

Chapter 3: Elements, Compounds And Mixtures

Think!

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Separation techniques are useful in getting the desirable substances from the mixtures. For example, separation of bran from flour by sieving, separation of butter by centrifugation, salt from sea water by evaporation

Exercise for Revision

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A. Tick (✓) the correct options:

1. (a) 2. (a) 3. (b) 4. (c) 5. (b)

B. Match the following:

1. (d) 2. (c) 3. (b) 4. (a)

C. Write the symbols of the following:

1. Cu 2. Fe 3. F 4. Al 5. K
6. Mg 7. H 8. C 9. Au

Exercise for Revision

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A. Tick (✓) the correct options:

1. (c) 2. (b) 3. (d) 4. (c)
5. (b) 6. (a) 7. (c)

B. Fill in the blanks:

1. chemically 2. change 3. homogeneous
4. heterogeneous 5. homogeneous

Exercise for Revision

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A. Tick (✓) the correct options:

1. (c) 2. (d) 3. (c)

B. State whether the following statements are true or false. Rewrite the false statements correctly:

1. True
2. False, **Correct statement:** The process of gravitation is used when one of the components is heavier than water and the other is lighter than water.
3. False, **Correct statement:** Crystalline substances have a well-defined geometrical arrangement.
4. False, **Correct statement:** Alcohol and water can be separated by fractional distillation.

Exercise

A. Short answer questions:

1. (a) A compound is made up of two or more elements. These elements are present in a definite proportion.
(b) The constituents of a compound can be separated only by chemical methods.
2. Two or more pure substances (elements or compounds) mixed together in any proportion, that do not undergo any chemical change and retain their individual properties are called mixtures.

Characteristics of a mixture

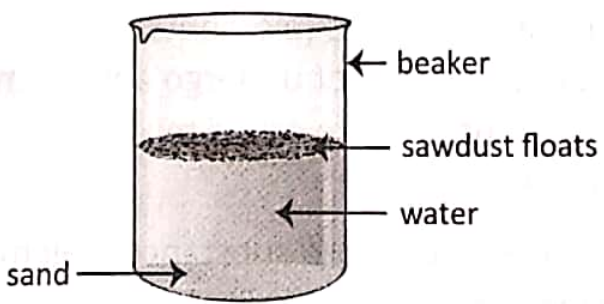
- (a) It consists of two or more substances (elements or compounds or both) mixed together physically.
For example, a mixture of sand and water
- (b) It does not have any fixed composition. Components of a mixture are present in different proportions.

| 3. | Homogeneous mixture | Heterogeneous mixture |
|----|---|---|
| | A mixture in which the components are mixed uniformly in a way that they cannot be seen separately is called a homogeneous mixture. | A mixture in which the components are not mixed uniformly and can be seen separately is called a heterogeneous mixture. |

4. We need to separate the components of a mixture to—
- (a) remove undesirable and harmful substances.
 - (b) get useful components.
 - (c) get a pure sample of a substance.
5. The process during which a liquid changes into its vapour, at temperature below its boiling point is called evaporation.
- We get only a solid substance from the mixture by the process of evaporation. The liquid component of the mixture escapes in the form of vapour. Both liquid and solid components can be obtained by distillation.
6. Substances having different densities are separated by centrifugation.
- It is based on the principle that when the mixture is rotated at high speed, the heavier solid particles (high density) move towards the bottom and lighter particles (low density) float on the liquid.
- It is used to separate cream from milk. Milk is rotated at a high speed in a centrifuge machine. Cream is lighter than milk, so it floats on the top of milk. It is then separated.

