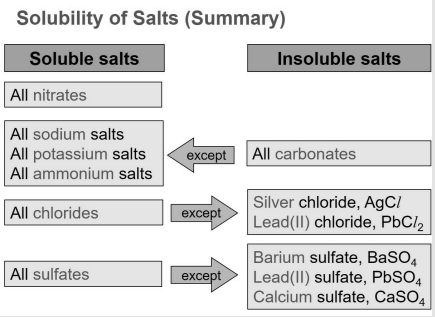
Definition of Salt

A salt is a compound formed when the hydrogen ion in an acid is replaced by a metallic ion or an ammonium ion. It is an ionic compound with high melting and boiling point. Soluble salts dissolve in water to form oppositely charged ions in aqueous solutions thus it can conduct electricity.

Solubility Table



Hydrated Salts

Water is present in the crystals of certain salts which gives the salt its crystalline properties. The water present is known as water of crystallization which is easily removed by heating.

E.g: Copper(II) sulfate crystals (CuSO4.5H2O)

Hydrated Salt (Upon Heating) ➔ Anhydrous Salt + Water

Salt Preparation

Method	Constituents	Salt Formed
Reaction with Acid	Acid + Excess Insoluble Reactant	Soluble Salt
Titration	Acid + Soluble Reactant	Soluble Salt
Precipitation	2 Soluble Reactants	Insoluble Salt

Questions to consider:

1. Is the salt soluble in water?
2. Are the starting reactants soluble in water?

Reaction of Excess Insoluble Reactant with Acid

Method:

Acid + Metal (Mg, Al, Zn, Fe)

Acid + Insoluble Base (MgO, ZnO, CuO)

Acid + Insoluble Carbonate (MgCO3, ZnCO3)

The insoluble reactant used is in excess. This is to ensure that all the acid is used up. The excess reactant is filtered from the salt solution at the end of the reaction. The salt solution formed is then heated to evaporate some water away to obtain a saturated solution then cooled to allow crystallization to occur to produce the salt crystals.

When is all the acid used up?

1. When there is no more effervescence produced (Metal / Carbonate)
2. When there is a residue of reactant left behind (Base)

Only moderately reactive metals can be used.

Steps:

1. Add excess reactant into the acid and stir until the effervescence stops.
2. Filter to remove excess reactants. Collect the filtrate (salt solution).
3. Heat filtrate to obtain a concentrated salt solution.
4. Test for saturation with a glass rod.
5. Leave the solution to cool and crystalise.
6. Filter to obtain crystals.
7. Wash with cold distilled water and dry with clean filter paper.

Titration

Method:

Acid + Soluble Base / Alkali (NaOH, KOH, NH3(aq))

As both the reactants in this method are solutions, titration is used to add the exact volume of one reactant to the other. An indicator is used in the beginning to determine the volume of the reactants required. However, the experiment is repeated without the indicator so as to not contaminate the salt produced.

Titration (cont)

1. Fill up a burette with dilute acid. Note the initial burette reading (V1 cm^3).
2. Pipette 25.0 cm^3 of aqueous alkali solution into a conical flask.
3. Add 1–2 drops of methyl orange indicator to the solution.
4. Add dilute acid slowly from the burette until the solution just turns orange. This is the end-point.
5. Stop adding acid. Record the final burette reading (V2 cm^3).

Repeat the experiment:

1. Pipette 25.0 cm^3 of alkali solution into a beaker. Do not add indicator.
2. Add (V2 – V1) cm^3 of dilute acid from the burette.
3. Heat to saturate the solution.
4. Cool and crystallise to obtain the salt.
5. Filter and dry.

Precipitation

Method:

Reaction with 2 aqueous solutions.

2 Salt Solutions OR 1 Salt Solution & 1 Dilute Acid

In order to SEPARATE the insoluble salt from its reacting mixture, its starting reactants MUST BE soluble. This is to ensure that the insoluble salt produced can be filtered away from the reaction mixture.

$AB\ (aq) + CD\ (aq) \rightarrow AD\ (s) + BC\ (aq)$

$A^+\ (aq) + D^-\ (aq) \rightarrow AD\ (s)$

Steps:

1. Add solution AB to solution CD in a beaker. A white precipitate of AD forms.
2. Filter to obtain the precipitate.
3. Wash the precipitate with cold, distilled water to remove impurities.
4. Leave the precipitate of AD to dry.

E.g Ba(NO3)2 (aq) + Na2SO4 (aq) → BaSO4 (s) + 2NaNO3 (aq)