



Australian Government

Department of Education, Employment and Workplace Relations

MSL975008A Apply electrophoretic techniques

Revision Number: 1

MSL975008A Apply electrophoretic techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to analyse samples using electrophoretic techniques. The unit also includes establishing client needs for routine and non-routine samples, optimising enterprise procedures and instruments for specific samples, obtaining valid and reliable data and reporting test results. Personnel are required to recognise atypical test data/results and troubleshoot common analytical procedure and equipment problems.
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Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory technical officers working in all industry sectors. All operations and analytical methods must comply with relevant standards, appropriate procedures and/or enterprise requirements. Although a supervisor may not always be present, the technician will follow standard operating procedures (SOPs) that clearly describe their scope of permitted practice, including varying enterprise/test procedures and communicating results to people outside the laboratory. 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		
	<i>MSL973002A</i>	<i>Prepare working solutions</i>
		OR
	<i>MSL974001A</i>	<i>Prepare, standardise and use solutions</i>
	<i>MSL974003A</i>	<i>Perform chemical tests and procedures</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. Establish client needs and schedule analysis	1.1.Liaise with client or sample provider to determine client needs and sample history 1.2.Record sample description, compare with specification and record and report discrepancies 1.3.Identify non-routine samples and the possible need to vary enterprise procedures 1.4.Seek advice from supervisor about any proposed variations and document all approved changes 1.5.Schedule analysis using enterprise procedures
2. Prepare samples and standards	2.1.Obtain a representative analytical portion of the laboratory sample 2.2.Prepare sample in accordance with testing requirements 2.3.Prepare validation checks for analytical portion
3. Set up and optimise instrument	3.1.Perform pre-use and safety checks in accordance with enterprise procedures 3.2.Start up and condition the instrument using enterprise procedures 3.3.Optimise instrumental parameters to suit sample and test requirements 3.4.Check calibration status of instrument and perform calibration using specified standards and procedures, if applicable
4. Perform analysis	4.1.Measure analyte response for standards, validation checks and samples 4.2.Conduct sufficient measurements to obtain reliable data 4.3.Return instruments to standby or shutdown condition as required
5. Process and analyse data	5.1.Confirm data is the result of valid measurements 5.2.Perform required calculations and ensure results are consistent with standards or estimations and expectations 5.3.Record results with the appropriate accuracy, precision and units 5.4.Analyse trends in data and/or results and report out of specification or atypical results promptly to appropriate personnel 5.5.Troubleshoot analytical procedure or equipment

ELEMENT	PERFORMANCE CRITERIA
	problems which have led to atypical data or results
6. Maintain a safe work environment	6.1. Identify risks, hazards, safety equipment and control measures associated with sample handling, preparation and analytical method 6.2. Use personal protective equipment and safety procedures specified for test method and materials to be tested 6.3. Minimise the generation of wastes and environmental impacts 6.4. Ensure the safe disposal of laboratory wastes 6.5. Clean, care for and store equipment and consumables in accordance with enterprise procedures
7. Maintain laboratory records	7.1. Enter approved data and results into laboratory information management system 7.2. Maintain equipment logs in accordance with enterprise procedures 7.3. Maintain security, integrity and traceability of samples and documentation 7.4. Communicate results to appropriate personnel

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- interpreting client requests, test methods and procedures
- setting up and shutting down equipment safely and following enterprise procedures
- checking the calibration/qualification status of equipment
- preparing standards and samples
- choosing and optimising procedures and equipment settings to suit sample/test requirements
- operating equipment to obtain valid and reliable data
- making approved adjustments to procedures for non-routine samples
- recognising atypical data/results
- identifying potential sources of uncertainty
- troubleshooting common analytical procedure and equipment problems
- applying theoretical knowledge to interpret data and make relevant conclusions
- calculating, recording and reporting data/results in accordance with enterprise procedures
- maintaining security, integrity and traceability of samples and documentation
- following occupational health and safety (OHS) procedures and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- electrophoretic principles and concepts related to instrumentation operation, material preparation and testing
- handling of unstable or hazardous chemicals or samples and/or the fragile/labile nature of biological material
- sample preparation procedures
- function of key components of the equipment
- use of different electrophoresis procedures for analysis of specific samples
- effects on results of modifying instrumental variables, such as field strength, constant current and constant power
- procedures for optimising separation through changing operation parameters, such as buffers, pH and detection methods
- basic procedure and equipment troubleshooting procedures
- preparation and use of calibration charts and/or standards
- calculation procedures to give results in appropriate precision, units and uncertainty

REQUIRED SKILLS AND KNOWLEDGE

- basic equipment maintenance procedures
- enterprise and/or legal traceability requirements
- relevant health, safety and environment requirements

Specific industry

Additional knowledge requirements may apply for different industry sectors. For example:

Biomedical and environmental services:

- techniques that capitalise on biological properties to assist in electrophoretic separations

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:

- interpret client requests, test methods and procedures accurately
- safely set up and shut down equipment using enterprise procedures
- check the calibration/qualification status of equipment
- prepare standards and samples appropriately
- choose and optimise procedures and equipment settings to suit sample/test requirements
- operate equipment to obtain valid and reliable data
- make approved adjustments to procedures for non-routine samples
- recognise atypical data/results
- troubleshoot common analytical procedure and equipment problems
- apply theoretical knowledge to interpret data and make relevant conclusions
- record and report data/results in accordance with enterprise procedures
- maintain security, integrity and traceability of samples and documentation
- follow OHS procedures and principles of GLP.

