Separation and Purification

Content 🚄

Separating a Solid from a Liquid

Technique Name	Sample Diagram	Steps
Filtration		1. Pour the mixture into a filter funnel
	Friday	that is lined with filter paper.
	Filling The State of	2. Collect the filtrate in a conical flask
		3. Collect the residue and dry it on a
		piece of filter paper.
Evaporation to	Search Emponding Dirin	1. Heat the solution in an evaporation
Dryness	NL	dish
	Turitan	2. When all the liquid has been
		removed, all the impurities will be
		there
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.
	L.	5. Filter to collect the crystals, wash
		with a little cold distilled water. Dry
		between a few sheets of filter
		paper

Separating Solids from Solid Mixture

Technique Name	Sample Diagram	Steps
Using a Suitable solvent		 Add the solvent and stir to dissolve the soluble solid. Filter the suspension If using the filtrate, evaporate it to Dryness If using residue, wash residue with Distilled water
Sublimation	HEAT	 Heat the mixture The moment all of the chemical completely sublimes and deposits on the surface of the filter funnel, stop heating

Using a Magnet	Magnet	1. Use a magnet and let it attract all the magnetically attractable chemical, wash off any impurities with distilled water and dry with
	4	sheets of filter paper

Separating a Liquid from a Solution – Simple Distillation



Separating Liquids

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

Separating Liquids - Fractional Distillation

Occurrences during Fractional Distillation

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

- 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



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



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

 Separate the mixture of the invisible sample using a suitable solvent. Stop the chromatography before the solvent reaches the top of the paper. Dry the paper Spray a locating agent The locating agent reacts with each of the amino acids to form colored spots on the paper. By checking the R_f value of each colored spot, we can identify the different spots on the 	Sample Diagram	Procedure
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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 an exact 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

Test yourself 🎫

- 1. Explain all possible methods of separating
 - i. Insoluble Solid from a Liquid
 - ii. Solids from Solid Mixture

- iii. 2 miscible liquids
- iv. 2 immiscible liquids
- 2. Briefly describe some precautions used in Fractional Distillation?
- 3. What are some applications of distillation?
- 4. What is the additional equipment used for fractional distillation?
- 5. Define *Chromatography*
- 6. Describe how a sample of amino acids can be separated using Thin Layer Chromatography (Paper Chromatography)
- 7. What are some uses of Chromatography?
- 8. What is the use of Locating Agents? Name one of them
- 9. How is the Retention factor calculated? What is its significance?
- 10. What is the importance of Purity?
- 11. Explain how to test the purity of a Solid and Liquid?
- 12. What will you observe when an impure Solid and Liquid is heated?
- 13. What is a property only pure solids and liquids have?