

Quantitative Analysis

Anion - Carbonate Test

Carbonate + acid \longrightarrow carbon dioxide + salt + water

1. add **dilute nitric acid** to solid/solution in a test tube
2. if **effervescence/bubbles** substance could be carbonate
3. run gas produced through **lime water**, if CO₂ will turn cloudy (precipitate of calcium carbonate forms)

Anion - Sulfate test

1. add aqueous **barium nitrate** (or chloride) to substance in a test tube
2. in presence of sulfate, **dense white precipitate forms** - BaSO₄

Anion - Halide test

1. add **aqueous silver nitrate (AgNO₃)** to aqueous solution of halide in test tube
 - silver chloride = **white**
 - silver bromide = **cream**
 - silver iodide = **yellow**
2. Add **aqueous ammonia (NH₃)** to test solubility - colours difficult to distinguish
 - silver chloride = soluble in dilute
 - silver bromide = soluble in concentrated
 - silver iodide = insoluble

Carry out tests in this order as ...

1. neither sulfate/halide ions produce bubbles with dilute acid
2. BaSO₄ only formed when no carbonate present - barium carbonate is insoluble
3. Ag₂CO₃ and Ag₂SO₄ also insoluble in water - rule out these possibilities first

Mixture of ions

1. add dilute nitric acid until bubbling stops - all carbonate ions removed
2. add excess Ba(NO₃)₂ - any sulfate ions will precipitate out as barium sulfate, filter to remove.
3. any S⁴⁻ or CO₃²⁻ ions already removed - any precipitate formed must be halide ions

Cation - Test for Ammonium NH₄

1. add aqueous **sodium hydroxide (NaOH)** to solution of ammonium ion
2. ammonia gas produced - unlikely to see bubbles as very soluble in water
3. mixture warmed and gas released - NH₃
4. test gas with moist pH indicator paper - **blue**