Preparing salts

There are 4 ways of making salts:

1. Reacting a metal with an acid.
2. Reacting an insoluble base with an acid.
3. Neutralising an alkali with an acid by titration method.
4. By precipitation. (Making insoluble salts)

General reactions:

1. Reacting a metal with an acid.

Metal + Acid ------> Metal Salt + Hydrogen

2. Reacting an insoluble base with an acid.

Insoluble base + Acid ------> Metal Salt + Water

3. Neutralising an alkali with an acid by titration method.

Alkali + Acid ------> Metal Salt + Water

4. By precipitation.

Soluble Compound + Soluble Compound->Soluble Salt + Insoluble Salt

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1. Reacting a metal with an acid.

Metal + Acid ------> Metal Salt + Hydrogen

Note:

- This method of salt making is used for metals above hydrogen in the reactivity series
- The series has the most reactive metals on the top and the least reactive metals at the bottom.
- Carbon and hydrogen are non-metals. They have been included for comparison only.
- We cannot make salts of copper, lead and silver which are below hydrogen in the reactivity series.
- Salts of highly reactive metals cannot be prepared in this way.
- So we can make salts of Mg, Al, Zn and Fe in this way.

Reactivity series:

Mnemonics	Metals	Metal Ions
People	Potassium	K^+
Should	Sodium	Na^+
Carefully	Calcium	Ca^{2+}
Make	Magnesium	Mg^{2+}
All	Aluminium	Al^{3+}
COMEDY	CARBON	
Zoo	Zinc	Zn^{2+}
Insects	Iron	Fe^{2+}
Tall	Tin	Sn^{2+}
Like	Lead	Pb^{2+}
HOW	HYDROGEN	
Camel	Copper	Cu^{2+}
Should	Silver	Ag^+
Get	Gold	Au^{3+}
Pepsi	Platinum	Pt^{2+}

Examples for:

Metal + Acid ------> Metal Salt + Hydrogen

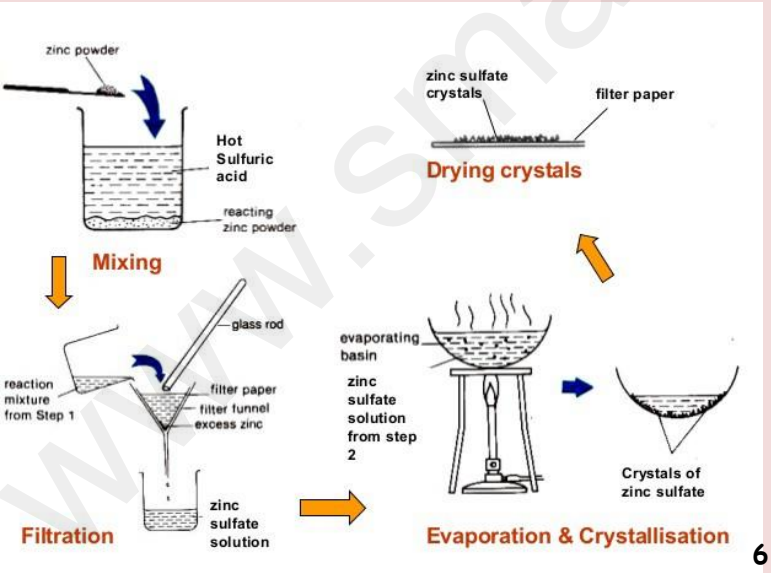
$Zn\ (s) + H_2SO_4(aq) \text{ ----> } Zn(SO)_4(aq) + H_2(g)$ Zinc sulfate

$Mg(s) + 2HCl\ (aq) \text{ ----> } MgCl_2\ (aq) + H_2(g)$ magnesium chloride

$Mg(s) + 2HNO_3(aq) \text{ --->} Mg(NO_3)_2(aq) + H_2(g)$ magnesium nitrate

- When a metal reacts with hydrochloric acid the salt produced is a chloride.
- When a metal reacts with sulfuric acid the salt produced is a sulfate.
- When a metal reacts with nitric acid the salt produced is a nitrate.

Metal + Acid ------> Metal Salt + Hydrogen

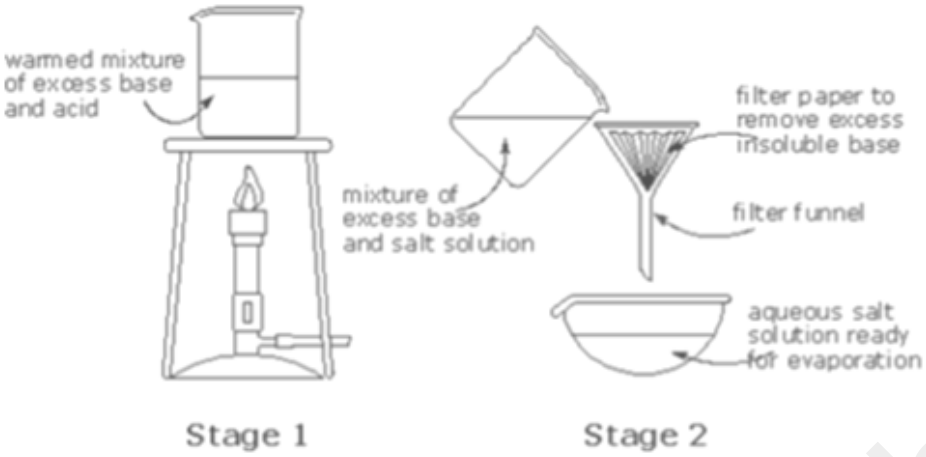


Steps for salt making:

1. Add excess metal to the acid in the flask.
2. Complete the reaction by warming the flask and filtering off excess metal.
3. The filtrate is the metal salt.
4. Evaporate the water from the filtrate till the crystallisation point is reached.
5. Filter off the crystals and wash them with a tiny amount of solvent to remove the soluble impurities.
6. Dry the crystals between sheets of filter paper. The salt is ready.