B. Long answer questions:

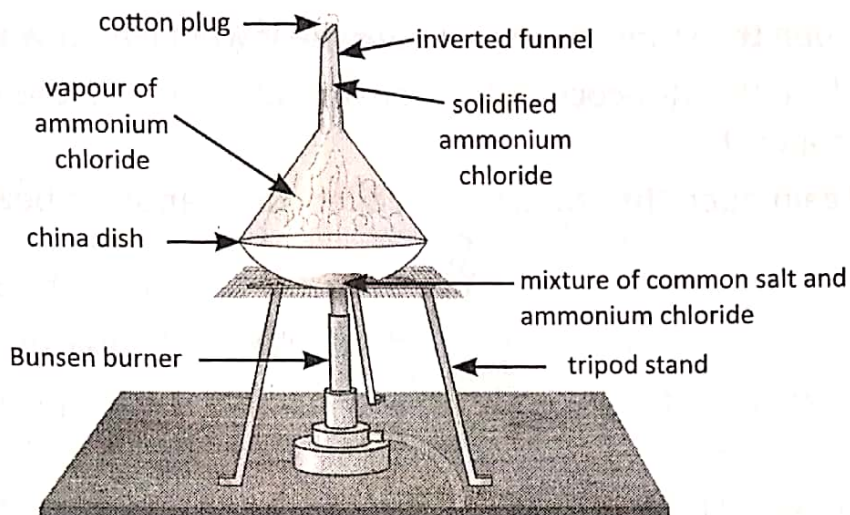
1. Gravitation method is used when one of the components is heavier than water and other is lighter than water. In a mixture of sand and sawdust, sand is heavier than water and sawdust is lighter than water. Thus a mixture of sand and sawdust can be separated by gravitation method. Take a mixture of sand and sawdust. Put it in water. Sawdust floats on water, whereas sand settles down. Sawdust is separated by filtration.



Sand and sawdust in water

2. Method to separate ammonium chloride and sodium chloride (common salt) from their mixture

- (a) Put the mixture of ammonium chloride and sodium chloride in a china dish.
- (b) Take a funnel and block its nozzle with a cotton plug. Invert it on the china dish.
- (c) Heat the mixture with a Bunsen burner gently, till white vapour is produced.



Sublimation and deposition of ammonium chloride

On heating, ammonium chloride changes into its vapour. The vapour condenses and get deposited on the cold inner walls of the funnel. It can be scraped off from the neck of the funnel. Sodium chloride is left behind in the china dish.

3. The method of getting a pure liquid from a solution by evaporation and then condensation of the vapour is called distillation.

In this process, solution is taken in a round bottom distillation flask. The distillation flask has a thermometer and a side tube. It is connected to a condenser called Liebig's condenser. The process of distillation can also be used to separate two liquids. These liquids are completely miscible. They have a considerable difference (about 25 °C or more) in their boiling points.

Fractional Distillation

It is used to separate a mixture of two miscible liquids having a difference in their boiling points of less than 25 °C.

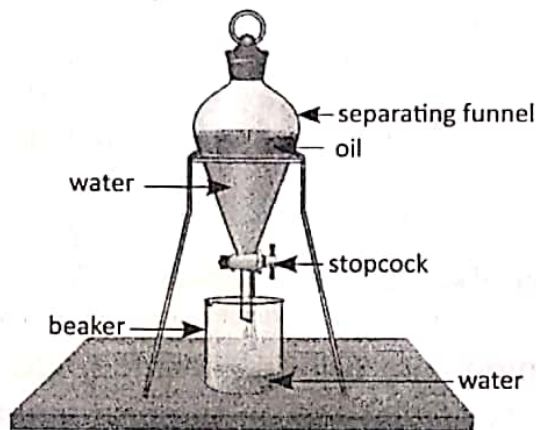
It is used to separate liquids having different boiling and condensation points.

A fractionating column is used for fractional distillation. A simple fractionating column is a glass tube packed with glass beads. The beads provide a large surface area for the vapour to cool and condense. Mixture is taken in a distillation flask and heated. The vapour of a liquid having the lower boiling point first passes out of the fractionating column. It condenses and gets collected in the receiving flask.

