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, Li+ (red)
- Sodium ion, Na+ (yellow)
- Potassium ion, K+ (lilac)
- Calcium ion, Ca2+ (orange-red)
- Copper ion, Cu2+ (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, Al^{3+}
    - White precipitate (dissolves when excess NaOH is added)
- Calcium ion, Ca^{2+}
    - White precipitate
- Copper ion, Cu^{2+}
    - Blue precipitate
- Iron (II) ion, Fe^{2+}
    - Green precipitate
- Iron (III) ion, Fe^{3+}
    - Brown precipitate
- Ammonium ion, 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, CO_3^{2-}, using dilute acid and identifying the CO_2 evolved
  - Gas produced bubbled through limewater, if the limewater goes cloudy, the gas is CO_2 (carbonates react with dilute acids to produce CO_2)
- Sulfate ion, 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, Cl^-, bromide ion, Br^-, iodide ion, 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
  - Iodide 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