



Australian Government

Department of Education, Employment and Workplace Relations

MSL975017A Perform laboratory-based ecological techniques

Revision Number: 1

MSL975017A Perform laboratory-based ecological techniques

Modification History

Not applicable.

Unit Descriptor

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.
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Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technicians and technical officers working in biological, biotechnology and environmental industry sectors. It is expected that all work would conform to statutory and enterprise occupational health and safety (OHS) codes of practice. This unit of competency assumes that the worker would perform tests and procedures under the close supervision of scientific staff and that the enterprise will equip its workers with relevant animal handling skills should such be required. The unit does not cover procedures related to the handling of vertebrates that are subject to national and state/territory animal care and ethics regulations. 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'.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL974006A	<i>Perform biological procedures</i>
	MSL973007A	<i>Perform microscopic examination</i>
	MSL973004A	<i>Perform aseptic techniques</i>

Employability Skills Information

Employability skills	This unit contains employability skills.
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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.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
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 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

ELEMENT	PERFORMANCE CRITERIA
	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 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

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skill include:

- communicating scientific and technical concepts and terminology accurately to supervisors, peers and clients
- maintaining the viability of specimens
- identifying and classifying species
- taking representative samples for analysis
- relating field and laboratory data for the generation of meaningful results
- working safely for the protection of self and co-workers
- disposing of wastes carefully for the protection of those who may handle and process wastes and to minimise contamination of the environment

Required knowledge

Required knowledge includes:

- 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

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:

- relate field and laboratory data for the generation of meaningful results
- identify and classify animal and plantspecies for scientific and experimental purposes
- maintain the viability of species during experimentation
- monitor the physiology and interactions of plants and animals and their environments
- take representative samples for analysis
- work safely for the protection of self and co-workers
- communicate appropriately with customers and be aware of cultural and social contexts
- not contaminate sterile environments or specimens
- dispose of wastes carefully for the protection of those who may handle and process wastes and to minimise contamination of the environment.

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:

- *MSL925001A Analyse data and report results*
- *MSL974007A Undertake environmental field-based monitoring.*

Resources may include:

- equipment and resources for investigating the physiology of plants and animals in the laboratory
- enterprise procedures, sampling plans, test methods and equipment manuals
- computers and programs for simulated experiments or data analysis.

Method of assessment

The following assessment methods are suggested:

- review of data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness

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	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. 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. Environmental (1) 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

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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 (2)

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.

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/NZS ISO 9000 Set:2008 Quality management systems set
 - AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
 - AS/NZS 2243 Set:2006 Safety in laboratories set
- animal welfare legislation and codes of practice
- OHS national standards and codes of practice
- national environment protection measures
- Guide to physical containment levels and facility types
- Australian Quarantine and Inspection Service (AQIS) Export Control (Orders) Regulations 1982
- instructions to comply with new legislation, standards, guidelines and codes
- enterprise procedures, standard operating procedures (SOPs) and operating manuals
- validated and authorised test procedures
- laboratory sampling procedures for labelling, preparation, storage, transport and disposal
- safety procedures to minimise contraction of zoonoses
- safety requirements for equipment, materials or products

RANGE STATEMENT	
	• quality system and continued improvement processes • incident and accident/injury reports • schematics, work flows and laboratory layouts • stock records and inventory • waste minimisation, disposal protocols and environment protection procedures
Items of equipment, reagents, specimens and systems for botanical and zoological techniques	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 • physiological monitors for temperature and respiration • monitors for experimental variables, such as temperature and humidity • hand-held microtomes and microtome knives (non-disposable or disposable) • tissue processors • incubators, water baths and 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 (LIMS), databases, record and filing systems, including specimen accessioning

RANGE STATEMENT	
Communication	Communication may include: • scientists • field workers • local government professionals or representatives of state/territory authorities, such as environmental protection agencies • supervisors and managers (laboratory, quality and customer service) • clients
Hazards	Hazards may include: • microbiological organisms and agents, associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • solar radiation, dust and noise • chemicals, such as acids, solvents and stains • sharps and broken glassware • flammable liquids and gases • fluids under pressure, such as steam and industrial gases • disturbance or interruption of services
Safe work practices	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, material safety data sheets (MSDS) 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, gowns, hearing protection and safety boots • using containment facilities (PCII, PCIII and PCIV physical containment laboratories),

RANGE STATEMENT	
	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	Disposal of biohazardous wastes may include: • collection for sterilisation by autoclaving (e.g. autoclaving of microbiological plates) • appropriate storage (e.g. of waste containing radioactive isotopes) • use of biohazard waste containers
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise 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
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Competency field

Competency field	
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Co-requisite units

Co-requisite units		