



Australian Government

Department of Education, Employment and Workplace Relations

MSL973002A Prepare working solutions

Revision Number: 1

MSL973002A Prepare working solutions

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare working solutions and to check that existing stocks are suitable for use. Calculations of quantities, choice of reagent grades and required dilutions will be specified by the supervisor.
------------------------	--

Application of the Unit

Application of the unit	<p>This unit of competency is applicable to laboratory assistants working in all industry sectors. Test solutions include those required to perform laboratory tests.</p> <p>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'.</p>
--------------------------------	--

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.
-----------------------------	--

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.
---	--

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Safely use laboratory chemicals, glassware and equipment	<ul style="list-style-type: none">1.1. Apply appropriate safety precautions for use of laboratory equipment and hazardous chemical materials1.2. Use appropriate laboratory glassware and measuring equipment1.3. Clean and store glassware and equipment in accordance with enterprise procedures
2. Make up working solutions	<ul style="list-style-type: none">2.1. Identify the relevant standard methods for solution preparation2.2. Assemble specified laboratory equipment2.3. Select and prepare materials and solvent of specified purity2.4. Measure appropriate quantities of reagents for solution preparation and record data2.5. Prepare labels and log solution details in laboratory register2.6. Transfer solutions to appropriately labelled containers
3. Check existing stock of solutions	<ul style="list-style-type: none">3.1. Monitor shelf life of working solutions according to laboratory procedures3.2. Replace out-of-date or reject solutions according to laboratory procedures3.3. Conduct routine titrimetric analyses, if appropriate, to determine if solutions are fit for purpose

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- using appropriate materials, equipment and procedures to prepare solutions
- following appropriate occupational health and safety (OHS), and hygiene procedures, if appropriate
- using all equipment safely and efficiently
- using enterprise procedures to calculate concentrations
- identifying solutions not fit for use
- using titrations to determine the concentration of solutions
- labelling, storing and disposing of solutions appropriately
- recording and presenting data appropriately

Required knowledge

Required knowledge includes:

- relevant biological, chemical, food and laboratory terminology
- principles of metrology
- the international system of units (SI)
- concentration terms, such as % w/w, % w/v, % v/v, ppm (mg/L) and molarity
- 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 material safety data sheets (MSDS)
- 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:

- prepare working solutions in compliance with relevant standards, appropriate procedures and/or enterprise requirements
- follow OHS procedures to safely use laboratory chemicals glassware and equipment
- make up working solutions according enterprise procedures
- check existing stocks of solutions as being fit for purpose.

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:

- *MSL922001A Record and present data*
- *MSL943002A Participate in laboratory/field workplace safety.*

Resources may include:

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

Method of assessment

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

EVIDENCE GUIDE

	<p>directly.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</p> <p>Access must be provided to appropriate learning and/or assessment support when required.</p> <p>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.</p>
This competency in practice	<p>Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and show its relevance in a workplace setting.</p> <p>Manufacturing</p> <p>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 sub-standard 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.</p> <p>Biomedical</p> <p>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.</p>

EVIDENCE GUIDE**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.

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 2163-2000 Laboratory glassware - Measuring cylinders
 - AS 2165-1996 Laboratory glassware - Burettes AS 2162.1-1996 Verification and use of volumetric apparatus - General - Volumetric glassware
 - AS ISO 1000-1998 The international system of units (SI) and its application
 - AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
 - AS/NZS 2243 Set:2006 Safety in laboratories set
- Australian code of good manufacturing practice for medicinal products (GMP)
- calibration and maintenance schedules
- enterprise recording and reporting procedures
- equipment manuals
- equipment startup, operation and shutdown procedures
- MSDS and safety procedures
- material, production and product specifications
- national measurement regulations and guidelines
- principles of good laboratory practice (GLP)
- production and laboratory schedules
- quality manuals

RANGE STATEMENT	
	<ul style="list-style-type: none"> • standard operating procedures (SOPs)
Concepts of metrology	<p>Concepts of metrology may include:</p> <ul style="list-style-type: none"> • that all measurements are estimates • measurements belong to a population of measurements of the measured parameters • repeatability • precision • accuracy • significant figures • sources of error • uncertainty • traceability
Typical test solutions	<p>Typical test solutions may include:</p> <ul style="list-style-type: none"> • solutions required for diagnostic/analytical and limit tests in food and chemical laboratories, such as sulphates, chlorides and 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 and titrimetric indicators • solutions required for laboratory maintenance and disinfection, such as 70% ethanol and hypochlorite
Laboratory equipment	<p>Laboratory equipment may include:</p> <ul style="list-style-type: none"> • pH meters • balances • magnetic stirrers, water baths and hot plates • measuring cylinders, beakers, conical flasks, volumetric flasks, pipettes and burettes • filter papers and funnels • fume cupboards
Hazards	<p>Hazards may include:</p> <ul style="list-style-type: none"> • corrosive chemicals, such as acids and alkalis • sources of heat, such as burners • sharps and broken glassware • spillages
Safety precautions	<p>Safety precautions may include:</p>

RANGE STATEMENT	
	<ul style="list-style-type: none"> • use of MSDS • 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, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Monitoring quality of solutions	<p>Monitoring quality of solutions may include:</p> <ul style="list-style-type: none"> • 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
Occupational health and safety (OHS) and environmental management requirements	<p>OHS and environmental management requirements:</p> <ul style="list-style-type: none"> • 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
--------------------	---------

Competency field

Competency field	
-------------------------	--

Co-requisite units

Co-requisite units		