

# Edexcel GCSE Chemistry

## Topic 9: Separate chemistry 2

### Qualitative analysis: tests for ions

#### Notes





### 9.1C Explain why the test for any ion must be unique

- you would never be able to know which specific ion it was if more than one ion gave the same result

### 9.2C Describe flame tests to identify the following ions in solids:

- Lithium ion,  $\text{Li}^+$  (red)
- Sodium ion,  $\text{Na}^+$  (yellow)
- Potassium ion,  $\text{K}^+$  (lilac)
- Calcium ion,  $\text{Ca}^{2+}$  (orange-red)
- Copper ion,  $\text{Cu}^{2+}$  (blue-green)
  - For each of the above you just need to hold a sample you wish to test on a wire in a roaring bunsen burner flame and observe the flame colour

### 9.3C Describe tests to identify the following ions in solids or solutions as appropriate: (using sodium hydroxide solution)

- Aluminium ion,  $\text{Al}^{3+}$ 
  - White precipitate (dissolves when excess  $\text{NaOH}$  is added)
- Calcium ion,  $\text{Ca}^{2+}$ 
  - White precipitate
- Copper ion,  $\text{Cu}^{2+}$ 
  - Blue precipitate
- Iron (II) ion,  $\text{Fe}^{2+}$ 
  - Green precipitate
- Iron (III) ion,  $\text{Fe}^{3+}$ 
  - Brown precipitate
- Ammonium ion,  $\text{NH}_4^+$ 
  - Pungent-smelling gas is produced
  - This gas produced turns damp red litmus paper blue

### 9.4C Describe the chemical test for ammonia

- Makes damp red litmus paper turn blue
- It also forms a white smoke of ammonium chloride when hydrogen chloride gas, from concentrated hydrochloric acid, is held near it





**9.5C Describe tests to identify the following ions in solids or solutions as appropriate:**

- Carbonate ion,  $\text{CO}_3^{2-}$ , using dilute acid and identifying the  $\text{CO}_2$  evolved
  - Gas produced bubbled through limewater, if the limewater goes cloudy, the gas is  $\text{CO}_2$  (carbonates react with dilute acids to produce  $\text{CO}_2$ )
- Sulfate ion,  $\text{SO}_4^{2-}$ , using dilute hydrochloric acid and barium chloride solution
  - Add dilute HCl followed by barium chloride solution
  - A white precipitate will form when sulfate ions are in this solution
- Chloride ion,  $\text{Cl}^-$ , bromide ion,  $\text{Br}^-$ , iodide ion,  $\text{I}^-$ , using dilute nitric acid and silver nitrate solution
  - 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

**9.6C Core Practical: Identify the ions in unknown salts, using the tests for the specified cations and anions in 9.2C, 9.3C, 9.4C, 9.5C**

**9.7C Identify the ions in unknown salts, using results of the tests above**

**9.8C Describe that instrumental methods of analysis are available and that these may improve sensitivity, accuracy and speed of tests**

- Elements and compounds can be detected and identified using instrumental methods
  - These are accurate, sensitive and rapid
- instrumental methods include: gas chromatography and mass spectrometry

**9.9C Evaluate data from a flame photometer: to determine the concentration of ions in dilute solution using a calibration curve, and to identify metal ions by comparing the data with reference data**

- 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 photometer
- Output is a line spectrum that can be analysed to identify the metal ions in the solution and measure their concentrations

