



Australian Government

MSL975019 Apply complex instrumental techniques

Release: 1

MSL975019 Apply complex instrumental techniques

Modification History

Release 1. Supersedes and is equivalent to MSL975019A Apply complex instrumental techniques

Application

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 workplace 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 applicable to technical officers working in all industry sectors, government agencies and research laboratories. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or workplace requirements. Although a supervisor may not always be present, the technical officer will follow standard operating procedures (SOPs) that clearly describe the scope of permitted practice, including varying workplace/test procedures and communicating results to people outside the laboratory.

While no specific licensing or certification requirements apply to this unit at the time of publication, laboratory operations are governed by relevant legislation, regulations and/or external accreditation requirements. Local requirements should be checked.

Pre-requisite Unit

MSL975009 Apply routine chromatographic techniques

AND

MSL974003 Perform chemical tests

OR

MSL974006 Perform biological procedures

OR

MSL975020 Apply routine spectrometric techniques

AND

MSL974003 Perform chemical tests

OR

MSL974006 Perform biological procedures

Competency Field

Testing

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed 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 workplace procedures
		1.4	Seek advice from supervisor about any proposed variations and document all approved changes.
		1.5	Schedule analysis using workplace procedures
2	Prepare samples and standards	2.1	Obtain a representative analytical portion of the laboratory sample
		2.2	Prepare sample in accordance with testing requirements
		2.3	Prepare validation checks and/or calibration standards for analytical portions
		2.4	Use specialised procedures for ultra-trace samples and standard preparation as required

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| 3 | Set up and optimise instrument and sub-systems | 3.1 | Perform pre-use and safety checks using workplace procedures |
| | | 3.2 | Assemble appropriate instrument sub-systems to construct the required analytical path |
| | | 3.3 | Start up and condition the instrument using workplace 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, as required |
| 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, uncertainty and units |
| | | 5.4 | Analyse trends in data and/or results and report out-of-specification or atypical results promptly to appropriate personnel |
| | | 5.5 | Troubleshoot analytical procedure or equipment problems which have led to atypical data or results |

6	Maintain a safe work environment	6.1	Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method
		6.2	Use personal protective equipment (PPE) and safety procedures specified for test method and materials to be tested
		6.3	Minimise the generation of waste and environmental impacts
		6.4	Ensure the safe disposal of laboratory waste
		6.5	Clean, care for and store equipment and consumables in accordance with workplace procedures
7	Maintain laboratory records	7.1	Enter approved data and results into laboratory information management system (LIMS)
		7.2	Maintain equipment logs in accordance with workplace procedures
		7.3	Maintain security, integrity and traceability of samples and documentation
		7.4	Communicate results to appropriate personnel

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Standards, codes, procedures and/or workplace

Standards, codes, procedures and/or workplace requirements include the latest version of one or more of:

requirements

- Australian and international standards covering the requirements for the competence of testing and calibration laboratories, laboratory design and construction, physical containment levels and facility types, laboratory safety, and quality and environmental management
- national work health and safety (WHS) standards and codes of practice, and national measurement regulations and guidelines
- Australian and international standards and guidelines covering specialised spectrometric and chromatographic analysis, accuracy of measurement methods and results, expression of uncertainty and quantifying uncertainty
- specific codes, guidelines, procedures and methods, such as the Australian code of good manufacturing practice for medicinal products (GMP), and principles of good laboratory practice (GLP)
- workplace documents, such as standard operating procedures (SOPs); quality and equipment manuals; calibration and maintenance schedules; material safety data sheets (MSDS) and safety procedures; material, production and product specifications; production and laboratory schedules; workplace recording and reporting procedures; waste minimisation and safe disposal procedures; cleaning, hygiene and personal hygiene requirements; and stock records and inventory
- sampling procedures (labelling, preparation, storage, transport and disposal)
- test procedures (validated and authorised)

Specialised analytical instruments Specialised analytical instruments include one or more of, but are not limited to:

- spectrometric instruments:
 - electrothermal atomic absorption spectroscopy (AAS)
 - vapour generation AAS
 - X-ray fluorescence (XRF) and diffraction (XRD)
 - nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI)
 - mass spectrometry (MS)
 - neutron activation analysis (NAA)
 - inductively coupled plasma mass spectrometry (ICP-MS)
- chromatographic instruments:
 - gas chromatography mass spectroscopy (GC-MS)
 - GC sampling devices (e.g. headspace and thermal desorption)
 - specialised GC detection devices (e.g. electron capture detector (ECD), flame photometric detector (FPD) and nitrogen phosphorous detection (NPD))

- specialised GC detection devices (e.g. fluorescent, diode array and electrochemical)
- liquid chromatography mass spectroscopy (LC-MS), electro-spray MS
- gas chromatography Fourier transform infrared (GC-FTIR)
- electrometric instruments, such as anodic stripping voltammetry
- flow injection analytical equipment

Tests requiring specialised analytical instruments

Tests requiring specialised analytical instruments include, but are not limited to, one or more of:

- trace analysis
- non-destructive testing
- multi-analyte determination
- analysis involving high sample throughput

