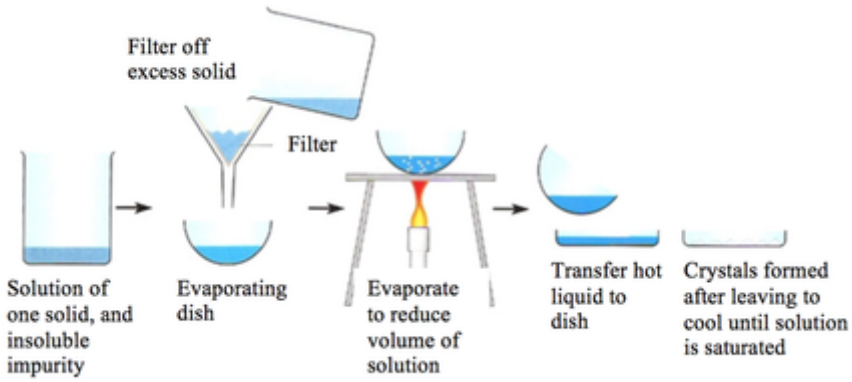
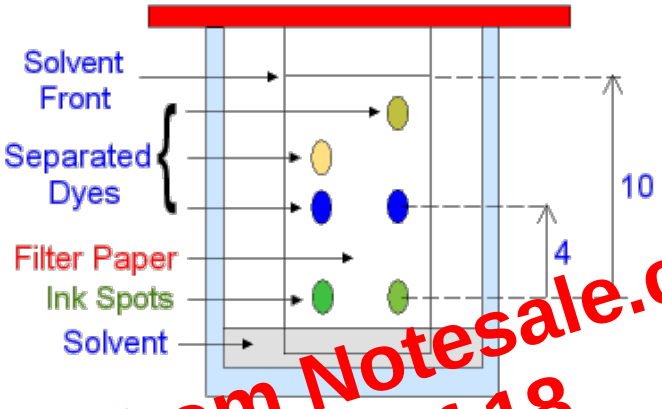
Crystallisation	Separates soluble solid and solvent e.g. $CuSO_4$ (aq) 
Paper chromatography	Separates miscible liquids or solids e.g. separating ink dyes 

Element	Group	Electronic configuration	No. of outer electrons
Carbon	4	2.4	4
Phosphorus	5	2.8.5	5
Calcium	2	2.8.8.2	2

e) Chemical formulae and chemical equations		
	1.21	write word equations and balanced chemical equations to represent the reactions studied in this specification
	1.22	use the state symbols (s), (l), (g) and (aq) in chemical equations to represent solids, liquids, gases and aqueous solutions respectively

Knowing the states of reactants and products is incredibly useful for designing a reaction. In an exam, if you include state symbols and they are not required you will **not** be penalised, so you might as well include them

For example: $CuCO_3(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l) + CO_2(g)$

You need to be able to write balance chemical equations for any reaction studied in this specification.

f) Ionic compounds		
	1.28	describe the formation of ions by the gain or loss of electrons
	1.30	recall the charges of common ions in this specification
	1.31	deduce the charge of an ion from the electronic configuration of the atom from which the ion is formed
	1.32	explain, using dot and cross diagrams, the formation of ionic compounds by electron transfer, limited to combinations of elements from Groups 1, 2, 3 and 5, 6, 7
	1.33	understand ionic bonding as a strong electrostatic attraction between oppositely charged ions
	1.34	understand that ionic compounds have high melting and boiling points because of strong electrostatic forces between oppositely charged ions
	1.35	understand the relationship between ionic charge and the melting point and boiling point of an ionic compound
	1.36	describe an ionic crystal as a giant three-dimensional lattice structure held together by the attraction between oppositely charged ions
	1.37	draw a diagram to represent the positions of the ions in a crystal of sodium chloride.

The charge that an ion will have can be deduced from the position of its element in the Periodic Table. For simple **metals** (i.e. not transition metals), the charge is always positive (from losing electrons) and is equal to the group number. For **non-metals,** the charge is negative and numerically equal to the group number minus 8.

Element	Electronic configuration	Ion

Halogen	State (at rtp)	Colour	Colour in aqueous solution	Colour in organic solution (e.g. hexane)
*Fluorine	Gas	Yellow	Colourless	Colourless
Chlorine	Gas	Green	V. pale green	V. pale green
Bromine	Liquid	Brown	Brown	Orange
Iodine	Solid	Grey	Brown	Purple

*you do not need to know about fluorine and astatine for GCSE, but might be expected to make predictions based on trends within the group.

When a halogen reacts with hydrogen it produces the hydrogen halide (HX) – for example, hydrogen chloride. When dissolved in water this will produce the corresponding acid.

- Hydrogen chloride = HCl (g) – covalent molecule
- Hydrochloric acid = HCl (aq) – dissociated in water
  - $HCl \rightarrow H^+ + Cl^-$
- Hydrogen chloride in methylbenzene is not dissociated and hence is not acidic.

Reaction of a halogen with a compound which contains the halide of a less reactive halogen will result in a displacement reaction.

For example:

$$Cl_2(aq) + 2KI(aq) \rightarrow I_2(aq) + 2KCl(aq)$$

Pale green solution → brown solution