8.3 IDENTIFICATION OF IONS BY CHEMICAL AND SPECTROSCOPIC MEANS (Chemistry only)

Metal hydroxides

Add sodium hydroxide solution to identify metal ions

- Copper(II) ions form a blue precipitate, iron(II) ions form a green precipitate and iron(III) ions form a brown precipitate
- Calcium, aluminium and magnesium ions all produce white precipitates
- Aluminium hydroxide will redissolve in excess sodium hydroxide

Carbonates

Carbonates react with dilute acids to produce carbon dioxide

- Carbon dioxide identified by bubbling through limewater
- Limewater will turn cloudy

Halides

First add dilute nitric acid

Add silver nitrate solution

Coloured precipitates produced: silver chloride is white, silver bromide is cream and silver iodide is yellow

Flame tests

1. Clean a wire loop using hydrochloric acid
2. Hold it in the blue flame until it burns without colour
3. Dip the loop into the sample
4. Place the loop in the flame and record the colour

- Lithium ions – crimson flame
- Sodium ions – yellow flame
- Potassium ions – lilac flame
- Copper ions – green flame
- Calcium ions – orange-red flame

Some flame colours may be masked if the sample contains a mixture of ions

Instrumental methods

Used to detect and identify elements and compounds

- Sensitive, accurate and rapid
- Analyse metal ions in solution

Flame emission spectroscopy

The sample is placed in a flame and the light given out is passed through a spectroscope

A line spectrum is produced that can be analysed to identify the ions and their concentrations

Sulfates

First add dilute hydrochloric acid

Add barium chloride solution

If sulfate ions are present, a white precipitate will form

$Ba^{2+} + SO_4^{2-} \longrightarrow BaSO_{4(s)}$

AQA