risks, applying specified control measures and working safely
- minimising waste and ensuring safe collection and disposal of waste materials
- applying relevant principles of good laboratory practice (GLP) procedures
- maintaining technical knowledge by accessing journals, technical updates, suppliers' product notes and test methods

Required knowledge

Required knowledge includes:

- sample preparation procedures including specialised techniques such as:
  - handling unstable/hazardous chemicals and samples and fragile/labile biological material
  - treatment of samples with high dissolved solids or high viscosity
  - filtration or centrifugation to remove particulates
  - open and closed wet chemical digestion and microwave digestion
  - alkali fusion of geological samples
- contamination control and ultra-trace analysis requirements such as:
  - prevention of airborne contamination with filtered air systems and clean rooms
  - preparation of ultra pure acids and reagents

REQUIRED SKILLS AND KNOWLEDGE

  - cleaning and storage of glass and plastic ware
  - prevention of personal contamination of samples by exposure to analyst
- atomisation and ionisation mechanisms within inductively coupled plasmas:
  - effects of plasma temperature and stability on atomisation, single/double ionisation, recombination and matrix decomposition
  - isobaric interferences due to combinations of isotopes of argon (plasma gas), oxygen (sample solution), or chloride (matrix components) with themselves or other elements
- calculations involving:
  - concentration and dilution
  - uncertainties
  - limit of detection, limit of quantitation and their application to quality control procedures
- operation, construction, selectivity, typical applications, troubleshooting and routine maintenance of ICP-AES/OES and ICP-MS systems including details such as:
  - design and operation of nebulisers and characteristics such as aerosol efficiency, dissolved solid tolerance and self-aspiration
  - laser ablation of solid samples into aerosol form
  - design and operation of spray chambers and effects on sample flow, sensitivity, plasma loading from larger droplets
  - design and operation of plasma torches (e.g. tube diameter, sampling depth, radio frequency (RF) source) and effects on energy transfer, plasma stability, aerosol flow and density, matrix decomposition, deposition on the interface, polyatomic ion interferences and implications for cleaning
  - axial/radial torch configurations
  - design of sample/skimmer cones at plasma-vacuum interface and effects on sensitivity, mass response, oxide and doubly charged ion formation and loading on vacuum system
  - operation of rotary and turbo-molecular pumps and valves to provide high vacuum, typical pressures and flow rates
  - design and operation of electrostatic ion 'lenses' to separate analyte ions from neutral species and photons (to minimise background signal)
  - use of collision-reaction cells to remove interfering polyatomic ions
  - atomic/optical emission spectroscopy detectors (AES or OES), transfer optics, diffraction gratings, monochromators and polychromators, photomultipliers and charge coupled devices
  - MS (e.g. quadrupole, magnetic sector, sector field, ion trap and time of flight mass analysers, electron multipliers with pulse and/or analogue modes for ion detection, measurements including selective ion monitoring (SIM), time resolved analysis, isotope ratio measurements and full scan/multi-element analysis)

