

## **Salt Analysis: Ammonium Chloride (NH<sub>4</sub>Cl)**

### **1. Physical Examination of the Salt**

Experiment	Observation	Inference
Colour	White	Fe <sup>2+</sup> , Cu <sup>2+</sup> , Ni <sup>2+</sup> , Co <sup>2+</sup> , Mg <sup>2+</sup> are absent
Smell	Ammoniacal smell	NH <sub>4</sub> <sup>+</sup> may be present
Deliquescence	Does not absorb moisture	Non-deliquescent

### **2. Dry Heating Test**

Experiment	Observation	Inference
A pinch of salt is taken in a dry test tube and heated.	Ammoniacal smell along with white sublimate on the inner wall of the test tube.	NH <sub>4</sub> Cl may be present

### **3. Flame Test**

Experiment	Observation	Inference
Clean platinum wire dipped in conc. HCl, touched with the given salt, and held at the edge of the oxidizing flame of a Bunsen burner.	No characteristic flame observed	Inconclusive

### **4. Concentrated H<sub>2</sub>SO<sub>4</sub> Test**

Experiment	Observation	Inference
A pinch of salt is taken in a dry test tube and heated with 2 drops of conc. H <sub>2</sub> SO <sub>4</sub> .	Colourless gas evolves with a pungent, suffocating smell.	Chloride, Sulphate may be present

### **5. Wet Test for Acid Radical (Chloride Ion, Cl<sup>-</sup>)**

Experiment	Observation	Inference
A small aqueous solution of the salt is taken in a test tube. Drops of $\text{HNO}_3$ are added, followed by $\text{AgNO}_3$ solution.	A highly curdy white precipitate is observed, which is highly soluble in $\text{NH}_4\text{OH}$ solution.	Presence of $\text{Cl}^-$ confirmed

#### Reactions:

- $\text{Cl}^- + \text{AgNO}_3 \rightarrow \text{AgCl} \downarrow \text{ (Curdy white precipitate)} + \text{NO}_3^-$
- $\text{AgCl} + 2\text{NH}_4\text{OH} \rightarrow [\text{Ag}(\text{NH}_3)_2]\text{Cl} \text{ (Soluble complex)} + 2\text{H}_2\text{O}$

#### 6. Test for Zero Group Cation (Ammonium Ion, $\text{NH}_4^+$ )

Experiment	Observation	Inference
To an aqueous solution of the salt, dilute $\text{NaOH}$ solution is added and warmed.	A pungent smelling, colourless gas evolves which makes brown precipitate with Nessler's reagent.	Presence of $\text{NH}_3$ (and thus $\text{NH}_4^+$ ) is confirmed

#### Reactions:

- $\text{NH}_4\text{Cl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{NH}_3 \uparrow \text{ (Pungent fumes)}$
- $\text{K}_2[\text{HgI}_4] + \text{NH}_3 + \text{NaOH} \rightarrow \text{NH}_2 \cdot \text{HgO} \cdot \text{HgI} \downarrow + \text{NaI} + \text{H}_2\text{O}$

(Nessler's Reagent)

(Brown precipitate)

#### Conclusion for Zero Group Cation:

Since a zero-group cation ( $\text{NH}_4^+$ ) is predicted in the given salt, no further group analysis is done.

#### Results for Salt 1 ( $\text{NH}_4\text{Cl}$ )

- Acid Radical:**  $\text{Cl}^-$  (Chloride ion)
- Basic Radical:**  $\text{NH}_4^+$  (Ammonium ion)