

# Salts: Properties and Uses



## More About Salts

### Definition and Formation

Salts are ionic compounds formed by the neutralization reaction between an acid and a base. In aqueous solutions, salts dissociate into their constituent ions. The general reaction for salt formation is:

$$\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water}$$

### Types of Salts

1. **Normal Salts:** Formed when all the hydrogen ions ( $\text{H}^+$ ) of an acid are replaced by metal or ammonium ions ( $\text{NH}_4^+$ ). For example, sodium chloride ( $\text{NaCl}$ ), potassium nitrate ( $\text{KNO}_3$ ).
2. **Acid Salts:** Formed when not all the hydrogen ions of an acid are replaced by metal or ammonium ions, resulting in salts that still have replaceable hydrogen ions. For example, sodium bisulfate ( $\text{NaHSO}_4$ ).
3. **Basic Salts:** Formed when a base is only partially neutralized by an acid, leaving hydroxide ions in the salt. For example, basic zinc carbonate ( $\text{ZnCO}_3 \cdot \text{Zn}(\text{OH})_2$ ).
4. **Double Salts:** Formed when two different salts crystallize together in a fixed ratio. They dissociate completely in water to give all ions present in the two salts. For example, potash alum ( $\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ ).

### Properties of Salts

1. **Solubility:** Most salts are soluble in water. The solubility of salts can vary significantly depending on the ions involved.
2. **Electrical Conductivity:** Aqueous solutions of salts conduct electricity due to the presence of free ions.
3. **pH:** Salts can be neutral, acidic, or basic. The pH of a salt solution depends on the nature of the parent acid and base. For example:
  - Sodium chloride ( $\text{NaCl}$ ) solution is neutral.
  - Ammonium chloride ( $\text{NH}_4\text{Cl}$ ) solution is acidic.
  - Sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) solution is basic.

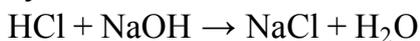
### Preparation of Salts

Salts can be prepared through various methods:

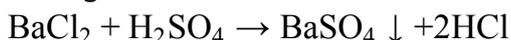
1. **Direct Combination:** Reacting elements directly to form a salt. For example, iron and sulfur combine to form iron(II) sulfide.



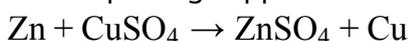
2. **Neutralization:** Reacting an acid with a base. For example, hydrochloric acid and sodium hydroxide react to form sodium chloride and water.



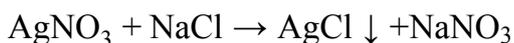
3. **Precipitation:** Mixing two solutions containing soluble salts to form an insoluble salt. For example, mixing solutions of barium chloride and sulfuric acid forms barium sulfate precipitate.



4. **Single Displacement:** Reacting a metal with a salt solution to displace another metal. For example, zinc displacing copper from copper sulfate solution.



5. **Double Displacement:** Mixing two salts in solution to form a new insoluble salt. For example, silver nitrate and sodium chloride form silver chloride precipitate.



## Uses of Salts

1. **Sodium Chloride (NaCl):** Used as table salt, in food preservation, and as a raw material for producing chemicals like sodium hydroxide, chlorine, and baking soda.
2. **Sodium Carbonate (Na<sub>2</sub>CO<sub>3</sub>):** Used in glass manufacturing, as a water softener, and in the production of other sodium compounds.
3. **Calcium Sulfate (CaSO<sub>4</sub>):** Used in plaster of Paris, as a building material, and in the medical field for making casts.
4. **Ammonium Nitrate (NH<sub>4</sub>NO<sub>3</sub>):** Used as a fertilizer and in explosives.

Salts play a crucial role in various industrial processes, biological functions, and everyday applications. Understanding their properties and reactions is essential in the field of chemistry.