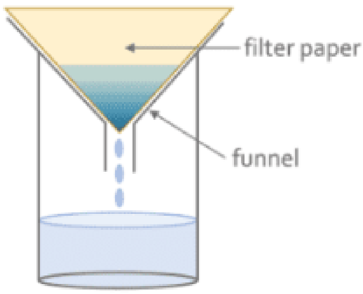
Separating a Solid from a Liquid

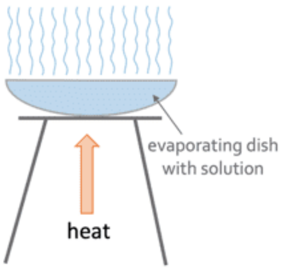
Technique Name	Steps
Filtration	1. Pour the mixture into a filter funnel that is lined with filter paper 2. Collect the filtrate in a conical flask 3. Collect the residue and dry it on a piece of filter paper
Evaporation to Dryness	1. Heat the solution in an evaporation dish 2. When all the liquid has been removed, all the impurities will be left behind
Crystallization	1. Dissolve the solid in water 2. Filter to remove any insoluble impurities, collect the filtrate 3. Heat the solution until it is saturated 4. Leave it to cool and crystallize 5. Filter and collect the crystals, wash with a little cold distilled water. Dry between a few sheets of filter paper

Filtration



Evaporation to Dryness

Crystallisation



Separating Solids from Solid Mixture

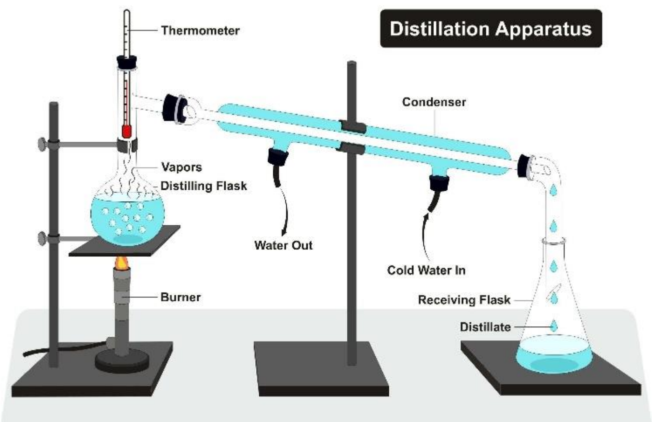
Technique Name	Steps
Using a Suitable Solvent	1. Add the solvent and stir to dissolve the soluble solid 2. Filter the suspension 3a. If using the filtrate, evaporate it to Dryness 3b. If using residue, wash residue with Distilled water
Sublimation	1. Heat the mixture 2. One solid undergoes the chemical change, it passes from solid state, completely sublimes and deposits on the surface of the filter funnel, stop heating

Using a Magnet

Technique Name	Steps
Using a Magnet	1. Use a magnet and let it attract all the magnetically attractable substances, wash with impurities with distilled water and dry with sheets of filter paper

Separating a Liquid from a Solution – Simple Distillation

Description
1. In the distillation flask, the solution boils. Boiling chips ensure smooth boiling. The liquid vaporises, rises, and enters the Liebig condenser 2. In the Liebig condenser, the vapour cools and condenses. It now changes back to a liquid and is known as a distillate 3. The pure distillate is collected in the receiver (conical flask)



Separating Liquids

Technique	Steps
Using a Separating Funnel	1. Pour the mixture of the two immiscible liquids into the separating funnel (Tap MUST be closed) 2. Support the separating funnel using a retort stand. Place a clean beaker below the separating funnel 3. Allow the liquids to separate completely. The denser liquid will be at the bottom layer 4. Open the tap of the funnel to allow the bottom layer to drain into the beaker. Close the tap before the top layer of liquid runs out 5. Place another beaker below the funnel. Open tap to allow a little of the top layer of liquid into the beaker. Dispose the liquid

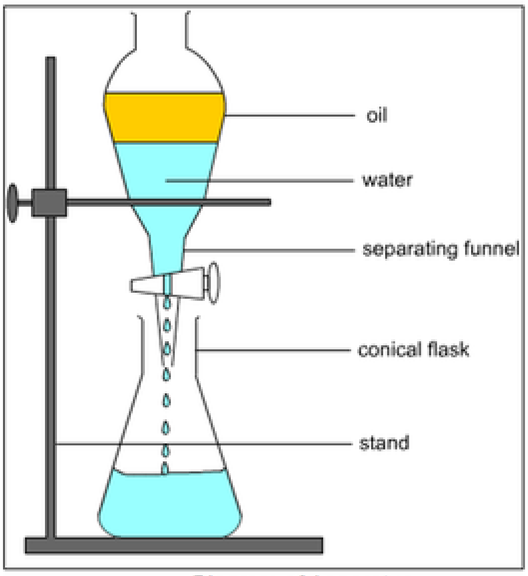


Diagram of Apparatus

Separating Liquids - Fractional Distillation

Occurrences during Fractional Distillation

- The liquid with the lowest boiling point will distil over first

Fractional Distillation Process:

