

Qualitative Analysis

Solubility of Ionic Compounds

Compound	Soluble / Insoluble	Description
Copper(II) Sulfate	Soluble	A: white powdery solid, B: blue crystalline solid
Sodium Hydroxide	Soluble	White powdery solid
Ammonium carbonate	Soluble	White crystalline solid
Silver chloride	Insoluble	White powdery solid
Barium Sulfate	Insoluble	White powdery solid
Iron(II) Sulfate	Soluble	Green crystalline solid

Cation Test

First Method: Addition of Sodium Hydroxide

Experimental procedure:

1. Add 2-3 drops of sodium hydroxide to the given solution and shake gently. Note observations.
2. Continue adding sodium hydroxide to the mixture and shake gently. Note down your observations upon addition of excess sodium hydroxide to the mixture.

Observation

- Precipitate formed?
- Colour of precipitate?

If precipitate is formed, proceed to the next step.

- Shake and observe carefully to see if the precipitate

Test for Cations - Table

Experimental Procedure: Add 2-3 drops of aqueous sodium hydroxide to the solution

Type of Reaction: Precipitation

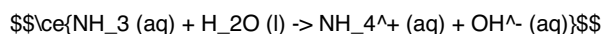
Sample Solution	Cations Present	Chemical Formulae of Products
Aluminium nitrate	Al^{3+} ion	$\text{Al}(\text{OH})_3 (\text{s}) + \text{NaNO}_3 (\text{aq})$

Sample Solution	Cations Present	Chemical Formulae of Products
Calcium nitrate	Ca^{2+} ion	$\text{Ca(OH)}_2 \text{ (s)} + \text{NaNO}_3 \text{ (aq)}$
Zinc nitrate	Zn^{2+} ion	$\text{Zn(OH)}_2 \text{ (s)} + \text{NaNO}_3 \text{ (aq)}$
Copper(II) nitrate	Cu^{2+} ion	$\text{Cu(OH)}_2 \text{ (s)} + \text{NaNO}_3 \text{ (aq)}$
Iron(II) nitrate	Fe^{2+} ion	$\text{Fe(OH)}_2 \text{ (s)} + \text{NaNO}_3 \text{ (aq)}$
Iron(III) nitrate	Fe^{3+} ion	$\text{Fe(OH)}_3 \text{ (s)} + \text{NaNO}_3 \text{ (aq)}$

Experimental Procedure: Add equal volumes of sodium hydroxide and test sample in the test tube and warm. **Type of Reaction:** Base + Ammonium salt

Sample Solution	Cations Present	Chemical Formulae of Products
Ammonium nitrate	NH_4^+ ion	$\text{NH}_3 \text{ (g)} + \text{H}_2\text{O(l)} + \text{NaNO}_3 \text{ (aq)}$

Dissociation Equation for Aqueous Ammonia



As aqueous ammonia dissociates to form ammonium cations and hydroxide anions, the hydroxide anions are able to react with the metal cations to form the insoluble hydroxides which will appear in the form of precipitates.

Second Method: Addition of Aqueous Ammonia

Experimental Procedure

1. Add 2-3 drops of aqueous ammonia to the given solution and shake gently. Note down the observations.
2. Continue adding aqueous ammonia to the mixture and shake gently. Note down your observations upon addition of excess sodium hydroxide to the mixture.