

**Ran Vijay Smarak Mahavidyalaya, Sector – 12/D, Bokaro**

**SEMESTR-VI**

**CHEMISTRY (Core – XIII)**

**INORGANIC CHEMISTRY – IV**

2. Dry Heating Test

- (i) Take about 0.1 g of the dry salt in a clean and dry test tube.
- (ii) Heat the above test tube for about one minute and observe the colour of the residue when it is hot and also when it becomes cold. Observation of changes gives indications about the presence of cations, which may not be taken as conclusive evidence

3. Flame Test

4. Borax Bead Test

5. Charcoal Cavity Test

**Step - II : Wet Tests for Identification of Cations**

Preparation of Original Solution (O.S.) to prepare the original solution, following steps are followed one after the other in a systematic order. In case the salt does not dissolve in a particular solvent even on heating, try the next solvent. The following solvents are tried:

1. Take a little amount of the salt in a clean boiling tube and add a few mL of distilled water and shake it. If the salt does not dissolve, heat the content of the boiling tube till the salt completely dissolves.
2. If the salt is insoluble in water as detailed above, take fresh salt in a clean boiling tube and add a few mL of dil. HCl to it. If the salt is insoluble in cold, heat the boiling tube till the salt is completely dissolved.
3. If the salt does not dissolve either in water or in dilute HCl even on heating, try to dissolve it in a few mL of conc. HCl by heating.
4. If salt does not dissolve in conc. HCl, then dissolve it in dilute nitric acid.
5. If salt does not dissolve even in nitric acid then a mixture of conc. HCl and conc.  $\text{HNO}_3$  in the ratio 3:1 is tried. This mixture is called aqua regia. A salt not soluble in aqua regia is considered to be an insoluble salt.

Group Analysis

(I) Analysis of Zero group cation (NH<sub>4</sub><sup>+</sup> ion)

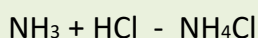
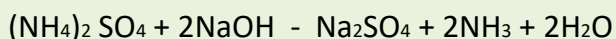
(a) Take 0.1 g of salt in a test tube and add 1-2 mL of NaOH solution to it and heat. If there is a smell of ammonia, this indicates the presence of ammonium ions. Bring a glass rod dipped in hydrochloric acid near the mouth of the test tube. White fumes are observed.

(b) Pass the gas through Nessler's reagent. Brown precipitate is obtained.

Chemistry of Confirmatory Tests for NH<sub>4</sub><sup>+</sup> ion

(a) Ammonia gas evolved by the action of sodium hydroxide on ammonium

(b) salts reacts with hydrochloric acid to give ammonium chloride, which is visible as dense white fume.



Group reagents for precipitating ions

| Group      | Cations                                                                   | Reagents                                                                          |
|------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Group-zero | NH <sub>4</sub> <sup>+</sup>                                              | None                                                                              |
| Group-1    | Pb <sup>2+</sup>                                                          | Dil HCL                                                                           |
| Group-11   | Pb <sup>2+</sup> , Cu <sup>2+</sup> , As <sup>3+</sup>                    | H <sub>2</sub> S in presence of dil HCL                                           |
| Group-111  | Al <sup>3+</sup> , Fe <sup>3+</sup>                                       | NH <sub>4</sub> OH in presence of NH <sub>4</sub> Cl                              |
| Group- 1V  | Co <sup>2+</sup> , Ni <sup>2+</sup> , Mn <sup>2+</sup> , Zn <sup>2+</sup> | H <sub>2</sub> S in presence of NH <sub>4</sub> OH                                |
| Group-V    | Ba <sup>2+</sup> , Sr <sup>2+</sup> , Ca <sup>2+</sup>                    | (NH <sub>4</sub> ) <sub>2</sub> Co <sub>3</sub> in presence of NH <sub>4</sub> OH |