



Australian Government

MSL974003 Perform chemical tests and procedures

Release: 1

MSL974003 Perform chemical tests and procedures

Modification History

Release 1. Supersedes and is equivalent to MSL974003A Perform chemical tests and procedures

Application

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 applicable to laboratory or technical assistants and instrument operators in all industry sectors.

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

Nil

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	Interpret and schedule test requirements	1.1	Review test request to identify samples to be tested, test method and equipment and instruments involved
		1.2	Identify hazards and workplace control measures associated with the sample, preparation and test methods, reagents and/or equipment
		1.3	Plan work sequences to optimise throughput of multiple

			samples
2	Receive and prepare samples	2.1	Log samples using standard operating procedures (SOPs)
		2.2	Record sample description, compare with specification and note and report discrepancies
		2.3	Prepare samples and standards in accordance with chemical testing requirements
		2.4	Ensure traceability of samples from receipt to reporting of results
3	Check equipment before use	3.1	Set up equipment and instruments in accordance with test method requirements
		3.2	Perform pre-use and safety checks in accordance with relevant workplace 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
		3.5	Quarantine out-of-calibration equipment and 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 and instruments in accordance with test method requirements
		4.2	Perform tests or procedures on all samples and standards in accordance with specified methods
		4.3	Shut down equipment and instruments in accordance with operating procedures
5	Process and	5.1	Record test data noting atypical observations

	interpret data	5.2	Construct calibration graphs 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 workplace procedures
		5.5	Estimate and document uncertainty of measurement in accordance with workplace procedures
		5.6	Interpret trends in data and/or results and report out-of-specification or atypical results promptly to appropriate personnel
		5.7	Determine if 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 (PPE) to ensure personal safety and that of other laboratory personnel
		6.2	Minimise the generation of wastes and environmental impacts
		6.3	Ensure the safe collection of laboratory and hazardous waste for subsequent disposal
		6.4	Care for and store equipment and reagents as required
7	Maintain laboratory records	7.1	Enter approved data into laboratory information management system (LIMS)
		7.2	Maintain confidentiality and security of workplace information and laboratory data
		7.3	Maintain equipment and calibration logs in accordance with workplace procedures

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 requirements

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

- Australian and international standards covering the requirements for the competence of testing and calibration laboratories, laboratory safety and quality management
- national work health and safety (WHS) standards and codes of practice, and national measurement regulations and guidelines
- standard methods for chemical analysis by gravimetric, titrimetric, spectrometric, chromatographic and electrochemical techniques
- specific codes, guidelines, procedures and methods, such as:
 - Association of Analytical Communities International (AOAC International) Official Methods of Analysis, Royal Australian Chemical Institute (RACI) and/or American Association of Cereal Chemists (AACC) methods for inorganic constituents
 - Australian code of good manufacturing practice for medicinal products (GMP), and principles of good laboratory practice (GLP)
- workplace documents, such as 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; and waste minimisation and safe disposal procedures

Sample preparation processes

Sample preparation processes include one or more of:

- grinding
- preparation of discs
- digestion, dissolving, refluxing and mulling

- precipitation, filtration, flocculation, evaporation and centrifugation
- washing, drying, tracting and ashing

Non-instrumental tests or procedures

Non-instrumental tests or procedures include one or more of:

- gravimetric analysis
- titrimetric analysis
- filtration, separation and solvent extraction techniques
- corrosion testing, cement content and accelerated weathering

Instrumental tests

Instrumental tests include:

- spectrometry, chromatography and electrochemistry

Types of instrumentation and instrumental techniques

Types of instrumentation and instrumental techniques include one or more of:

- colorimetric techniques, such as enzyme activity, chlorine in water, specific cations and anions
- infrared and ultraviolet-visible (UV-VIS) spectrophotometry
- other spectrometric techniques, such as fluorimetric analysis, flame atomic emission and flame atomic absorption spectrometry, and fourier transform infrared
- chromatographic techniques, such as column and thin layer analytical and preparative chromatography, gas or liquid chromatography, ion chromatography and gel filtration chromatography
- electrochemical techniques, such as pH, eH, conductivity and ion-selective electrodes
- electrophoretic techniques, such as for DNA patterns and determination of protein purity
- soil testing techniques, such as moisture content, organic matter content, specific anions and cations, auto-analysers for determination of total P, total Kjeldahl N, orthophosphate, nitrite/nitrate and ammonia

Chemical test methods

Chemical test methods include one or more of:

- control of starting materials, in-process materials and finished products
- environmental monitoring
- basic troubleshooting and/or problem solving within the scope

of SOPs and workplace processes

Safe work practices

Safe work practices include:

- ensuring access to service shut-off points
- recognising and observing hazard warnings and safety signs
- labelling of samples and hazardous materials
- handling and storage for hazardous materials and equipment in accordance with labelling, MSDS and manufacturer instructions
- identifying and reporting operating problems or equipment malfunctions
- cleaning equipment and work areas regularly using workplace procedures
- using PPE, 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/wastewater, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel

WHS and environmental management requirements

WHS and environmental management requirements:

- 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

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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 MSL974003 Perform chemical tests and procedures

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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:

- safely performing at least two (2) different chemical tests or procedures involving several measurement steps
- safely conducting at least three (3) instrumental tests (the same or different)
- interpreting chemical test methods and procedures accurately
- preparing samples using at least three (3) different processes
- maintaining and evaluating reagents
- conducting pre-use and calibration checks on equipment, and quarantining out-of-calibration equipment and instruments
- safely operating test equipment and instruments to workplace standards and manufacturer specifications
- processing data, interpreting gross features of data/results and making relevant conclusions
- preparing calibration graphs and calculating results using appropriate equations, units, uncertainties and precision
- identifying atypical results as either out-of-normal range or an artefact
- tracing and sourcing obvious causes of artefacts, tracking obvious test malfunctions for standardised procedures, and troubleshooting basic equipment and methods
- communicating problems to a supervisor or outside service technician
- recording and communicating results in accordance with workplace procedures
- maintaining security, integrity and traceability of samples, sub-samples, test data, results and documentation
- following workplace safety procedures.

Knowledge Evidence

Must provide evidence that demonstrates knowledge of:

- relevant chemical principles and concepts, such as:
 - ions, atoms, molecules, bonding and links to chemical properties
 - Atomic Mass
 - Moles and Molarity
 - chemical formulae and balancing equations

- chemical reactions involving acid/base, redox, complex ion formation, solubility and equilibrium
- energy levels and absorption/emission spectra
- purpose of the tests and/or procedures conducted
- concepts of metrology, principles and concepts related to equipment and instrument operation, tests and/or procedures
- function of key components of the equipment and instrument and reagents and effects of modifying equipment and instrument variables
- calibration and basic equipment and method troubleshooting procedures
- sample preparation procedures for the tests and/or procedures conducted
- workplace and/or 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:
 - MSL924001 Process and interpret data
 - MSL974001 Prepare, standardise and use solutions
- Holistic assessment methods include:
 - review of test data and 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
 - feedback from peers and supervisors
 - observation of the candidate conducting a range of sample preparations, chemical tests and procedures
 - oral or written questioning of chemical principles and concepts, test methods 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 equipped with appropriate sample preparation and test equipment, instruments, standards and reagents
- workplace procedures and standard methods
- records, including test and calibration results; equipment use, maintenance and servicing history, and faulty or unsafe equipment.
- 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.

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