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.*

Resources may include:

- standard laboratory equipped with routine electrophoresis equipment, laboratory reagents and equipment
- SOPs and testing methods.

Method of assessment

The following assessment methods are suggested:

EVIDENCE GUIDE

- review of test data/results obtained by the candidate over time to ensure accuracy, consistency and timeliness of results
- inspection of test records and workplace documentation completed by the candidate
- feedback from peers and supervisors
- observation of candidate applying a range of electrophoretic techniques
- oral or written questioning of chemical principles and concepts, electrophoretic techniques and enterprise procedures.

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

The advent of DNA typing in the mid-1980s has enormously increased the ability of forensic technicians to identify individuals uniquely by testing a variety of their body fluids found at the crime scene. The samples obtained from the scene are first treated to extract the DNA with short tandem repeated (STR) markers. After isolating the DNA from its cells, specific regions are copied by the polymerase chain reaction (PCR). The resulting PCR products are then separated and detected in order to characterise the STR region being examined. The most common separation methods used today are slab gel and capillary electrophoresis (CE).

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Given the enormous number of DNA samples to be processed, technicians frequently run fully automated injection, separation and detection steps. They use computerised data acquisition to enable rapid analysis and subsequent searching of digital storage of DNA results.

Food processing

Technicians who work in the food and beverage processing industries regularly monitor the purity of food additives, such as dyes and colouring agents in products, such as sweets and soft drinks. For example, technicians may sample a batch of soft drink by low temperature evaporation of a known percentage of the water and then subject the remains to electrophoresis separation technique. In this way, both the identification and concentration of a dye (or other additive) present in the soft drink can be determined. Technicians may also be required to examine the electrophoresis results for any indication of harmful or toxic impurities, which may have inadvertently contaminated the product. Quality control and use of appropriate standards are important components of these analytical procedures.

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 may include:

- Australian and international standards, such as:
 - AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
 - AS/NZS 2243 Set:2006 Safety in laboratories set
 - AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
 - AS/NZS ISO 14000 Set:2005 Environmental management standards set
 - AS/NZS ISO 9000 Set:2008 Quality management systems set
 - AS ISO 1000-1998 The international system of units (SI) and its application
- Australian code of good manufacturing practice for medicinal products (GMP)
- calibration and maintenance schedules
- cleaning, hygiene and personal hygiene requirements
- data quality procedures
- enterprise procedures, SOPs and operating manuals
- enterprise recording and reporting procedures
- equipment startup, operation and shutdown procedures
- incident and accident/injury reports
- material safety data sheets (MSDS)
- material, production and product specifications
- national measurement regulations and guidelines

RANGE STATEMENT	
	• principles of GLP • production and laboratory schedules • quality manuals, equipment and procedure manuals • quality system and continued improvement processes • safety requirements for equipment, materials or products • sampling procedures (labelling, preparation, storage, transport and disposal) • schematics, work flows and laboratory layouts • statutory and enterprise OHS requirements • stock records and inventory • test procedures (validated and authorised) • training program contents • waste minimisation, containment, processing and disposal procedures
Electrophoretic methods, including both analytical and preparative procedures	Electrophoretic methods, including both analytical and preparative procedures, may use: • vertical or horizontal apparatus • support materials, such as cellulose acetate • gels, such as agarose and polyacrylamide • buffer solutions • denaturing electrophoresis, such as SDS-PAGE • blot transfer procedures in conjunction with electrophoresis, such as Western and Southern Blot transfers, agarose and polyacrylamide DNA gels • capillary electrophoresis
Preparation of sample	Preparation of sample may include pre-treatment processes, such as: • identification of any hazardous properties associated with the samples and/or analytical chemicals • grinding, dissolving, extraction, centrifuging, refluxing, evaporation, washing and drying • determination of and, if appropriate, removal of any contaminants, impurities or interfering substances
Tests	Tests may include methods for:

RANGE STATEMENT	
	• control of starting materials, in-process materials and finished products (e.g. food and manufacturing) • therapeutic drug analysis • forensic testing • diagnostic pathology tests • determination of chemical analytes • special conditions for handling minute sample volumes • environmental monitoring • problem solving techniques for non-routine samples • troubleshooting enterprise processes
Common analytical procedure and equipment problems	Common analytical procedure and equipment problems may include: • problems with interfering substances • inappropriate support material or operating procedures • toxic or hazardous materials, including impurities in samples • lack of suitable or high purity reference standards • changes in operating variables, such as field strength, constant current, constant power, buffers and pH • problems with obtaining adequate sample volume
Hazards	Hazards may include: • electric shock • biohazards: • microbiological organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • mycotoxins • chemicals: • acrylamide • acids (e.g. sulphuric, perchloric and hydrofluoric) • hazardous materials, heavy metals,

RANGE STATEMENT	
	pesticides • sharps and broken glassware • aerosols from broken centrifuge tubes and pipetting • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • sources of ignition • disturbance or interruption of services
Addressing hazards	Addressing hazards may involve: • use of MSDS • labelling of samples, reagents, aliquoted samples and hazardous materials • personal protective equipment, such as gloves, safety glasses and coveralls • use of fumehoods and direct extraction of vapours and gases • use of appropriate equipment, such as biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets • use of Class PCII, PCIII and PCIV physical containment laboratories • handling and storage of all hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions
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		