REQUIRED SKILLS AND KNOWLEDGE

- sources of AES/OES spectral interferences such as:
  - viscosity of sample
  - spectral overlap
  - ionisation
- sources of MS spectral interferences such as:
  - isobaric interferences (e.g. $^{58}Fe^{+}$ and $^{58}Ni^{+}$)
  - polyatomic ions originating in gas, sample or matrix (e.g. $^{40}Ar^{35}Cl^{+}$ and $^{75}As^{+}$, $^{44}Ca^{16}O^{+}$ and $^{60}Ni^{+}$)
  - doubly charged ions such as Ba^{2+} interfering with $^{65}Cu^{+}$, $^{66}Zn^{+}$, $^{67}Zn^{+}$, $^{68}Zn^{+}$)
- computer control software for operating and optimising instrument
- procedures for optimising instrument (ICP-AES/OES or ICP-MS)performance such as:
  - effects of adjusting gas flow rates, torch residence time
  - investigation of plasma power/temperature on ionisation of analyte and interfering ions
  - optimising interface between ICP and MS detector (e.g. alignment of sample/skimmer cones and ion lens adjustment)
  - optimising plasma viewing height and for individual wavelengths for ICP-AES/OES
- use of manual/computer calibration charts and/or standards to identify and quantify analytes such as:
  - external calibration with or without internal standardisation
  - method of standard additions
  - semi-quantitative analysis
  - isotope ratio measurements
  - isotope dilution
- calculation steps to give results in appropriate units and precision
- troubleshooting and maintenance procedures recommended by instrument manufacturer
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • interpret client requests, test methods and procedures accurately • select, operate and maintain sample introduction and detector sub-systems • install ICP instrument sub-systems such as torch, nebuliser and spray chamber • safely set up, start up and shut down instrument using enterprise procedures • prepare samples and calibration standards in accordance with test method • check calibration/qualification status of equipment • optimise instrument sub-systems and procedures and equipment to suit sample/test requirements • operate equipment to obtain valid and reliable data • use software to identify analytes and calculate concentrations with appropriate accuracy, precision and units • recognise atypical data/results • troubleshoot common analytical procedure and equipment problems • record and report data/results using enterprise procedures • maintain security, integrity and traceability of samples and documentation • follow OHS procedures and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL976003A Evaluate and select appropriate test methods and procedures* • *MSL977003A Contribute to the validation of test methods* • *MSL977004A Develop or adapt analyses and*

EVIDENCE GUIDE	
	procedures. Resources may include: • laboratory with specialised analytical instruments • laboratory reagents and equipment • SOPs and test methods.
Method of assessment	The following assessment methods are suggested: • review of test data/results/calibration graphs obtained by the candidate over time to ensure accuracy, validity, precision and timeliness of results • inspection of results and technical records (e.g. maintenance schedules and quality control logbooks) completed by the candidate • observation of candidate using ICP instruments to measure analytes • feedback from clients, peers and supervisors • oral or written questioning of relevant ICP spectroscopy concepts, chemical principles underpinning sample preparation and separation of species, instrument design and optimisation, analytical techniques and enterprise procedures. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Food processing** A technician is analysing trace metals in red wine. He/she knows from experience that the ethanol in the wine will extinguish the torch even under standard

EVIDENCE GUIDE	
	operating conditions. The technician has four possible remedies: 1. Dilute the sample solution 2. Boil the ethanol off 3. Adjust the torch operating conditions 4. Change the sample introduction equipment. He/she considers factors such as the number of samples to be analysed and the likely analyte concentrations and searches the literature for recommended remedial actions. The technician decides to start by increasing the torch power from 1.0 to 1.3 KW and tuning the gas flow rates through the torch until the plasma is stable with normal sample introduction. **Environmental testing (1)** A technician receives a series of stream water samples from a client to test for elemental arsenic (As). The client advises the laboratory that they have acidified the samples as per the standard method to preserve the integrity of the sample during transit. Assuming that the client has used HNO_3 to bring the pH of the samples down to 1, the technician proceeds with the ICP-MS analysis. However, the technician soon realises that the client has used HCl because there is overwhelming interference between $^{40}Ar^{35}Cl^{+}$ and $^{75}As^{+}$. The clean up takes a considerable time and to prevent a recurrence of the problem, the laboratory now conducts rapid tests for chlorides in all water samples before ICP-MS analysis. **Environmental testing (2)** A technician receives a telephone call from a client requesting more information about the laboratory's ability to provide ICP-AES multi-element analysis of dry plant material as listed on the company website. The technician explains how the laboratory uses a dry ash method and requires about 500-1000 mg of sample. The technician briefly outlines how the samples are ashed in a silica crucible that is covered to prevent any contamination. The ash is then equilibrated with 5mL of 20% HCl at room temperature for 30 minutes before having 5mL of deionised water added, gently swirled and then allowed to settle for three hours. The solution is then decanted into 15mL plastic disposable tubes for direct determination by ICP-AES. The client mentions that they are particularly interested in the presence of Fe, Al and Cr and the technician notes that in this case, the laboratory usually refluxes the ash in 20% HCl to

EVIDENCE GUIDE	
	improve the recovery of these elements. The technician also advises the client that the laboratory reports elemental determinations as ppm on a weight element/dry sample weight basis and that ICP values are expressed on an atomic weight basis, not as any other molecular species.

