Factors that determine the relative solubility of a solute in aqueous and non-aqueous solvents.

The meaning and use of the terms: enthalpy change of solution, lattice enthalpy, enthalpy of solvation (hydration).

The solution of an ionic solid in terms of an enthalpy cycle involving enthalpy change of solution, lattice enthalpy and enthalpies of solvation (hydration) of ions.

The effect of atomic number, charge and hydration on the radii of anions and cations.

The relationship between ionic size and properties.

The Born-Haber cycle for simple ionic compounds.

Entropy as a measure of the number of ways that molecules and their associated energy quanta can be arranged.

The process of dissolving in terms of energy and entropy factors.

The tendency of a process to occur in terms of entropy changes in the system (delta S_{sys}) and surroundings (delta S_{sur}), and the requirement that the total entropy change (delta S_{total}) should be positive.

Calculations of entropy changes using the expression:
\[ \Delta S_{total} = \Delta S_{sys} + \Delta S_{sur} \]

Calculation of entropy changes for a reaction, given entropies of reactants and products.

Comparison of the following properties of water with those of other liquids, and other hydrides of Group 6 elements, and the relationship of these properties to molecular structure: specific heating capacity, enthalpy change of vaporisation, and density changes on melting.

The influence of oceans on climate in terms of the characteristic properties of water (Storyline O3).

The meaning and use of the following terms: strong acid, strong base, pH.

The ionic product of water, K_w.

Calculation of the pH of solutions of strong acids and strong bases.

The meaning and use of the following terms: weak acid, acidity constant K_a, pK_a.

Calculation of the pH of solutions of weak acids.

How buffer solutions work, and their applications.

Calculation of the pH of a buffer solution.

The meaning of the term solubility product for simple ionic compounds of formula X^{m+}Y^{n-}.

The use of solubility products to perform calculations concerning dissolving and precipitation processes.

Acid-base and precipitation processes in the oceans in terms of K_a and K_w (Storyline O4).

The global influence of the processes occurring when carbon dioxide dissolves in water (Storyline O4).