**Preparation, Separation and Purification of Salts**

(To demonstrate knowledge and understanding of preparation, separation and purification of salts)

**Salts**

* A salt is a compound that is formed when the **hydrogen atom** in an acid is replaced by a **metal**.
* For example if we replace the H in HC*l* with a potassium atom, then the salt potassium chloride is formed, KC*l*.
* Salts are important because they are used to make new compounds and products
* Fertilisers, batteries, cleaning detergents and healthcare products are examples of materials that have been made by using salts

**Naming salts**

* The name of a salt has two parts.
* The first part comes from the **metal** or the **metal** oxide or the **metal** carbonate which we start with when doing a reaction
* The second part comes from the **acid** which is used in the reaction
* The name of the salt can be determined by looking at the reactants themselves
* For example, hydrochloric acid always produces salts that end in chloride and contain the **chloride** ion, Cl–.
* Other examples:
  + **Sodium**hydroxide reacts with hydro**chloric** acid to produce sodium chloride.
  + **Zinc**oxide reacts with **sulf**uric acid to produce **zinc** **sulfate**.

**Preparing salts**

* Some salts can be extracted by mining but others need to be prepared in the laboratory.
* The key idea to consider when preparing salts, is solubility. You need to know is the salt being formed**soluble** or **insoluble** in water?

**Solubility of common slats**

(To demonstrate knowledge about: which salts are soluble in water? and which are not?)

|  |  |  |
| --- | --- | --- |
| **Salts** | **Soluble** | **Insoluble** |
| **Sodium, Potassium and ammonium** | **All** | **None** |
| **Nitrates** | **All** | **None** |
| **Ethanoates** | **All** | **None** |
| **Chlorides** | **Most are soluble** | **Silver and Lead(II)** |
| **Sulfates** | **Most are soluble** | **Barium, calcium and Lead(II)** |
| **Carbonates** | **Sodium, Potassium and ammonium** | **Most are insoluble** |

**Selecting a method for preparing salts:**

To decide the method for preparing a salt, we need to know whether the salt being produced is **soluble** or **insoluble**?

There are three methods that can be used to prepare salts:

1. **Solution + Solid** (for preparing soluble salts)

Examples:

H2SO4(aq) + Zn(s) ZnSO4(aq) + H2(g) (this is Acid + Metal reaction)

H2SO4(aq) + CuO(s) CuSO4(aq) + H2O(l) (this is Acid + Metal Oxide reaction)

2HCl(aq) + CaCO3(s) CaCl2(aq) + H2O(l) + CO2(g) (this is Acid + Metal Carbonate reaction)

2. **Solution + Solution** (for preparing soluble salts)

Examples:

NaOH(aq) + HCl(aq) NaCl(aq) + H2O(l)

H2SO4(aq) + 2KOH(aq) K2SO4(aq) + 2H2O(l)

3. **Precipitation Reaction** (for preparing insoluble salts)

Examples:

BaCl2(aq) + MgSO4(aq) BaSO4(s) + MgCl2(aq)

This reaction involves mixing two soluble salts (in the reactants side) to make one insoluble salt , BaSO4(s) , and one soluble salt , MgCl2(aq) . The insoluble salt is called Precipitate and can be separated from the mixture by filtration.

**Spectator Ions:**

These are ions that don’t take part in the preparation of a specific salt.

For example, in the reaction between Barium Chloride (BaCl2) and Magnesium Sulfate (MgSO4) to prepare the insoluble salt Barium Sulfate (BaSO4), we can write the ionic equation:

Ba2+(aq) + SO42-(aq) BaSO4(s)

In this reaction, the magnesium ion (Mg2+) and Chloride ion (Cl-) didn’t take part in the reaction to make the solid salt. Therefore, although they are still present in the reaction mixture, they are **Spectator Ions** and are not involved in the formula of the solid salt.