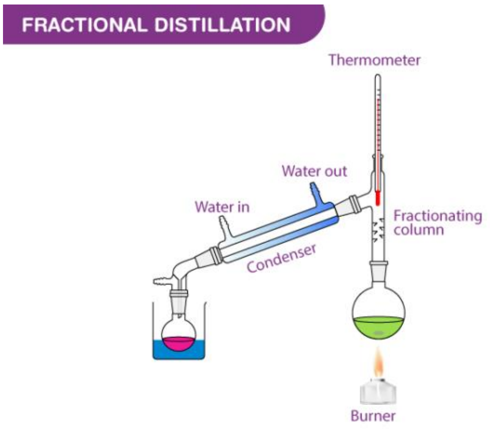
- The vapours of liquids with higher boiling points condense along the fractionating column and fall back into the round-bottomed flask

Fractionating Column and its purpose

- Attached to the round-bottomed flask and the condenser,
- Many glass beads in the fractionating column provide a large surface area for vapor to condense on.

An example of how Fractional Distillation works

Steps
1. The liquid that is boiling and the heated liquid both start to vaporise and rise up 2. The evaporating vapor is condensed in the fractionating column and falls back into the flask 3. Only the vapor that was boiling reaches the upper part of the column and distils over 4. The thermometer will show a constant temperature of the distilling liquid 5. In the Liebig Condenser, Hot vapor cools and condenses to a distillate 6. The liquid is collected as distillate in the receiver



Industrial applications to fractional distillation

1. Obtain Nitrogen, Argon and oxygen from air
2. Separate petroleum into useful fractions
3. Obtain ethanol produced by the fermentation of glucose solution.

Chromatography

Definition of Chromatography

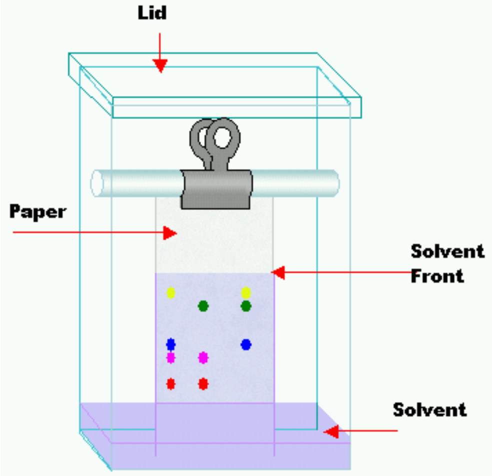
- Method of separating two or more components that dissolve in the same solvent.

Procedure for carrying out Paper Chromatography

Description
1. Set up the apparatus as shown above 2. Remove the chromatography paper. Ensure that it looks like what is on the right and that the solvent front with a pencil 3. Measure the distance from the starting line to the solvent front and the distance from the starting line to the separated spot 4. Calculate the Rf value by using the formula: Distance travelled by the spot / Distance travelled by the solvent 5. Compare the Rf value of the specific spot with the data on the Rf value of known chemical in the data sheet (if provided) 6. If the Rf values correlate, then the spot is identified as the chemical in the data sheet

Uses of Chromatography

- Separate components in a sample (such as dyes in an ink, pigments in plants and amino acids)
- Identify the components present in a sample (such as traces of banned substances in food)
- Identify substances (such as poisons, pesticides, and drugs)
- Determine the purity of a substance



Locating Agents

Uses of Locating agents

- Colourless substances will appear as coloured spots for easier identification, such as amino acids. A compound known as Ninhydrin is used as a locating agent

Procedure

Procedure
1. Separate the mixture of the invisible sample using a suitable solvent 2. Dry the chromatography paper before the solvent reaches the top of the paper. Dry the paper 3. Spray a locating agent 4. The locating agent reacts with each of the amino acids to form colored spots on the paper. By comparing the Rf value of each colored spot, we can identify the different spots on the chromatogram

Determining Purity

Importance of Purity

1. Impurities in drugs and medicines may cause undesirable side effects.

2. In the production of silicon chips for electronics, small amounts of impurities affect devices and make them less efficient

Pure Substances

For a Pure Solid:

- It will have a sharp and constant melting point
- Impurities lower the melting point, the more impurities, the lower the melting point.
- Melting with a sample containing impurities will occur over a range of temperatures

For a Pure Liquid:

- It will have an exact boiling point
- Impurities will increase the boiling point, the more amount of impurities, the higher the boiling point.
- Boiling a sample which contains impurities will boil over a range of temperatures