Range Statement

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

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • AS 2830.1 Good laboratory practice - Chemical analysis
	  • AS 4873 Set: 2005 Recommended practice for inductively coupled plasma mass spectroscopy (ICP-MS)
	  • ISO 22036: 2008 Soil quality - Determination of trace elements in extracts of soil by inductively coupled plasma atomic emission spectroscopy (ICP-AES)
	  • ISO 11885: 2007 Water quality - Determination of selected elements by inductively methods coupled plasma optical emission spectroscopy (ICP-OES) methods
	  • ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
	• Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
	• NATA supplementary requirements for the field of testing

RANGE STATEMENT	
	• Australian code of good manufacturing practice (GMP) • principles of good laboratory practice (GLP) • material safety data sheets (MSDS) • national measurement regulations and guidelines • enterprise procedures, standard operating procedures (SOPs) and operating manuals • quality manuals, equipment and procedure manuals • equipment startup, operation and shutdown procedures • calibration and maintenance schedules • cleaning, hygiene and personal hygiene requirements • data quality procedures • enterprise recording and reporting procedures • material, production and product specifications • production and laboratory schedules • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise occupational health and safety (OHS) requirements • stock records and inventory • test procedures (validated and authorised) • waste minimisation, containment, processing and disposal procedures

RANGE STATEMENT	

ICP instruments and techniques	Inductively coupled plasma instruments and techniques may include:
	• peristaltic sample pumps
	• nebulisers (e.g. cross-flow, V-groove, C spray, concentric, micro-concentric and ultrasonic)
	• spray chambers (temperature and pressure control)
	• alternative sample introduction systems such as:
	  • laser ablation of solid samples
	  • electrothermal vaporisation (ETV)
	  • flow injection for samples high in total dissolved solids
	  • chromatography (e.g. liquid and ion)
	  • hydride generation
	  • cold vapour mercury generation
	• plasma torch (RF generation and cooling), radial/axial alignment
	• plasma gas controls
	• interface (sample and skimmer cones) and ion lens
	• mass analysers such as:
	  • quadrupole (peak jump mode, scan mode and single ion monitoring mode)
	  • magnetic sector
	  • time of flight
	• optical spectrum analysers (diffraction grating)
	• ion detectors (channeltron, electron multiplier tube and micro channel plate)
	• photon detectors (photomultiplier tubes and charge coupled devices)
	• replaceable items, such as valves, tubing and fittings, lamps, vacuum oil and argon gas
	• data systems, such as recorders, electronic integrators, and software packages for peak detection and integration

Testing that uses ICP spectroscopy	Testing that uses inductively coupled plasma spectroscopy may include: • medical (toxicology) testing of whole blood, urine, plasma, serum, packed red blood cells

RANGE STATEMENT	
	for: • exposure to heavy metals • metabolic function • forensic testing to establish elemental 'fingerprint' and possible source of scene of crime samples • environmental monitoring of pollution in air, water or soil • monitoring of waste water, sludges and trade effluents • control of starting materials, in-process materials and final products in a wide range of industry sectors (e.g. semi-conductor purity and ultra purity chemical reagents) • materials analysis (e.g. engine wear and oil analysis) • trace elements in food and wine • pharmaceuticals analysis (e.g. metal elements in drug products) • geological testing: • characterisation of rocks and minerals • analysis of mineral/ore samples during exploration, ore processing, final product quality • geochronology isotope ratio measurements

