

Title	Demonstrate spectroscopic techniques		
Level	6	Credits	6

Purpose	People credited with this unit standard are able to: make and interpret measurements using UV-visible absorption spectrophotometry; demonstrate a flame technique; demonstrate infrared spectroscopy; and demonstrate fluorescence techniques.
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Classification	Science > Chemistry
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Available grade	Achieved
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Guidance Information

- All work must be carried out in accordance with the quality management system, documented protocol system or Standard Operating Procedures typically acceptable in a commercial or research laboratory.
- Health and Safety practices must conform to Australian/New Zealand Standard AS/NZS 2243:2010 Set – *Safety in Laboratories*, available at <http://www.standards.co.nz> and <http://infostore.saiglobal.com/store>. In order to assess against this unit standard, laboratories must meet the requirements of AS/NZS 2243.
- Legislation applicable to this unit standard includes:
Health and Safety at Work Act 2015;
Hazardous Substances and New Organisms Act 1996.
- Knowledge underpinning the competencies in this unit standard includes but is not limited to:
 - properties of light and radiant energy;
 - nature of emission and absorption spectra;
 - Beer-Lambert Law;
 - structural organic chemistry;
 - atomic theory;
 - block diagrams of instruments and principles of operation;
 - near infra-red techniques;
 - molecular orbital theory.
- Spectroscopic techniques are: UV-visible; atomic absorption and emission; infrared, fluorescence.

6 Glossary

Certified reference value is a value traceable to a national or international standard.

Outcomes and performance criteria

Outcome 1

Make and interpret measurements using UV-visible absorption spectrophotometry.

Performance criteria

- 1.1 Wavelength for analysis is chosen by scanning, spectrophotometer is set, and calibration solutions are prepared to cover appropriate concentration range.
- 1.2 Concentration or identity of unknown solution is determined consistent with results and calibration plotting.
- 1.3 The UV-visible spectra are described in terms of molecular orbitals.

Outcome 2

Demonstrate a flame technique.

Range one of – atomic emission, atomic absorption.

Performance criteria

- 2.1 Technique is selected, justified, and performed using a calibration curve to meet the needs of the analysis.
- 2.2 Actions are taken to avoid potential sources of interference in terms of the analysis carried out.
- 2.3 An explanation is provided in terms of the reasons and remedies for abnormal results arising from interferences.

Range may include – chemical, ionisation, spectral, matrix;
background – deuterium lamp, Zeeman.
- 2.4 Concentration of sample is determined consistent with results of analysis.

Outcome 3

Demonstrate infrared spectroscopy.

Performance criteria

- 3.1 Sample is prepared using the most suitable method for sample in accordance with laboratory procedure.

Range may include – neat liquid, solution, mull, potassium bromide (KBR) disc, gas, Attenuated Total Reflection (ATR).

3.2 The spectrum is interpreted and identified by functional group absorbance.

Outcome 4

Demonstrate fluorescence techniques.

Performance criteria

- 4.1 A set of four standard solutions is prepared to cover the range of the unknown solution in accordance with laboratory procedure.
- 4.2 Emission and excitation wavelengths are chosen in order to select optimal wavelengths.
- 4.3 Intensities of standard samples are measured and examined for concentration quenching for the analyte used.
- 4.4 Comparison is established between the sample quantified from the calibration curve and the certified reference value.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	22 December 1996	31 December 2014
Revision	2	19 February 1998	31 December 2014
Review	3	23 November 1999	31 December 2014
Review	4	18 June 2010	31 December 2022
Rollover	5	27 January 2015	31 December 2022
Rollover and Revision	6	15 June 2017	31 December 2022
Revision	7	26 October 2017	31 December 2022
Review	8	22 October 2020	31 December 2022

Consent and Moderation Requirements (CMR) reference	0113
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.