Australian Government

Department of Education, Employment and Workplace Relations

PMLTEST303B Prepare working solutions

Release: 1

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Modification History

Unit Descriptor

This unit of competency covers the ability to prepare working solutions and to check that existing stocks are suitable for use. This unit assumes that calculations of quantities, choice of reagent grades and required dilutions will be specified by the supervisor.
This unit of competency has no prerequisites.
This unit of competency is applicable to laboratory assistants working in all industry sectors. 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 are found at the end of this unit of competency under the section This competency in practice.

Application of the Unit

Licensing/Regulatory Information

Pre-Requisites

Employability Skills Information

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.
Performance Criteria describe the level of performance required to demonstrate achievement of the element.

Elements and Performance Criteria

Elements and Performance Criteria

Element	Performance Criteria
1 Safely use laboratory chemicals, glassware and equipment	1.1 Apply appropriate safety precautions for use of laboratory equipment and hazardous chemical materials
	1.2 Use appropriate laboratory glassware and measuring equipment
	1.3 Clean and store glassware and equipment in

		accordance with enterprise procedures
2	Make up working solutions	2.1 Identify the relevant standard methods for solution preparation
		2.2 Assemble specified laboratory equipment
		2.3 Select and prepare materials and solvent of specified purity
		2.4 Measure appropriate quantities of reagents for solution preparation and record data
		2.5 Measure appropriate quantities of reagents for solution preparation and record data
		2.6 Transfer solutions to appropriately labelled containers
3	Check existing stock of solutions	3.1 Monitor shelf-life of working solutions as per laboratory procedures
		3.2 Replace out-of-date or reject solutions as per laboratory procedures
		3.3 Conduct routine titrimetric analyses, if appropriate, to determine if solutions are fit for purpose.

Required Skills and Knowledge

Evidence Guide

The Evidence Guide describes the underpinning knowledge and skills that must be demonstrated to prove competence.

Critical aspects of competency

Competency must be demonstrated in the ability to perform consistently at the required standard. In particular, the assessor should look to see that the candidate:

uses appropriate materials, equipment and procedures to prepare solutions
follows appropriate OHS (and hygiene, if appropriate) procedures
uses all equipment safely, efficiently and in accordance with enterprise procedures
uses enterprise procedures to calculate concentrations
identifies solutions not fit for use
uses titrations to determine the concentration of solutions
labels, stores and disposes of solutions appropriately
records and present data appropriately.

Underpinning knowledge

Competency includes the ability to apply and explain:

relevant biological, chemical, food and laboratory terminology
basic theory of acids, bases, salts, buffers and neutralisation
enterprise procedures for preparing solutions
calculations required to prepare specified amounts of solutions of specified concentration
appropriate OHS procedure for preparing, handling and disposal of solutions
use of MSDSs
relevant health, safety and environment requirements.

Assessment context and methods

This unit of competency is to be assessed in the workplace or simulated workplace environment.

The following assessment methods are suggested:

inspection of solutions prepared, labelled and stored by the candidate
review of solution records and workplace documentation completed by the candidate
feedback from peers, and supervisors
observation of the candidate preparing working solutions
oral or written questioning.

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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

PMLDATA200A Record and present data
PMLOHS302A Participate in laboratory/field workplace safety.

Resource implications

Resources may include:

standard laboratory equipped with appropriate equipment and reagents
standard operating procedures and testing methods
access to appropriate containers and storage facilities.

This competency in practice

Manufacturing

When starting materials used for the manufacture of common household materials are in transit from the supplier to the manufacturer, they may degrade if subjected to conditions, such as heat, moisture, light and oxygen. Even when the supplier ships quality materials to the manufacturing plant, the materials may be substandard when they arrive. Quality control tests are designed to test starting materials to ensure they are within specification. For example, aspirin forms salicylic acid when stored under adverse conditions. Laboratory assistants prepare and monitor the quality of solutions, such as ferric chloride solution, which gives an intense violet colour when added to salicylic acid but gives no colour with aspirin. Absence of the violet colouration indicates that breakdown of the aspirin hasn't occurred.