RANGE STATEMENT	
Presumptive tests	Presumptive tests may include: • pH • sample solubility in water and salinity • total dissolved solids • colour test • possible interferences and ion suppressants in sample matrix (e.g. presence of chlorides and chlorates)
Sample and standard preparation	Sample and standard preparation may include: • identification of any hazards associated with the samples and/or analytical chemicals • grinding, dissolving, extraction, filtration, refluxing, centrifuging, evaporation, washing and drying • digestion in nitric acid or aqua regia or hydrogen fluoride for geological samples • microwave digestion • determination of, and if appropriate, removal of any contaminants or impurities or interfering substances • ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware • preparation of internal standards, such as Indium and/or Gallium
Pre-use, calibration and safety checks	Pre-use, calibration and safety checks may include: • cleanliness of sample/skimmer cones, spray chamber and sample injection/nebuliser orifices • cleanliness of RF coils and quartz tubes • condition of sample and waste tubing on peristaltic pump lines • alignment of torch central tube with sample cone • initial mass calibrations (e.g. He isotopes in air, argon or other gases) • resolution checks • use of Rhodium levels, Cerium/oxide ratios and de-ionised water blanks to test sensitivity and alignment

RANGE STATEMENT	

Instrumental parameters	Instrumental parameters may include:
	• ICP parameters:
	  • manual/auto sample, pump program, pre- and post-sample washes
	  • sample introduction rate and sample uptake rate
	  • nebuliser/water flow rates
	  • torch gas flow rates
	  • adjustment of plasma temperature to optimise ionisation and minimise interferences (e.g. oxide)
	• OES/AES detector/source control parameters:
	  • wavelength choice for element sensitivity and/or interference
	  • photomultiplier and charge coupled device
	• MS parameters:
	  • vacuum pressures and gas flows
	  • sample and skimmer cone alignment
	  • sampling depth (distance between torch and sampling cone tip)
	  • ion optics voltage
	  • mass analyser control
	  • detector settings, such as discriminator voltage, detector high voltage, dead time correction and dual mode/extended range detector calibration
	  • scan, mass start/end, scan time and inter-scan delay
	  • selective ion monitoring (SIM)

Common analytical procedure problems and remedies	Common analytical procedure problems and remedies may include: • lack of suitable reference standards • poor sensitivity • overlapping spectra • nebuliser interferences, such as changes in sample delivery rate, nebuliser efficiency and droplet size • MS polyatomic interferences, reduced by: • cooling the spray chamber to 2-5^{0}C

RANGE STATEMENT	
	• desolvating the aerosol using a condenser and/or semi-permeable membrane • using alternative sample introduction methods • reducing chlorides by using nitric acid digests • adding gases such as H_2, N_2 and CH_4 to the inner, intermediate or outer gases • adding ethanol to the sample to reduce $ArCl^+$ • using spectral line fitting software • using cold plasma conditions • using correction equations • using a collision or reaction cell
	• MS non-spectral (matrix) interferences, reduced by: • matrix matching of calibration and sample solutions • equilibrating test sample solutions to room temperature • removal of dissolved gases from sample solutions • dilution of sample solution • using internal standards (i.e. reference elements) • analyte additions • isotope dilution

RANGE STATEMENT	
Common equipment problems	Common equipment problems may include: • system leaks • efficiency of rotary pump (oil and bearing wear) and turbo/molecular pumps • flat spots in sample/peristaltic pump tubing causing irregular sample or solvent delivery • contamination of sample, solvents, lines or other system elements • build up of salts/dissolved solids in sample valves, torch, MS spray chamber and/or cones
Hazards	Hazards may include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • corrosive chemicals • sharps and broken glassware • flammable liquids and gases • fluids under pressure, sources of ignition • disturbance or interruption of services • toxic fumes and ozone (plasma exhaust) • non-ionising radiation (UV and RF)
Addressing hazards	Addressing hazards may include: • use of MSDS • accurate labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods, direct extraction of vapours and gases • use of appropriate equipment such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise

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

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		