Title	**Describe and apply chemistry fundamentals used in a laboratory in a primary products food processing operation**		
Level	**3**	**Credits**	**5**

Purpose	People credited with this unit standard are able to: describe chemical elements and structures, formulae, reactions, and chemical concentrations used; describe and perform titration tests in a laboratory; describe and use laboratory instruments; perform chemistry tests in a laboratory, in a primary products food processing operation.

Classification	Primary Products Food Processing > Primary Products Food Processing - Operational Skills

Available grade	Achieved

Guidance Information

1 Legislation and references relevant to this unit standard include but are not limited to:
- Hazardous Substances and New Organisms Act 1996;
- Health and Safety at Work Act 2015;
- Health and Safety in Employment Regulations 1995;
- Resource Management Act 1991;
- NZS ISO/IEC 17025:2018 *General requirements for the competence of testing and calibration laboratories*, available at http://www.standards.co.nz; and any subsequent amendments.

2 Definitions
Chemical concentrations – The quantity of solute (dissolved substance) present in a solvent (dissolving liquid) that combine to form a solution.
Chemical formulae – the chemical proportions of atoms that constitute a particular chemical compound or molecule.
Chemical structures – in their basic form, elements are composed of molecules, and molecules are composed of atoms.
Chemical reactions – the process where one or more substances are transformed to different substances.
Organisational requirements – instructions to staff on policies and procedures which are documented in memo, electronic or manual format and are available in the workplace.
Primary products food processing operation – covers a meat, dairy, seafood, fruit and vegetable and honey processing, food and beverage manufacturing, and other related industries.

3 All evidence presented in this unit standard must be in accordance with organisational requirements.

Outcomes and performance criteria

Outcome 1

Describe chemical elements and structures, formulae, reactions, and chemical concentrations used in a primary products food processing operation.

Performance criteria

1.1 Describe an element and an atom in terms of their differences.

1.2 Describe formulae for common chemicals used in the laboratory.

Range evidence of three common chemicals is required.

1.3 Describe chemical reactions completed under experimental conditions in terms of their main features.

Range chemical reactions may include but are not limited to – metals and water, solubility and precipitation, heating metals, carbon dioxide test;
evidence of four chemical reactions is required.

Outcome 2

Describe and perform titration tests in a laboratory in a primary products food processing operation.

Performance criteria

2.1 Describe titration in terms of the critical factors which affect it.

Range critical factors may include but are not limited to – concentration of solutions, chemical reactions that take place, measuring the end point;
evidence of two is required.

2.2 Derive molarity for HCI, NaOH and AgNO3 solutions.

2.3 Standardise a 0.1 Molar solution of NaOH.

2.4 Perform a titration test.

2.5 Describe the chemical formulae for the reactions of titration tests in terms of their effects on food products.

Outcome 3

Describe and use laboratory instruments in a primary products food processing operation.

Range instruments may include but are not limited to – Flow injection analysis (FIA), Gas chromatography (GC), GC with mass spec detection GCMS, High performance liquid chromatography (HPLC), Liquid chromatography with mass spec detection (LCMS), Inductively Coupled Plasma optical emission spectroscopy (ICPOES) and Inductively Coupled Plasma with mass spec detection (ICPMS), X Ray fluorescence (XRF), nuclear magnetic resonance (NMR), Enzyme linked immunosorbent assay (ELISA), Thermogravimetric Analysis (TGA);
evidence of two instruments is required

Performance criteria

3.1 Describe the basic design of instruments in terms of their main features.

3.2 Calibrate instruments in accordance with the manufacturer's specifications.

3.3 Perform tests on each instrument.

Outcome 4

Perform chemistry tests in a laboratory in a primary products food processing operation.

Performance criteria

4.1 Perform product tests.

Range evidence of two tests is required.

4.2 Calculate and record test results and compare results for consistency.

4.3 Describe protein tests in terms of the test method used and their relationship with food processing.

Range evidence of two tests is required.

4.4 Follow up or report any non-conformance.

4.5 Formulate solutions to meet the requirements of the job tasks in the workplace.

Replacement information	This unit standard replaced unit standard 4312.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	17 September 2015	31 December 2021
Review	2	24 October 2019	31 December 2024
Reinstatement	3	24 March 2022	N/A

Consent and Moderation Requirements (CMR) reference	0033

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Hanga-Aro-Rau Manufacturing, Engineering, and Logistics Workforce Development Council qualifications@hangaarorau.nz if you wish to suggest changes to the content of this unit standard.