



Australian Government

MSS024010 Perform environmental biological techniques

Release: 1

MSS024010 Perform environmental biological techniques

Modification History

Release 1. Supersedes and is equivalent to MSS024010A Perform environmental biological techniques

Application

This unit of competency covers the ability to collect and examine biological samples using microscopes, keys and biochemical tests to identify and enumerate environmentally significant organisms. Personnel are expected to prepare aseptic media and solutions, set up equipment for microbiological testing and identify basic microorganisms of environmental significance.

This unit of competency is applicable to environmental technicians working in a range of industry sectors, such as environmental services (e.g. sampling and monitoring of air quality, water and soil); clean water (e.g. catchments, supply and environmental flows); water treatment, storm and wastewater management; and natural resource management.

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

Pre-requisite Unit

Nil

Competency Field

Sampling and testing

Unit Sector

Environmental

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

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| 1 Obtain biological samples | 1.1 | Locate and review background information for site/project. |
| | 1.2 | Review work request to identify required samples and the procedures, materials and equipment involved. |

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| | | 1.3 | Identify hazards and workplace control measures associated with collecting the sample, preparation methods, reagents and/or equipment. |
| | | 1.4 | Assemble required materials, reagents and equipment and check they are fit for purpose. |
| | | 1.5 | Collect samples in accordance with relevant legislative requirements, codes of practice and workplace procedures. |
| | | 1.6 | Log samples using workplace procedures. |
| | | 1.7 | Record sample description, compare with specification and note and report discrepancies. |
| | | 1.8 | Ensure traceability from receipt of sample to reporting of results. |
| 2 | Perform basic biological techniques associated with the examination of microorganisms | 2.1 | Use aseptic techniques to prepare media for microbiological analysis. |
| | | 2.2 | Obtain samples aseptically for microbiological analysis. |
| | | 2.3 | Identify possible contamination pathways for both samples and media. |
| | | 2.4 | Perform simple chemical tests to identify morphology of environmentally significant bacteria. |
| | | 2.5 | Use aseptic techniques to manipulate samples and bacterial cultures. |
| | | 2.6 | Use standard techniques to grow cultures of environmentally significant microorganisms. |
| | | 2.7 | Use disinfection and sterilisation to control the growth of microorganisms. |
| 3 | Prepare microscope for use | 3.1 | Select appropriate microscope and attachments for examination and measurements. |
| | | 3.2 | Check that all microscope components are clean and fit for purpose. |
| | | 3.3 | Mount sample in accordance with specified method. |

		3.4	Adjust settings and alignment of optical and mechanical components to optimise performance.
4	Perform microscopic examination in accordance with test methods	4.1	Identify microorganisms, cell structures and components of animal/plant tissues in environmental samples.
		4.2	Measure organisms and structures.
		4.3	Enumerate microorganisms in environmental samples.
5	Classify organisms	5.1	Classify organisms into hierarchical structures using appropriate keys.
		5.2	Record all observations and measurements used to determine classifications.
6	Relate cell structures and their functions to environmental adaptation	6.1	Identify cell structures from examination of biological specimens.
		6.2	Associate biological functions with cell structures.
		6.3	Associate cell physiology and enzyme cycles to environmental adaptation.
		6.4	Identify important biochemical pathways associated with environmentally significant organisms.
7	Maintain a safe work environment	7.1	Ensure safety and minimise cross-contamination through the use of personal protective clothing and safety equipment.
		7.2	Handle all samples and equipment in accordance with workplace safety procedures.
		7.3	Clean up spills using appropriate techniques to protect personnel, work area and environment.
		7.4	Minimise generation of waste and environmental impacts.
		7.5	Collect and dispose of all wastes safely.

		7.6	Report hazards and incidents to designated personnel using workplace procedures.
8	Maintain workplace records	8.1	Record approved data into workplace system.
		8.2	Maintain confidentiality and security of workplace information and data.

Foundation Skills

This section describes those required skills (language, literacy and numeracy) 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.

