

Salt Preparation

What is a salt? A salt is an ionic compound formed through specific types of reactions, such as neutralisation.

Goal: (choose a method to) prepare a _____ dry sample of a specific salt through chemical reactions

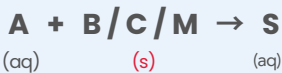
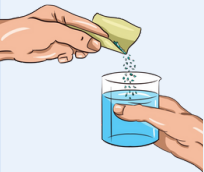
3 salt preparation methods

The best method for salt preparation **depends on the solubility of the _____ and the _____**. This is important because excess reactants in the same physical state as the product cannot be removed by filtration, would _____ the product and make it impure.

Acid + Solid (Excess BCM)

to prepare soluble _____

- The **solid must be in _____** so that **all of the acid will be _____** since the excess acid is in the same physical state as the aqueous salt solution, cannot be removed by filtration and results in an impure salt.
- Any excess solid can be removed from the aqueous salt by filtration.



E.g. to prepare $ZnSO_4$

- use an acid that contains the SO_4^{2-} ion such as _____ and
- a BCM that contains Zn such as _____

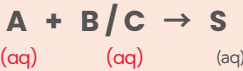
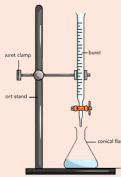
COPPER, SILVER & GOLD CANNOT REACT WITH ACID. DO NOT SUGGEST REACTIVE METALS.

- Add **excess zinc** into beaker of dilute sulfuric acid until *****no more zinc dissolves*****
- Filter** to remove the excess zinc.
- Heat** the filtrate until saturation point
- Leave the solution to **cool and crystallise**
- Filter** the mixture to collect crystals
- Rinse** the crystals with a little cool distilled water
- Dry** crystals between a few sheets of filter paper

Titration

to prepare _____

- The **reactants must react in _____ volumes**.
- Since the product and both reactants are all soluble (same physical state), any excess reactant cannot be removed by filtration and results in an impure salt.



E.g. to prepare $NaNO_3$

- use an acid that contains the NO_3^- ion e.g. HNO_3
- a BC that contains Na such as sodium hydroxide, sodium oxide and sodium carbonate

Suggest the **metal hydroxide** instead of the metal oxide where possible. This is because reactive metal oxides react with water to produce hydroxides anyway. e.g. $Na_2O + H_2O \rightarrow 2NaOH$

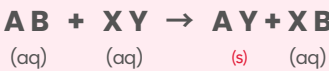
- Fill the **burette** with dilute nitric acid to the 0.00cm^3 mark.
- Pipette** 25.0cm^3 of sodium hydroxide into a conical flask.
- Add 1-2 drops of **methyl orange indicator** to the sodium hydroxide in the conical flask.
- While swirling the conical flask, add dilute nitric acid into the conical flask slowly until **one drop of acid turns the solution orange**. Record the volume of acid used.
- To a **beaker**, add this volume of acid to 25.0cm^3 of sodium hydroxide.
- Heat** the filtrate until saturation point
- Leave** the solution to cool and crystallise
- Filter** to collect crystals
- Rinse** the crystals with a little cool distilled water
- Dry** crystals between a few sheets of filter paper

FAQ: the volume to add could be determined by an earlier part of the question, burette readings to 2d.p. and pipette readings to 1d.p.

Precipitation

to prepare _____
from soluble salts

- The insoluble salt can be removed from any excess reactant by filtration.



e.g. to prepare $AgCl$

- use a soluble salt or acid that contains Cl^- e.g. HCl
- a soluble salt that contains Ag^+ e.g. $AgNO_3$

- Add excess _____ into a beaker of _____.
- Filter** to collect the precipitate
- Rinse** the precipitate with a little cool distilled water
- Dry** the precipitate between a few sheets of filter paper

FAQ:

The question may provide information to calculate the number of moles of each reactant, allowing you to identify the excess and limiting reagents and determine the final observations.

Steps to solving most salt prep questions

- Categorise the salt to be prepared into one of these three categories: non-SPA, SPA, insoluble
- Based on the solubility category, choose the appropriate preparation method.
- Determine the physical states of the reactants and product for the chosen method to ensure easy separation and purity of the final product.
- Check if the given reactants meet the criteria for the selected method. If the starting reactants are not suitable: Add nitric acid to produce a nitrate version of the salt, making it soluble (since all nitrates are soluble).

Solubility Table

SPAN	-
Cl^-	Sil Lead
SO_4^{2-}	Ba Ca Lead
except SPA	oxides/hydroxides
except SPA	carbonates

Other notes:

- Formation of a precipitate reduces the conductivity of the solution since ions come together to form a solid.

