# Achievement Standard

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| **Subject Reference** | Chemistry 3.2 |
| **Title** | Determine the concentration of an oxidant or reductant by titration |
| **Level** | 3 |
| **Credits** | 2 |
| **Assessment** | Internal |
| **Subfield** | Science |
| **Domain** | Chemistry |
| **Registration date** | 23 November 2005 |
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This achievement standard involves individually carrying out a titration involving an oxidation-reduction reaction, and calculating the concentration of the oxidant or reductant in the solution.

**Achievement Criteria**

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| • Carry out an oxidation-reduction titration with limited precision.<br>• Calculate the concentration of the oxidant or reductant using titration data. | • Carry out an oxidation-reduction titration with reasonable precision.<br>• Determine the composition of the sample being analysed. | • Carry out an oxidation-reduction titration with high precision.<br>• Accurately calculate the composition of the sample being analysed. |

**Explanatory Notes**

1 This achievement standard is derived from *Chemistry in the New Zealand Curriculum*, Learning Media, Ministry of Education, 1994, p. 28, achievement objectives 8.1, 8.2 and 8.3.

2 The titration procedure and balanced equation will be provided.

3 In the calculation of the concentration of the oxidant or reductant or composition of the sample, the titration data used may be that collected by the student or that provided by the assessor.

4 Determination of the composition of the sample will involve one mathematical conversion between the concentration of the solution analysed and the composition of the sample, eg:

- concentration of the sample before dilution
- concentration in grams per litre (g $L^{-1}$) or % (w/v).
- % composition (or purity) of a solid.

5 This note provides more detailed guidance on the evidence expected for each phase of the assessment.

- For achievement
  *Limited precision* requires:
  - at least two recorded titre values must fall within a range of 0.6 mL; the average titre value must be within 0.6 mL of the expected outcome.

  *Calculate the concentration* requires:
  - using only titre values within a range of 0.6 mL to calculate the average volume
  - the calculation of the concentration of the unknown solution must be carried out using an appropriate procedure (not provided). A minor numerical error is allowed.
- For achievement with merit
  *Reasonable precision* requires:
  - at least three recorded titre values must fall within a range of 0.4 mL; the average titre value must be within 0.4 mL of the expected outcome.

  *Determine the composition of the sample* requires:
  - using only titre values within a range of 0.4 mL to calculate the average volume
  - the composition of the sample being determined using a correct procedure.
- For achievement with excellence
  *High precision* requires:
  - at least three recorded titre values must fall within a range of 0.2 mL; the average titre value must be within 0.2 mL of the expected outcome.

  *Accurately calculate the composition of the sample* requires:
  - using only titre values within a range of 0.2 mL to calculate the average volume
  - correctly determining the composition of the sample, using correct units and appropriate number of significant figures
  - evidence of being able to carry out calculations involving reactions where the reactants are not in a 1:1 mole ratio.

**Quality Assurance**

1 Providers and Industry Training Organisations must be accredited by the Qualifications Authority before they can register credits from assessment against achievement standards.

2 Accredited providers and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Accreditation and Moderation Action Plan (AMAP) reference 0226