Instrument sub-systems

Instrument sub-systems include, but are not limited to, one or more of:

- sample introduction units and auto sampling equipment
- detectors and signal conditioning units
- temperature control devices, such as cryostats, ovens and thermostat baths
- software control/interface

Sample preparation

Sample preparation includes one or more of:

- identification of any hazards associated with the samples and/or analytical chemicals
- techniques, such as grinding, mulling, preparation of disks, digestion, dissolving, ashing, refluxing, extraction, filtration, evaporation, flocculation, precipitation, washing, drying and centrifugation
- solid-phase micro-extraction
- determination of, and if appropriate, removal of any contaminants or impurities
- ultra-trace procedures requiring high purity solvents, clean rooms, ultra clean glassware and specialised glassware

Safe work practices

Safe work practices include, but are not limited to, one or more of:

- ensuring access to service shut-off points
- recognising and observing hazard warnings and safety signs

- labelling of samples, reagents, aliquoted samples and hazardous materials
- handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer instructions
- identifying and reporting operating problems or equipment malfunctions
- cleaning and decontaminating equipment and work areas regularly using workplace procedures
- using PPE, such as gloves, safety glasses, coveralls and gowns
- reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/wastewater, gases, smoke, vapour, fumes, odour and particulates, to appropriate personnel

WHS and environmental management requirements

WHS and environmental management requirements include:

- complying with WHS and environmental management requirements at all times, which may be imposed through state/territory or federal legislation. These requirements must not be compromised at any time
- applying standard precautions relating to the potentially hazardous nature of samples
- accessing and applying current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health, where relevant

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSL975019A Apply complex instrumental techniques

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5c63a03b-4a6b-4ae5-9560-1e3c5f462baa>

Assessment Requirements for MSL975019 Apply complex instrumental techniques

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Performance Evidence

Evidence of competence in this unit must satisfy all of the requirements of the elements and performance criteria, and include demonstration of:

- using a specialised analytical instrument to analyse complex samples and obtain valid and reliable data on at least three (3) occasions
- accurately interpreting client requests and test methods/procedures
- establishing client needs for routine and non-routine samples
- safely setting up, operating and shutting down equipment
- checking calibration and qualification status of equipment
- preparing samples and standards
- assembling and optimising instrument sub-systems
- optimising a specialised analytical instrument and/or procedures for specific samples
- interpreting data, recognising atypical test data and results and making relevant conclusions
- troubleshooting common analytical procedure and equipment problems
- preparing and using calibration charts and standards
- identifying and calculating potential sources of uncertainty
- calculating analyte concentrations using appropriate equations, units, uncertainties and precision
- recording and reporting data and results using workplace procedures
- maintaining security, integrity and traceability of samples and documentation
- following workplace safety procedures.

Knowledge Evidence

Must provide evidence that demonstrates knowledge of:

- principles and concepts associated with a specialised analytical instrument's operation and analytical procedure or test method
- handling of unstable or hazardous chemicals and samples and the fragile and labile nature of biological materials
- sample preparation procedures
- functions of key components and sub-systems of the instrument and the effects on outputs and results of modifying instrumental variables
- procedures for optimising instrument performance

- basic procedure and equipment troubleshooting techniques
- common analytical procedure and equipment problems, such as:
 - sample introduction blockages
 - incomplete atomisation of analyte
 - poor resolution of peaks
 - poor sensitivity
- calculation steps to give results in appropriate accuracy, precision, uncertainty and units
- basic equipment maintenance procedures
- workplace and legal traceability requirements
- relevant hazards, work health and safety (WHS) and environment requirements.

Assessment Conditions

- Judgment of competence must be based on holistic assessment of the evidence. Assessment methods must confirm consistency of performance over time, rather than a single assessment event.
- This unit of competency is to be assessed in the workplace or a simulated workplace environment. A simulated workplace environment must reflect realistic operational workplace conditions that cover all aspects of workplace performance, including the environment, task skills, task management skills, contingency management skills and job role environment skills.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept in each case).
- This unit of competency may be assessed with:
 - *MSL925001 Analyse data and report results*
- Holistic assessment methods include:
 - review of test data/results obtained by the candidate over time to ensure accuracy and consistency of results
 - inspection of test records and workplace documentation completed by the candidate
 - observation of candidate using specialised instruments to measure analytes
 - feedback from clients, peers and supervisors about the candidate's ability to provide valid and reliable results within expected timeframes
 - oral or written questioning of relevant chemical principles, concepts, analytical techniques and workplace procedures.
- Access is required to instruments, equipment, materials, workplace documentation, procedures and specifications associated with this unit, including, but not limited to:
 - a standard laboratory with specialised analytical instruments, laboratory reagents and equipment, standard operating procedures (SOPs) and test methods.

- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- The assessor must demonstrate both technical competence and currency.
- Technical competence can be demonstrated through:
 - relevant VET or other qualification/Statement of Attainment AND/OR
 - relevant workplace experience.
- Currency can be demonstrated through:
 - performing the competency being assessed as part of current employment OR
 - having consulted with a laboratory about performing the competency being assessed within the last twelve months.

Links

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