

## Achievement Standard

|                            |   |                               |                  |
|----------------------------|---|-------------------------------|------------------|
| <b>Subject Reference</b>   | Chemistry 3.1   |                               |                  |
| <b>Title</b>               | Carry out an investigation in chemistry involving quantitative analysis |                               |                  |
| <b>Level</b>               | 3   | <b>Credits</b>                | 4                |
|                            |   | <b>Assessment</b>             | Internal         |
| <b>Subfield</b>            | Science   |                               |                  |
| <b>Domain</b>              | Chemistry   |                               |                  |
| <b>Status</b>              | Registered  | <b>Status date</b>            | 04 December 2012 |
| <b>Planned review date</b> | 31 December 2020  | <b>Date version published</b> | 17 November 2016 |

This achievement standard involves carrying out an investigation in chemistry involving quantitative analysis.

### Achievement Criteria

| Achievement  | Achievement with Merit  | Achievement with Excellence   |
|--|---|---|
| <ul style="list-style-type: none"> <li>Carry out an investigation in chemistry involving quantitative analysis.</li> </ul> | <ul style="list-style-type: none"> <li>Carry out an in-depth investigation in chemistry involving quantitative analysis.</li> </ul> | <ul style="list-style-type: none"> <li>Carry out a comprehensive investigation in chemistry involving quantitative analysis.</li> </ul> |

### Explanatory Notes

- 1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to the Material World achievement objective:

Investigate and measure the chemical and physical properties of a range of groups of substances.

It is also related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education, 2010 at <http://seniorsecondary.tki.org.nz>.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* achievement objectives to which this standard relates, see the [Papa Whakaako](#) for the relevant learning area.

Procedures outlined in *Safety and Science: a Guidance Manual for New Zealand Schools*, Learning Media, Ministry of Education, 2000, should be followed.

- 2 *Carry out an investigation in chemistry* involves:
- exploring a possible trend or pattern in the quantity of substance in a sample

- developing and carrying out a procedure to collect data about a possible trend or pattern in the quantity of a substance
- collecting and recording a sufficient quantity of data to enable a conclusion to be reached
- processing of the data to reach a conclusion
- presenting a report that contains:
  - a statement of the purpose of the investigation
  - a description of the procedure that includes preparation of samples and the analytical technique used
  - a summary of the collected and processed data
  - a conclusion based on the processed data.

*Carry out an in-depth investigation in chemistry involves:*

- collection of quality data which includes standardising the standard solution(s) and control of significant variables
- accurate processing of the data to reach a valid conclusion
- providing evidence of the mathematical steps used to process the experimental data
- presenting a report that contains:
  - a description of the procedure in sufficient detail for the investigation to be duplicated
  - a conclusion that links the processed data to the purpose of the investigation
  - an explanation of how the procedure used contributed to the collection of quality data.

*Carry out a comprehensive investigation in chemistry involves:*

- accurate processing of the data using appropriate significant figures and units
- presenting a report that shows evidence of:
  - justifying the steps used in the procedure in relation to the reaction(s) occurring and to the nature of the samples being analysed
  - a comprehensive evaluation of the investigation that includes a selection from:
    - evaluation of the reliability of the data by considering the procedure used and possible sources of error
    - justification of how the processed data supports the conclusion(s)
    - linking the conclusion(s) to chemical principles and/or real life applications.

- 3 A logbook needs to be kept throughout the investigation. The logbook contains details of the development of the purpose, procedure, raw data, and calculations.
- 4 Instructions may be provided for an analytical technique that may be used in a school laboratory, or equivalent.
- 5 The investigation is based on an analytical technique such as titration (acid-base or redox) or colorimetry.
- 6 To enable a conclusion to be reached titre data values of at least 5 mL are required or for colorimetry the range of the standard curve must be appropriate.
- 7 Conditions of Assessment related to this achievement standard can be found at [www.tki.org.nz/e/community/ncea/conditions-assessment.php](http://www.tki.org.nz/e/community/ncea/conditions-assessment.php).

**Replacement Information**

This achievement standard replaced unit standard 6341 and AS90694.

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**Quality Assurance**

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference

0233