



Australian Government

Department of Education, Employment and Workplace Relations

PMLTEST406A Perform physical tests

Release: 1

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Modification History

Unit Descriptor

This unit of competency covers the ability to interpret physical test requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine physical tests. These tests will involve several measurement steps. The unit includes data processing and interpretation of results and tracking of obvious test malfunctions where the procedure is standardised. However, personnel are not required to analyse data, optimise tests/procedures for specific samples or troubleshoot equipment problems where the solution is not apparent. This unit of competency is based on, and is equivalent to, the unit **PMLTEST402A Perform non instrumental tests/procedures**.

This unit of competency has no prerequisites.

This unit of competency is applicable to laboratory or technical assistants and instrument operators working in the manufacturing, environment, food and construction materials 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 Interpret and schedule test requirements	1.1 Review test request to identify samples to be tested, test method and equipment/instruments involved 1.2 Identify hazards and enterprise control measures associated with the sample, preparation/test methods and/or equipment 1.3 Plan work sequences to optimise throughput of multiple samples (if appropriate).
2 Receive and prepare samples	2.1 Log samples using standard operating procedure 2.2 Record sample description, compare with specification and note and report discrepancies 2.3 Prepare samples and standards in accordance with physical testing requirements 2.4 Ensure traceability of samples from receipt to reporting of results
3 Check equipment before use	3.1 Set up equipment/instruments in accordance with test method requirements 3.2 Perform pre-use and safety checks in accordance with relevant enterprise and operating procedures 3.3 Identify faulty or unsafe components and equipment and report to appropriate personnel 3.4 Check equipment calibration using specified procedures (if applicable) 3.5 Quarantine out-of-calibration equipment/instruments
4 Test samples to determine physical properties	4.1 Operate equipment/instruments in accordance with test method requirements 4.2 Perform tests/procedures on all samples and standards (if appropriate) in accordance with specified methods

- 4.3 Shut down equipment/instruments in accordance with operating procedures
- 5 Process and interpret data
 - 5.1 Record test data noting atypical observations
 - 5.2 Ensure calculated values are consistent with expectations
 - 5.3 Record and report results in accordance with enterprise procedures
 - 5.4 Interpret trends in data and/or results and report 'out-of-specification' or atypical results promptly to appropriate personnel
 - 5.5 Determine if obvious procedure or equipment problems have led to atypical data or results
- 6 Maintain a safe work environment
 - 6.1 Use established safe work practices and personal protective equipment to ensure personal safety and that of other laboratory personnel
 - 6.2 Minimise the generation of wastes and environmental impacts
 - 6.3 Ensure the safe collection of laboratory and hazardous waste for subsequent disposal
 - 6.4 Care for and store equipment and materials as required
- 7 Maintain laboratory records
 - 7.1 Enter approved data into laboratory information management system
 - 7.2 Maintain confidentiality and security of enterprise information and laboratory data
 - 7.3 Maintain equipment and calibration logs in accordance with enterprise procedures.

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, assessors should look to see that the candidate:

interprets test methods/procedures accurately

prepares and tests samples in accordance with specified methods

performs calibration checks (if required)

safely operates test equipment/instruments to enterprise standards and/or manufacturer's specifications

applies basic knowledge of physical properties of materials to interpret gross features of data and make relevant conclusions

identifies atypical results, such as 'out of normal' range or an artefact

traces and sources obvious causes of an artefact

communicates problem(s) to a supervisor or outside service technician

records and communicates results in accordance with enterprise procedures

maintains security, integrity and traceability of samples, sub-samples, test data/results and documentation.

Underpinning knowledge

Competency includes the ability to apply and explain:

physical principles and concepts underpinning the test/procedure, such as:

matter, interatomic and intermolecular forces, states of matter

mass, weight, forces, pressure, energy

properties of gases, pressure/volume/temperature, density, diffusion, compressibility

cohesive/adhesive forces, hydrostatic pressure, fluid flow, viscosity, friction

thermal expansion, thermal conductivity, coefficients of expansion

changes of state, energy content, enthalpy change, endothermic and exothermic processes

electromagnetic spectrum, primary/secondary colours, reflection, refraction diffraction,

interference of light

electrical concepts, including electric field, voltage, current, resistance, AC/DC

(electro)magnetic concepts, including magnetic field and flux, electromagnetic induction

sound concepts, including wave properties, amplitude, frequency, loudness dB

use of instruments for qualitative and/or quantitative analysis

purpose of test(s)

metrology techniques underpinning test/procedure

principles and concepts related to equipment/instrument operation and testing

function of key components of the equipment/instrument

effects on test of modifying equipment/instrument variables

sample preparation procedures

basic equipment/method troubleshooting procedures

use of calibration procedures

calculation steps to give results in appropriate units and precision

enterprise and/or legal traceability requirements

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:

review of test data/results obtained by the candidate over a period of time to check accuracy, consistency and timeliness of results

review of test records and workplace documentation completed by the candidate

observation of candidate conducting a range of physical tests and procedures and sample preparation

feedback from peers and supervisors

oral or written questioning of physical principles and concepts, test methods 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. Questioning techniques should suit the language and literacy levels of the candidate.

