

Title	Demonstrate knowledge of acid-base pH measurement and equilibria		
Level	4	Credits	5

Purpose	People credited with this unit standard are able to: describe maintenance of a pH meter; describe operation principles of, and calibrate, a pH meter; describe the reactions of acids and bases with water; explain the behaviour of buffer solutions; produce titration curves for acid-base titrations; and describe the action of acid-base indicators.
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Classification	Science > Chemistry
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Available grade	Achieved
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Guidance Information

- 1 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.
- 2 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>.
- 3 Legislation applicable to this unit standard includes:
Health and Safety at Work Act 2015;
Hazardous Substances and New Organisms Act 1996.
- 4 Accuracy for calibration and pH measurements is ± 0.2 pH units.
- 5 Glossary
Laboratory procedures refer to documented systems or processes of operation, which may be found in a SOP manual, quality management system or protocol system documentation. These procedures are external and/or internal laboratory requirements governing laboratory work.

Outcomes and performance criteria

Outcome 1

Describe maintenance of a pH meter.

Performance criteria

- 1.1 Maintenance of a pH meter including the electrodes are described in accordance with manufacturer's instructions.

Outcome 2

Describe operation principles of, and calibrate, a pH meter.

Performance criteria

- 2.1 The principles of operation of a pH meter are described in terms of its components.
- Range glass electrode, reference electrode, mV scale, buffer.
- 2.2 Buffer solutions are selected over a relevant range to perform a two-point calibration, and the pH meter is calibrated in accordance with manufacturer's instructions.
- Range known, unknown.

Outcome 3

Describe the reactions of acids and bases with water.

Performance criteria

- 3.1 Cations are described in terms of their ability to act as acids.
- 3.2 Anions are described in terms of their ability to act as acids or bases.
- 3.3 The behaviour of acids and bases are described in terms of their reaction with water.

Outcome 4

Explain the behaviour of buffer solutions.

Performance criteria

- 4.1 Buffer solutions are explained in terms of composition and action.
- 4.2 Buffer solutions are explained in terms of the procedures for calculating the pH.

Outcome 5

Produce titration curves for acid-base titrations.

- Range strong acid and strong base, weak acid and strong base, weak base and strong acid, polyprotic acid or its ion with strong base.

Performance criteria

- 5.1 The titration curves are produced in accordance with laboratory procedures.
- 5.2 Theoretical values are identified and calculated in relation to the titration curve.
- Range initial pH, pH at equivalence point;
must include where applicable – buffer range, pKa points.

Outcome 6

Describe the action of acid-base indicators.

Performance criteria

- 6.1 Acid-base indicators are described in terms of the acid and conjugate base colour.
- 6.2 The appropriate indicator for a titration is identified using pKa values.

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	24 September 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>.