



Australian Government

MSS024010 Perform environmental biological techniques

Release: 1

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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. |
| | | 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. |
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| 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.

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| 3 | Prepare microscope for use | <div>3.1 Select appropriate microscope and attachments for examination and measurements.</div> <div>3.2 Check that all microscope components are clean and fit for purpose.</div> <div>3.3 Mount sample in accordance with specified method.</div> <div>3.4 Adjust settings and alignment of optical and mechanical components to optimise performance.</div> |
| 4 | Perform microscopic examination in accordance with test methods | <div>4.1 Identify microorganisms, cell structures and components of animal/plant tissues in environmental samples.</div> <div>4.2 Measure organisms and structures.</div> <div>4.3 Enumerate microorganisms in environmental samples.</div> |
| 5 | Classify organisms | <div>5.1 Classify organisms into hierarchical structures using appropriate keys.</div> <div>5.2 Record all observations and measurements used to determine classifications.</div> |
| 6 | Relate cell structures and their functions to environmental adaptation | <div>6.1 Identify cell structures from examination of biological specimens.</div> <div>6.2 Associate biological functions with cell structures.</div> <div>6.3 Associate cell physiology and enzyme cycles to environmental adaptation.</div> <div>6.4 Identify important biochemical pathways associated with environmentally significant organisms.</div> |

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

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Links

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