Salts from insoluble bases:

This method is used to make salts from metals that are low in the reactivity series.

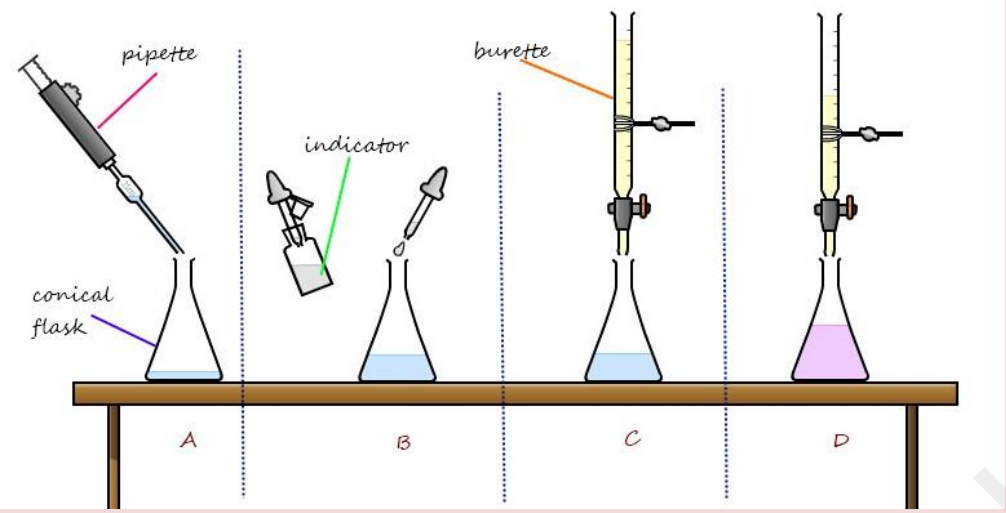


1. Add excess metal oxide to the acid in the beaker.
2.Complete the reaction by warming the beaker and filtering off excess metal oxide.
3. The filtrate is the metal salt.
4.Evaporate the water from the filtrate till the crystallisation point is reached.
Filter off the crystals and wash them with a tiny amount of solvent to remove the soluble impurities.
6.Dry the crystals between sheets of filter paper. The salt is ready.

Examples of insoluble basic oxides:

List of bases:

They are usually metal oxides, metal hydroxides, metal carbonates or metal hydrogencarbonates.



Making soluble salts from acids and alkalis by titration

A titration involves finding the unknown concentration of one solution by reacting it with a solution of known concentration. The solution of unknown concentration (the analyte) is usually placed in a flask, while the solution of known concentration (titrant) is placed in a burette. The titrant is added to the analyte until the endpoint is reached usually determined by a color change. Calculations are then performed to find the unknown concentration of the analyte. Titrations are typically performed on acid/base reactions but are not limited to them.

$$M_{acid} \times V_{acid} = M_{base} \times V_{base}$$

M_{acid} = Molarity of the acid
V_{acid} = Volume of the acid
M_{base} = Molarity of the base
V_{base} = Volume of the base

Steps:

- **Measure known volume of alkali/acid in a titration flask using a pipette. Clean this pipette with a few drops of alkali/acid that you will be using in the flask.**
- **Add a few drops of indicator solution to the alkali/acid in the flask.**
  Clean the burette with the acid/alkali that you would want to use for titration.
- **Record the burette reading.(V_1)**
- **Open the burette tap and let the acid/alkali flow into the flask. Keep swirling to let the acid and alkali in the flask mix properly.**
- **Keep adding the alkali/acid slowly till the indicator changes colour. This is the end point.A salt has been formed.**
- **Record the reading on the burette(V_2).**
- **V_2-V_1 is the rough titre or the ' range finder ' titre.**
- **Repeat the experiment 4-5 times and get the accurate titre by taking the average of the tires. Ignore the inconsistent titre.**

Note: Titre: It is the minimum volume of a solution needed to reach the end point in a titration.

Making insoluble salts (precipitate) from two soluble salts

In this method we make insoluble salts with the help of two soluble compounds.
For this you need to know the solubility rules
Method:

- Identify the ions that are present in the salt you need to make.
- Choose soluble compounds based on this information.
- Mix the two soluble compounds together.
- Filter off the precipitate.
- Then wash and dry to obtain solid crystals.

Solubility Rules:

" Some Group1 High Courts NAG that the CBI's are slower than Some Giant Snail named CaBaLe

Mnemonic	Soluble compounds	Insoluble exceptions
Some Group1 High Courts	Grp 1 hydroxides and carbonates. (calcium hydroxide is slightly soluble)	
N	Nitrates-All	----------
A	Ammonium salts-All	----------
G that the	Group 1 salts-All	----------
CBI' s are	Chlorides, Bromides and Iodides	Slower than (Silver and Lead)
Some Giant	Group 1-2-oxides	Most metal oxides
Snail	sulphates	named CaBaLe (Calcium/Barium/Lead)