

Specification of Competency Standards
for the Testing, Inspection and Certification Industry
Unit of Competency

Functional Area - Testing Operations

Title	Apply inductively coupled plasma spectroscopic techniques to chemical testing
Code	105786L4
Range	This unit of competency (UoC) covers the abilities to optimise and operate instruments associated with inductively coupled plasma (ICP) independently, record and analyse test data accurately for chemical analysis by applying the ICP spectroscopic principles and techniques in testing laboratories.
Level	4
Credit	6 (For Reference Only)
Competency	<p>Performance Requirements</p> <p>1. Possess knowledge of working mechanisms of ICP techniques, procedures and its precautions</p> <ul style="list-style-type: none"> • Apply the principles of atomisation, ionisation and excitation mechanisms within inductively coupled plasma. • Describe the construction of ICP instruments including: <ul style="list-style-type: none"> ○ inductively coupled plasma-atomic/optical emission spectrometer (ICP-AES/OES), ○ inductively coupled plasma-mass spectrometer (ICP-MS). • Explain the functions of key components of ICP-MS instruments, e.g. plasma torch, collision cell, interface, mass analyser, mass detector. • Describe the operation, interface, selectivity, sensitivity, linear range, typical applications and interferences (e.g. spectral interferences) of ICP-AES/OES and ICP-MS instruments. • Describe the procedures of carrying out routine performance check of ICP instruments. • Identify the maintenance requirements of mass spectrometer in ICP-MS instrument. • Outline the steps of applying ICP spectroscopic techniques for identifying and quantifying analytes to give results in appropriate accuracy, precision, uncertainty and units. • Differentiate the applications of various types of ICP spectroscopic techniques for qualitative and quantitative analysis according to the nature and characteristics of samples and analytes. • Identify risks, hazards, safety equipment and control measures associated with the use of ICP and the test method. • Apply the concepts of uncertainty and instrument calibration to ICP spectroscopic analysis. <p>2. Apply and operate ICP-AES/OES and/or ICP-MS systems for chemical analysis</p> <ul style="list-style-type: none"> • Determine the test request and identify sample characteristics that may affect the chemical analysis. • Select appropriate test method and ICP instrument in compliance with test requirements. • Carry out routine performance check of the selected ICP instrument according to manufacturer's instruction and/or relevant standard to ensure it is ready for chemical analysis. • Set up the ICP instrument by configuring the sample introduction, plasma torch and detector sub-systems and check vacuum pressures, gas flow and torch cooling before igniting the torch. • Optimise the performance of the ICP instrument to achieve the required specification by using appropriate calibration standards and adjusting instrumental operating parameters. • Determine the appropriateness of the sample for the ICP instrument.

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	<ul style="list-style-type: none"> • Carry out ICP spectroscopic analysis on the sample independently and safely according to the test method by measuring analyte responses for standards, validation and quality control checks, and the sample. • Record accurate and reliable ICP spectroscopic data by conducting sufficient measurements. • Analyse ICP spectroscopic data for chemical analysis. <p>3. Exhibit professionalism</p> <ul style="list-style-type: none"> • Troubleshoot analytical procedures or ICP instruments in case of any atypical observations/data/results being identified during sample analysis or performance check. • Ensure integrity and confidentiality of laboratory data and information by observing the code of conduct of the laboratory.
Assessment Criteria	<p>The integrated outcome requirements of this UoC are the abilities to:</p> <ul style="list-style-type: none"> • apply, optimise and operate the inductively coupled plasma spectroscopic instrument independently and safely to carry out chemical analysis of the sample according to the test method and sample characteristics, • record accurate and reliable ICP spectroscopic data by conducting sufficient measurements, • analyse ICP spectroscopic data by verifying validation and quality control check data.
Remark	<p>Practitioners are required to have prior knowledge of the following UoCs:</p> <ul style="list-style-type: none"> • Apply atomic spectrometric