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

- federal legislation, such as the Environment Protection and Biodiversity Conservation Act
- state/territory government legislation and regulations and local government by-laws, policies, and plans dealing with environmental protection, nature conservation, wildlife/plant protection, prevention of cruelty to animals and quarantine
- legislation, standards and codes of practice for work health and safety (WHS)
- codes of practice dealing with the care and use of animals for scientific purposes
- Australian and international standards covering safety in laboratories and water microbiology, such as AS/NZS 2243.3:2010 Safety in laboratories - Microbiological safety and containment, and AS/NZS 4276 Water microbiology
- international guidelines and methods, such as:
 - Australian and New Zealand Guidelines for fresh and marine water quality
 - American Public Health Association (APHA) Standard methods for examination of water and wastewater
- registration/licensing and/or accreditation requirements

- workplace documents, such as standard operating procedures (SOPs), work schedules; quality management procedures; sampling procedures, validated/authorised test procedures; safety data sheets (SDS) and safety procedures; equipment manuals; recording and reporting procedures; cleaning, hygiene, personal hygiene requirements; waste minimisation, containment, processing and safe disposal procedures.

Equipment, materials and systems include one or more of:

- sampling equipment for different sample types and species, such as air samplers (e.g. for Legionella), nets (e.g. for plankton), sediment samplers, soli samplers (e.g. Niskin and Nansen)
- protective and physical containment facilities and equipment for safe handling of microorganisms, including personal protective equipment (PPE), such as gloves, gowns, masks, safety glasses, and gloves for working with extremes of heat and cold
- laboratory equipment, such as glassware and measuring equipment; transfer equipment such as inoculating loops, pipettes (quantitative and qualitative), flasks, tubes and spatulas; Bunsen burners and bench incinerators; water baths; filtration membranes; disinfecting and sterilising equipment, such as ultraviolet (UV) lamps and autoclaves
- laboratory consumables, such as stains, media, reagents; disinfecting and sterilising solutions
- materials suitable for the safe containment, collection, processing and disposal of biological and non-biological wastes
- carbon dioxide cabinets, incubators, anaerobic jars, fermentation chambers, continuous culture systems and other devices for controlling growth environments of microorganisms; liquid nitrogen containers for cell storage
- microscopes with bright field and other relevant illumination systems and stereomicroscopes
- counting chambers for micro-enumeration; colony counting devices
- laboratory information management systems (LIMS), reference databases, record and filing systems.

Samples include one or more of:

- air
- surface water, wastewater and stormwater
- soils and sediments
- plants and animals.

- Aseptic techniques include one or more of:**
- preparation of basic and enriched media
 - sterilisation of media
 - aseptic transfer of microorganisms (e.g. bacteria, fungi and yeasts) to culture media
 - production and identification of pure cultures on solid media
 - production of contaminant-free cultures in liquid media.
- Microscopes and microscopy techniques include one or more of:**
- bright field microscopy
 - dark field microscopy techniques
 - Kohler illumination and its importance in producing uniform and glare-free images
 - phase contrast microscopy
 - polarised light microscopy
 - stereo microscopy techniques
 - image analysers and camera eyepieces
 - stage micrometers and microscopic measurement
 - counting chambers.
- Organism classification includes one or more of:**
- kingdoms
 - hierarchical system of species classification
 - dichotomous keys.
- Cell structure and function include one or more of:**
- eukaryotic and prokaryotic cells and their organisation
 - cell organelles and structures, including plasma membrane and cell wall, chromosomes, nucleus, cytoplasm, vacuoles and vesicles, golgi complex, endoplasmic reticulum, lysosomes, chloroplasts, ribosomes and mitochondria, cytoskeleton, cilia and flagella
 - biological membranes (structure and function - osmosis, diffusion, active transport cellular metabolism)
 - heterotrophic and autotrophic organisms.
- WHS and environmental management requirements include:**
- compliance with relevant federal/state/territory WHS legislation at all times
 - assuming that samples are potentially hazardous and applying standard precautions
 - accessing and applying current industry understanding of infection control issued by the National Health and Medical

