



Australian Government

MSL975014 Perform molecular biology tests and procedures

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MSL975014A Perform molecular biology tests and procedures

Application

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 is applicable to technical officers working in manufacturing (e.g. macro, micro, nanotechnology, pharmaceutical and blood products), food, biomedical (e.g. forensics, pathology and veterinary) and environmental industry sectors. Results are generally interpreted and reported to supervising scientists, medical, veterinary or other responsible officers of a workplace, regulatory authority or legal agency.

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

MSL973007 Perform microscopic examination

MSL973004 Perform aseptic techniques

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/instruments involved
		1.2	Identify hazards and workplace 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 workplace procedures
		2.2	Record sample description, compare with specification and note and report discrepancies
		2.3	Store samples in accordance with workplace and test method requirements
		2.4	Maintain chain of custody, traceable to the worker, for all samples
3	Prepare equipment and reagents	3.1	Set up equipment/instrumentation in accordance with test method requirements and perform pre-use and safety checks
		3.2	Select and collect reagents in accordance with test method requirements
		3.3	Prepare and label reagents in accordance with test method requirements
4	Extract, verify and manipulate biomolecules	4.1	Produce/extract biomolecules from samples using appropriate isolation methods
		4.2	Prevent contamination of samples by unwanted biomolecules
		4.3	Recognise the presence of common inhibitors of

- biomolecular reactions and take corrective action
- 4.4 Quantify and qualify biomolecular yields from purified extractions
- 4.5 Use appropriate techniques to prepare and test a range of biomolecular samples
- 4.6 Use controls and reference standards to confirm the integrity of biomolecular sample preparation and procedures
- 5 **Process data**
- 5.1 Record test data noting atypical observations
- 5.2 Ensure results are consistent with reference standards and expectations
- 5.3 Record and report results in accordance with test methods
- 5.4 Interpret trends in data and/or results and report out-of-specification or atypical results promptly to appropriate personnel
- 5.5 Troubleshoot basic procedure, reagent or equipment problems which have led to atypical data or results
- 6 **Maintain a safe work 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 waste
- 6.3 Ensure the safe disposal of waste, including hazardous waste and tested samples
- 6.4 Clean, care for and store equipment and reagents
- 7 **Report and communicate results**
- 7.1 Record approved data into workplace system
- 7.2 Keep accurate, traceable work records to protect the workplace's intellectual property (IP) rights
- 7.3 Maintain confidentiality and security of workplace

information and laboratory data

- 7.4 Maintain equipment 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 and environmental management
- Australian Standards covering the requirements for safety cabinets; cleaning, disinfecting and sterilising reusable medical and surgical instruments and equipment and maintenance of associated environments in health care facilities; and verification and use of volumetric apparatus
- national work health and safety (WHS) standards and codes of practice, national environmental protection measures, and national measurement regulations and guidelines
- specific codes, guidelines and procedures, such as National Association of Testing Authorities (NATA) accreditation requirements, National Health and Medical Research Council (NHMRC) requirements, principles of good laboratory practice (GLP), Food Standards Australia New Zealand, Australian code of good manufacturing practice for medicinal products (GMP), Therapeutic Goods Regulations, National Registration Authority (NRA), Australian Dangerous Goods Code, Guide to physical containment levels and facility types, and Guidelines for small scale genetic manipulation work from the gene technology regulations
- workplace documents, such as standard operating procedures (SOPs); quality and equipment manuals; calibration and maintenance schedules; material safety data sheets (MSDS) and safety procedures; cleaning, hygiene and personal hygiene requirements; material, client and product specifications; production and laboratory schedules; workplace recording and reporting procedures; and waste minimisation and safe disposal procedures
- sampling procedures (labelling, preparation, storage, transport and disposal), and validated and authorised test methods and procedures

Molecular biology tests and procedures

Molecular biology tests and procedures include, but are not limited to, one or more of:

- generic techniques, such as:

- sample digestion, extraction, filtration, separation, dialysis, precipitation and centrifugation
- accurate and reliable use of micropipettes
- application of aseptic techniques
- labelling (e.g. digoxin, fluorescence, enzymes, radioactivity and antibodies)
- production, labelling and use of DNA probes
- preparation of competent bacterial cells
- preservation and storage of samples (e.g. freezing)
- extraction of nucleic acids, 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
 - mini-prep and rapid method isolation of plasmid DNA
 - purification of nucleic acids and proteins:
 - 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
- 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 and microsatellites
 - detection of protein products by measuring activity, including a range of immunological assays
- hybridisations, such as:

- hybridisation to screen cDNA libraries
- blotting (southern blots for DNA and Western blots for protein)
- cloning such as:
- cloning and sub-cloning of genes and fragments of DNA
- applications of techniques:
- polymerase chain reaction (PCR)
 - methods to detect gene expression, such as RNA hybridisation, immunological techniques and radioactive labelling
 - testing DNA for sequence variation that is either causative of, or associated with, human disease
 - testing blood for the presence of viruses using the PCR
 - identification of species, such as bacterial contaminants
- generating data for taxonomic and ecological investigations

Corrective action

Corrective action includes:

- purification
- dilution
- additional extraction steps

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, gowns, body suits and respirators
- using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures
- reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/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

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Links

MSA Training Package Implementation Guides - <http://mskills.org.au/training-packages/info/>