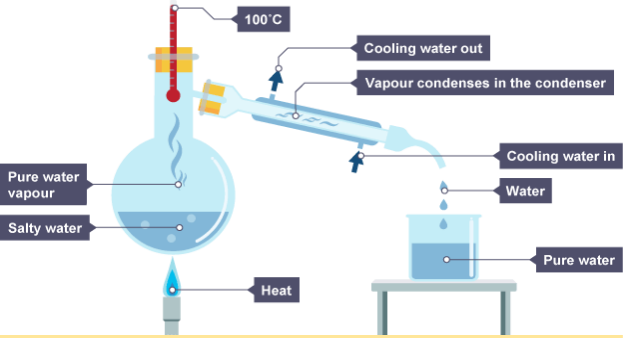
SEPARATION TECHNIQUES

Simple Distillation

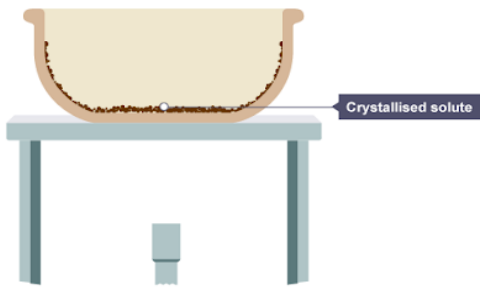


What is it?
It is used to separate a liquid and a **soluble solid** from a solution (e.g. water from a solution of salt water) or a pure liquid from a mixture of liquids.

How is it done?
The solution is heated, and pure water evaporates producing a vapour which rises through the neck of the round-bottomed flask.

The vapour passes through the condenser, where it cools and condenses, turning into a pure liquid H_2O. Once the water is evaporated from the solution, only the solute will be left behind.

Crystallisation



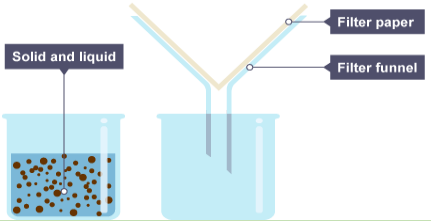
What is it?
It is used to separate a **dissolved liquid** from a solution, when the solid is much more soluble in hot solvent than in cold.

How is it done?
The solution is heated, allowing the solvent to evaporate to leave a saturated solution behind.

To test the solution, dip a clean, dry, cold glass rod. If it is saturated, crystals will form on the glass rod.

The saturated solution slowly cools. Solids will come out of the solution. Crystals are collected by filtering the solution, then washed and dried.

Filtration

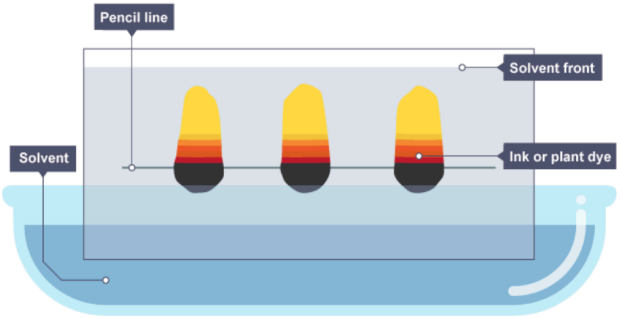


What is it?
It is used to separate a dissolved solid from a mixture of the solid and a liquid/solution (e.g. sand from a mixture of sand and water)

How is it done?
Filter paper is placed in a filter funnel above another beaker. The mixture of insoluble solid and liquid is poured into the filter funnel.

The filter paper will only allow small liquid particles to pass as the filtrate. Solid particles are too large to pass through the filter paper so stay behind as a **residue.**

Paper Chromatography



What is it?
It is used to separate substances that have **different solubilities** in a given solvent (e.g. coloured inks that are mixed in black ink)

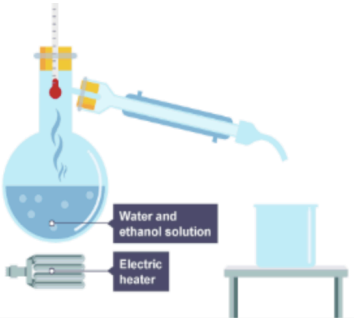
How is it done?
A **pencil line** is drawn on chromatography paper and spots of the sample are placed on it. The paper is lowered into the solvent container, making sure that the pencil line sits above the level of the solvent.

The solvent travels up the paper by **capillary action,** taking some of the coloured substance with it. Substances have different solubility to travel at different rates.

Fractional Distillation

What is it?
It is used to separate two or more liquids that are **miscible** with one another (e.g. ethanol and water from a mixture of the two)

How is it done?
The solution is heated to the temperature of the substance with the **lowest boiling point**. This substance will evaporate first, cool in the condenser and the liquid is collected. This leaves behind the other components.



This is the same technique used to separate the components of crude oil. Crude oil is a mixture of hydrocarbon molecules of different chain sizes.

The mixture is evaporated by heating and its vapours condense at **different heights** corresponding to **different temperatures** in the fractional column. Each fraction contains hydrocarbons with a similar number of carbon atoms.