Interdependent assessment of unit

This unit of competency may be assessed with:

PMLDATA400A Process and interpret data.

Resource implications

Resources may include:

standard laboratory equipped with appropriate test equipment/instruments, standards and materials

enterprise procedures and standard methods.

This competency in practice**Manufacturing**

A technical assistant was measuring the specific density of a shipment of glycerol using a standard laboratory procedure. The result did not agree with the manufacturer's certificate of analysis. The assistant notified the manufacturer who came to the plant and checked the delivered material. It had been raining while the glycerol was in transit and rain water had entered the drum, diluting the glycerol. The drum was returned to the manufacturer and a new drum was supplied to the manufacturing plant. The manufacturer investigated the seals on the glycerol drums and took action to ensure that new seals would protect the product in transit.

Food processing

A technician was testing the melt flow index of a new type of polymer that was to be used as a sealant for packages of freeze dried coffee. The technician measured the melt flow rate and found it was much too high. The technician then checked the melt flow equipment as per the manufacturer's directions and found the machine was out of calibration. After recalibration using recommended standards, another sample was obtained and retested. This time, the polymer was within specification and was released for use in production.

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 levels in 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, Communic Planning Working Using Solving Using

analysing and organising information	ating ideas and information	and organising activities	with others and in teams	mathematic al ideas and techniques	problems	technology
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Level 2	Level 1	Level 2	Level 1	Level 2	Level 2	Level 2
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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.

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 ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

AS 2243.7 Safety in Laboratories - electrical aspects

ISO 9000 series Quality management and quality assurance standards

Codes of Practice (such as GLP and GMP)

National Measurement Act

material safety data sheets (MSDSs)

standard operating procedures (SOPs)

quality manuals, equipment and procedures manuals

equipment startup, operation and shutdown procedures

calibration and maintenance schedules

data quality procedures

enterprise recording and reporting procedures

production and laboratory schedules

material, production and product specifications.

Preparation of samples may include processes, such as:

drying, washing, grinding, sieving, melting, moisture conditioning

cutting, trimming or machining of test specimens, etching.

Physical tests and procedures may include:

precise measurement of position, orientation and dimensions, such as:

3D set up of manufacturing tools using inclinometers, verniers, laser

thickness using vernier, X-ray, gamma ray

particle size using sieving, laser

dimensional stability involving expansion, contraction, weathering

movement using strain gauge, accelerometer

mass, density and specific gravity, such as:

moisture/density relationship

compaction

loose and compacted density

thermal tests, such as:

thermal conductivity

coefficients of expansion (for example, linear, volume)

melt flow index

calorimetry, (for example, specific heat, latent heat)

combustion properties (for example, enthalpy, energy content)

drying times

thermal stability of products

optical tests, such as:

flatness, surface finish

refractive index
optical rotation
transmission/absorption of filters
colour matching of products
acoustic tests, such as:
absorption, reflection, transmission
intensity, attenuation, loudness (dB)
amplitude, frequency
electrical tests, such as:
conductance, resistance, insulation
temperature dependence of dielectrics
magnetic tests, such as:
permeability
retentivity, hysteresis loss, coercivity
intrinsic induction.

Tests may include methods for:

control of starting materials, in-process materials and finished products
investigation of sources of construction materials
basic troubleshooting of enterprise processes.

Hazards may include:

microbiological organisms and agents, associated with soil, air, water
chemicals, such as acids and solvents
radiation, such as alpha, beta, gamma, X-ray, neutron
sharps, broken glassware and hand tools
flammable liquids and gases
cryogenics, such as dry ice and liquid nitrogen
fluids under pressure, such as steam, industrial gases
sources of ignition
burners, ovens
disturbance or interruption of services
crushing, entanglement, cuts associated with moving machinery (grinders).

Hazard control measures may include:

ensuring access to service shut-off points
recognising and observing hazard warnings and safety signs
labelling of samples, and hazardous materials
handling and storage of hazardous materials and equipment in accordance with labelling,
materials safety data sheets and manufacturer's instructions
identifying and reporting operating problems or equipment malfunctions
cleaning equipment and work areas regularly using enterprise procedures
using personal protective clothing and equipment, such as gloves, safety glasses, coveralls,
and safety boots
following established manual handling procedures
reporting abnormal emissions, discharges and airborne contaminants, such as noise, light,
solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to
appropriate personnel.

Records may include:

test and calibration results
equipment use, maintenance and servicing history

faulty or unsafe equipment.

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 potential 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)