AQA GCSE Chemistry

Topic 8: Chemical analysis

Identification of ions by chemical and spectroscopic means

Notes

(Content in bold is for Higher Tier only)

Flame tests

- Flame tests can be used to identify metal ions.

Lithium	Crimson
Sodium	Yellow
Potassium	Lilac
Calcium	Orange- Red
Copper	Green

- However, if a sample containing a mixture of ions is used some flame colours can be masked (you won't be able to see them)

Metal hydroxides

- Aluminium, calcium and magnesium ions form a white precipitate with NaOH.
- Only aluminium's precipitate dissolves when excess NaOH is added.
- Copper(II) produces a blue precipitate
- Iron(II) produces a green precipitate
- Iron(III) produces a brown precipitate
- equations: e.g. $Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$
    - you need as many OH^- ions as the charge on the metal ion
    - the Na from the NaOH and whatever the metal ion was bonded to will react to form a compound together: e.g. $CuCl_2 + 2NaOH \rightarrow Cu(OH)_2 + 2NaCl$

Carbonates

- Carbonates react with dilute acids to create carbon dioxide.
- This gas can be bubbled through limewater, if the limewater goes cloudy, the gas is CO_2.

Halides

- First add dilute nitric acid, followed by silver nitrate solution
- Chloride gives a white precipitate
- Bromide gives a cream precipitate
- Iodine gives a yellow precipitate
- *(cats with brains can ideally yodel)*

Sulfates

- First add dilute hydrochloric acid, followed by barium chloride solution
- A white precipitate will form when sulfate ions are in this solution

Instrumental methods

- Elements and compounds can be detected and identified using instrumental methods

- These are: accurate, sensitive and rapid, making them advantageous compared to chemical tests

Flame emission spectroscopy

- Example of an instrumental method used to analyse metal ions in solutions
- Sample is put into a flame and the light given out is passed through a spectroscope
- Output is a line spectrum that can be analysed to identify the metal ions in the solution and measure their concentrations