Achievement Standard

Subject Reference	Chemistry 3.7				
Title	Describe properties of aqueous systems				
Level	3	**Credits**	5	**Assessment**	External
Subfield	Science				
Domain	Chemistry				
Registration date	23 November 2005	**Date version published**	23 November 2005		

This achievement standard involves describing properties of aqueous systems using equilibrium principles.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Describe properties of aqueous systems.	• Explain and apply properties of aqueous systems.	• Discuss properties of aqueous systems.

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 *Aqueous systems* are limited to those in which proton transfer occurs and those involving a sparingly soluble ionic solid.

3 *Properties* of aqueous systems are related to the nature and the concentration of the species present in the solution. Description, explanation and application, or discussion of these properties may be qualitative and/or quantitative.

4 Qualitative evidence may include
- correlation between acid or base strength, K_a and pH
- relative equilibrium concentrations of dissolved species
- variability in solubility of a sparingly soluble salt due to the formation of a complex ion, the addition of a common ion, or the reaction of a basic anion with added acid

- features of titration curves including buffer region, equivalence point and selection of indicator (titrations of weak acids with weak bases are excluded)
- the nature of buffer solutions.

5 Quantitative evidence includes calculations involving
- K_a, K_w and pH limited to
  - solutions of bases, monoprotic acids and buffers
  - those in which the extent of reaction is small so that the equilibrium concentration of a dissolved weak acid can be approximated by the initial concentration, ie [HA] = c(HA)
  - pH at a particular point in a titration;
- K_s and solubility limited to
  - AB, A_2B and AB_2 type solids where neither of the ions A or B react further with water
  - calculating the concentration of one ion given the other
  - calculating the solubility in water and in solutions already containing one of the ions A or B (a common ion)
  - predicting precipitation or dissolution.

6 Terms
- *Describe* involves identifying, naming, drawing, giving characteristics of, giving an account of, defining, and/or carrying out simple calculations.
- *Explain and apply* involves describing as well as giving reasons for, making links between chemical concepts and/or observations, or carrying out calculations.
- *Discuss* involves showing understanding by analysing, interpreting, justifying, relating, evaluating, comparing and contrasting, and/or calculating.

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