Tests for anions and cations

Flame test for metal cations

Step 1) Clean a platinum or nichrome wire by dipping it into concentrated HCl acid and hold it in a hot bunsen flame.
Step 2) Moisten the clean wire by dipping it into the acid again. Dip it in the salt so that it sticks to the wire.
Step 3) Hold the wire in the clear part of a blue bunsen flame and observe the colour:

Lithium ion - red
Sodium ion - orange yellow
Potassium ion - lilac
Copper ion - blue-green
Barium ion - pale/apple green

Test for anions

Halide ions

Add equal volumes of the halide solution and dilute nitric acid. Add aqueous silver nitrate.

- Silver halides are insoluble, so if a halide is present a precipitate will form.

Precipitate colour	Indicates presence of	Ionic equation
White	Chloride ions, Cl^-	$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$
Cream	Bromide ions, Br^-	$Ag^+(aq) + Br^-(aq) \rightarrow AgBr(s)$
yellow	Iodide ions, I^-	$Ag^+(aq) + I^-(aq) \rightarrow AgI(s)$

Sulfate, sulfite, nitrate and carbonate ions

Ion	To a small amount of the solution	What forms if the ion is present	Ionic equation
Sulfate ion SO_4^{2-}	Add an equal volumes of dilute HCl, then add barium nitrate solution	White ppt of $BaSO_4$	$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

Sulfite ion SO_3^{2-}	Add an equal volume of dilute HCl	SO_2 gas given off	$2H^+(aq) + SO_3^{2-}(aq) \rightarrow H_2O(l) + SO_2(g)$
Nitrate ion NO_3^-	(to the solid/ solution) add a little dilute aqueous NaOH. Add small pieces of aluminium foil, heat gently.	NH_3 gas given off	$8Al(s) + 3NO_3^-(aq) + 5OH^-(aq) + 2H_2O(l) \rightarrow 3NH_3(g) + 8AlO_2^-(aq)$
Carbonate ion CO_3^{2-}	(to the solid/ solution) add a little dilute HCl	Mixture bubbles and gives a gas that turns limewater milky(CO_2)	$2H^+(aq) + CO_3^{2-}(aq) \rightarrow H_2O(l) + CO_2(g)$ (same as that for the sulfite ion- just replace the S with a c)

Additional

- Sulfuric acid (H_2SO_4) salts are called sulfates.
- Sulfurous acid (H_2SO_3) salts are sulfites.
- Electrons in cations take in heat energy, jump to higher levels, and fall back again- giving out energy as light of a single colour. This helps identify them in the cation flame test.