Biomedical

A laboratory assistant made up 1 litre of buffer solution using buffer tablets and a 1 litre volumetric flask as specified in the method. To ensure the solution was suitable for use, the assistant measured the pH and found it was within acceptable range. The assistant then appropriately labelled a storage vessel and stored the buffer according to requirements. By following enterprise procedures the shelf life of the buffer was maximised.

Environmental

An environmental laboratory is contracted to determine the acidity of water samples taken from local lakes and streams. A laboratory assistant is required to make up small batches of 0.01M sodium hydroxide and to determine its concentration by titrating it against a standard solution of potassium acid phthalate using phenolphthalein indicator. This procedure is carried out monthly to ensure that the concentration of the sodium hydroxide solution is accurately known. Alternatively, the laboratory assistant may be required to prepare and standardise a fresh batch of sodium hydroxide on a monthly basis. In this case, he/she must understand the underpinning knowledge of basic acid/base theory, potential problems of interferences (such as slow absorption of carbon dioxide by sodium hydroxide solution) so as to ensure that the concentrations of workup solutions are accurately known. He/she must also be skilled in calculating and performing dilution when required to prepare such low concentrations (0.01M) of working solutions.

Key Competencies

The seven key competencies represent generic skills considered for effective work participation. The bracketed numbering against each of the key competencies indicates the performance level required in this unit. These are stand-alone levels and do not correspond to the Australian Qualifications Framework (AQF).

Level (1) represents the competence to undertake tasks effectively

Level (2) represents the competence to manage tasks

Level (3) represents the competence to use concepts for evaluating and reshaping tasks.

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams	Using mathematical ideas and techniques	Solving problems	Using technology
Level 1	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1

Range Statement

The range of variables relates to the unit of competency as a whole. It allows for different work environments and situations that will affect performance.
Where reference is made to industry Codes of Practice, and/or Australian/international standards, it is expected the latest version will be used.
This unit of competency describes the work conducted by supervised laboratory assistants who prepare a range of working solutions for laboratory use. Test solutions include those required to perform laboratory tests. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. These procedures include or have been prepared from:
Australian and international standards, such as:
AS 2162.1 General - volumetric glassware
AS 2163 Laboratory glassware - measuring cylinders
AS 2165 Laboratory glassware - burettes
industry methods, such as American Association of Cereal Chemists (AACC) Solution methods
Codes of Practice, such as GLP and GMP
material safety data sheets (MSDSs)
National Measurement Act
standard operating procedures (SOPs)
equipment manuals
equipment startup, operation and shutdown procedures
calibration and maintenance schedules
quality manuals
enterprise recording and reporting procedures
production and laboratory schedules
material, production and product specifications.
The nature of test solutions will depend on the enterprise and the range of testing carried out.
Typical test solutions may include:
solutions required for diagnostic/analytical and limit tests in food and chemical laboratories, such as sulphates, chlorides, heavy metals
solutions, such as stains for standard diagnostic/analytical procedures in biomedical/environmental laboratories, such as cell staining, fixation of cells and tissues, suspension of cells, titrimetric indicators
solutions required for laboratory maintenance and disinfection, such as 70% ethanol, hypochlorite.
Laboratory equipment may include:
pH meters
balances
magnetic stirrers, waterbaths and hot plates
measuring cylinders, beakers, conical flasks, volumetric flasks, pipettes, burettes
filter papers and funnels
fume cupboards.
Hazards may include:
corrosive chemicals, such as acids and alkalis
sources of heat, such as burners
sharps, broken glassware

spillages.
Safety precautions may include:
use of material safety data sheets (MSDSs)
use of personal protective equipment, such as safety glasses, gloves and coveralls
correct labelling of reagents and hazardous materials
handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
regular cleaning and/or decontamination of equipment and work areas.
Monitoring quality of solutions can include:
noting turbidity to exclude absorption of moisture
noting deposits to exclude microbial contamination or chemical degradation
noting crystals to exclude evaporation
conducting titrations to check concentration
noting colour changes indicating a pH shift with solutions containing indicators
checking expiry dates on solution containers.
Concentration terms may include: % w/w, % w/v, % v/v, ppm (mg/L), molarity.
Health, **safety and environment**
All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.
All operations assume the potentially hazardous nature of samples and require standard precautions to be applied. Users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council and State and Territory Departments of Health. All operations are performed in accordance with standard operating procedures.

Unit Sector(s)