#### Map of the unit: The Oceans

This shows the relationship between the Storyline, the Activities and the Chemical Ideas. To aid planning, laboratory-based practical work is indicated by (P), activities involving IT skills are indicated by (IT) and those developing study skills by (S).

ACTIVITIES	CHEMICAL STORYLINE	CHEMICAL IDEAS
<ul> <li>O1.1 What is the relationship between a solvent and the substances that dissolve in it? (P)</li> <li>O1.2 What changes occur when an ionic solid dissolves? (P)</li> <li>O1.3 What factors affect the enthalpy change of formation of an ionic compound? (IT)</li> </ul>	O1 THE EDGE OF THE LAND	<ul> <li>5.1 Ions in solids and solutions (revision)</li> <li>4.5 Energy changes in solution</li> <li>4.6 The Born-Haber cycle</li> </ul>
	O2 WIDER STILL AND DEEPER	
<ul><li>O3.1 The enthalpy change of vaporisation of water (P)</li><li>O3.2 What crystals form when a solution is cooled? (P)</li></ul>	O3 OCEANS OF ENERGY	<ul> <li>4.4 Energy, entropy and equilibrium</li> <li>5.4 Forces between molecules: hydrogen bonding (revision)</li> </ul>
O4.1 Finding out more about weak acids (P) O4.2 Investigating some buffer solutions (P)	O4 A SAFE PLACE TO GROW	<ul> <li>7.1 Chemical equilibrium (revision)</li> <li>7.2 Equilibria and concentrations (revision)</li> <li>8.1 Acid-base reactions (revision)</li> <li>7.7 Solubility equilibria</li> <li>11.2 The s block: Groups 1 and 2 (revision)</li> <li>8.2 Weak acids and pH</li> <li>8.3 Buffer solutions</li> </ul>
O5 Check your notes on The Oceans (S)	O5 SUMMARY	

**Note** Chemical Ideas in italics are revisited from earlier units.

A2

LEVEL

0

# THE OCEANS

### Relation to other units

This teaching unit will come near the end of the course. It brings together much of the inorganic and physical chemistry met in earlier units. It builds on the work on enthalpy cycles and entropy from **Developing Fuels** and on ideas about ionic compounds in **From Minerals to Elements** and **Aspects of Agriculture**. These ideas are developed further in the context of acids and bases (**From Minerals to Elements**) and Group 1 and 2 compounds (**The Elements of Life**).

The work on chemical equilibrium, from **The Atmosphere**, **Engineering Proteins** and **Aspects of Agriculture**, is brought together and applied to solutions of ionic compounds.

Intermolecular forces were introduced in **Developing Fuels** and **The Polymer Revolution** and revisited in many subsequent units in the course. In **The Oceans**, the hydrogen bonding in water is studied in relation to its properties and the role of the oceans in transporting energy.

#### Concept map

The concept map which follows shows how the major chemical ideas in this teaching unit develop throughout the course.

Concept	Introduced in unit	Developed in unit(s)	Assumed in unit(s)
Entropy	DF	0	_
Quantisation of energy	EL	A, SS, O	several
Molecular-kinetic theory	А	0	several
Intermolecular forces	DF	PR	DP, EP, AA, CD, O, MD
Chemical equilibrium	А	EP, AA, O	SS
Acids and bases	М	0	A, WM, EP, AA, MD
Buffering action	AA	0	-
Solubility and energy changes in solution	О	-	-
Ionic substances	М	AA, O	all others
Hydration of ions	М	AA, O	several
Size of ions	AA	0	-
Groups 1 and 2	EL	О	AA
Born–Haber cycle	0	_	-
Precipitation	М	SS, O	CD
Interaction of carbon dioxide with water	А	0	-

#### Advance warning

The following items needed for activities in this unit may not already be in your school, and might take a little time to obtain.

Activity	Item(s)	Essential/Optional	Typical quantity per experiment
01.1 03.1	Hexane or cyclohexane Apparatus for measuring the enthalpy change of vaporisation of water (details on the activity sheet, Figure 1 on page 297)	Essential Optional	12 cm <sup>3</sup> 1

## A2 LEVEL