Research Council (NHMRC) and state/territory
Departments of Health, where relevant.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSS024010A Perform environmental biological techniques

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5b04f318-804f-4dc0-9463-c3fb9a3fe998>

Assessment Requirements for MSS024010 Perform environmental biological 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:

- performing each of the following environmental biological techniques on at least two (2) occasions:
 - collecting biological samples in accordance with given instructions/procedures
 - using aseptic techniques to obtain/manipulate samples and prepare media
 - using standard techniques to grow cultures of environmentally significant microorganisms
 - setting up, cleaning and optimising the performance of light microscopes
 - conducting tests and microscopic examination of samples to identify and enumerate environmentally significant (micro)organisms and important components of plant/animal tissues
- interpreting instructions, manuals and applying workplace procedures
- logging, tracking and reporting biological samples from collection/receipt through to completion of a procedure
- identifying artefacts or image aberrations attributable to misalignment or obstruction of light paths or condensers used in bright field, dark ground, and phase contrast microscopy, or with other steps in microscopic examinations
- interpreting, recording and storing test results, including performing simple calculations/estimations
- preparing documentation that is concise, accurate and meets workplace requirements
- using personal protective clothing, safety equipment and procedures to prevent contaminating oneself, other people, the work area, equipment or the samples under test
- demonstrating safe sterilisation, disinfection, cleaning, spillage, decontamination and waste disposal techniques
- cleaning and storing laboratory equipment
- seeking advice when issues/problems are beyond scope of competence/responsibility.

Knowledge Evidence

Must provide evidence that demonstrates knowledge of:

- principles and terminology used in elementary microbiological testing, organism classification, microscopic examination and cell structure

- common sampling techniques for air, water, soil in a range of terrestrial and aquatic habitats
- relationship between sterile practices, hygiene procedures and the ability to obtain growth of microorganisms free of contamination
- importance of pure culture techniques and aseptic transfer to successful microbiological investigation and correct interpretation of results
- growth requirements of microorganism cultures (e.g. bacteria, fungi and yeasts)
- principles of infection control related to work health and safety (WHS), sampling and transfer of materials in microbiological investigations
- disinfection and sterilisation procedures used in the collection, processing and safe disposal of samples and materials
- cleaning and sanitising requirements of equipment and work area and effects of physical and chemical agents on microbial growth and death
- parts and functions of common microscopes, set-up procedures and common causes/solutions for sub-optimal performance (e.g. fringing)
- cell theory, basic structure and function of cells and organelles
- basic classes and classification of organisms
- cell physiology and processes, such as simple and facilitated diffusion, plasmolysis, osmosis, tonicity, active transport, energy production, mitosis, motility, phagocytosis and pinocytosis
- purposes and mechanisms of staining (e.g. Gram +ve and -ve)
- workplace and/or legal traceability requirements
- relevant hazards, controls and safety procedures – especially those associated with handling microorganisms.

Assessment Conditions

- Judgement 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).
- Holistic assessment methods include:
 - inspection of media/samples/cultures and review of data, results and records prepared by the candidate

- feedback from supervisors that the candidate can safely perform the environmental biological techniques listed above and provide reliable test results within the agreed timeframe
- oral and/or written questions to assess the candidate's knowledge sampling, safe handling, culturing, testing and examination of microorganisms, and their identification
- observation of the candidate preparing/handling media/samples/cultures; optimising a light microscope for identified samples; classifying organisms and/or performing basic environmental microbiological testing.
- Access is required to all instruments, equipment, materials, workplace documentation, procedures, and specifications associated with this unit including, but not limited to:
 - standard microbiology laboratory with relevant equipment, materials and reagents
 - relevant sampling/testing equipment and materials
 - workplace procedures, sampling/test methods, equipment manuals, safety procedures
 - under duty of care requirements, off-the-job training providers will only use biological samples and organisms of a risk category that is compatible with their laboratory as defined in *AS/NZS 2243.3 Safety in laboratories - Microbiological aspects and containment facilities*.
- 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 competency 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 an organisation providing environmental monitoring, management or technology related services about performing the competency being assessed within the last twelve months.

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