4. Liquids that do not dissolve completely in each other and form separate layers (when pour in a container) are called immiscible liquids.

Method to separate mixture of oil and water

- Take a mixture of water and oil in a separating funnel. Leave it undisturbed for some time. Oil forms the upper layer, whereas water forms the lower layer.
- Open the stopcock to drain out the lower layer of water in a beaker.
- Close the stopcock of the separating funnel as the oil reaches the stopcock.
- Again open the stopcock to collect oil in another beaker.



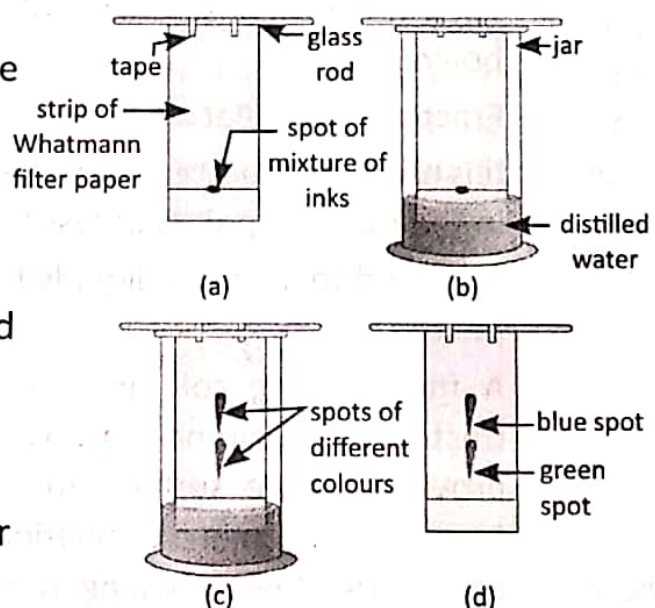
Separation of water and kerosene oil

5. The process of separating the different dissolved components of a mixture by their adsorption on an appropriate material is called chromatography.

This method is based on the principle that substances present in a mixture have different solubilities in the given solvent. Thus, they interact (adsorb) differently with stationary phase and mobile phase.

Method to separate the mixture of two inks by paper chromatography

- Mark a 3 cm line with a pencil (reference line above one end on a thin strip of Whatmann filter paper.
- Place this paper strip on a smooth surface.
- At the centre of the marked line, make a small spot with a mixture of inks and leave it to dry Fig.(a).
- Fill the chromatographic jar with water till a height of 2-3 cm.



Separation of mixture of inks by paper chromatography

(e) When the spot dries out, stick the paper strip to the glass rod with tape and suspend it in the jar [Fig. (b)].

(f) Leave the apparatus undisturbed for some time (about 10-15 min).

Precaution: The paper should be suspended in the jar vertically, and the level of water must be below the pencil mark (reference line).

Observation: The water in the apparatus rises by capillary action. When water rises, it takes along the dissolved components, and we can see two different coloured spots on the paper (chromatogram). These spots are seen at different distances from the reference line [Fig. (c) and (d)]. The colour that moves faster is more soluble in water than others. It produces a spot at a greater height. The colours separate because of different solubilities in water.

C. Application/Skill-based questions:

1. Centrifugation method is used to separate fat from *lassi*.
2. (a) Oil and water form a heterogeneous mixture.
(b) Mustard oil and water mixture is separated by separating funnel.
3. A layer of oil is separated on the mixture. Salt is dissolved in water and iron filings settle at the bottom. Oil is separated by separating funnel. Iron filings by gravitation. Salt and water by distillation (Evaporation can be used in case water is not required).
4. (a) Sieving (b) Distillation (c) Chromatography
(d) Crystallisation (e) Fractional Distillation

Integration

Basalt is an igneous rock mainly composed of plagioclase and pyroxene minerals. Plagioclase contains calcium and sodium. Granite is an igneous rock mainly composed of two minerals, i.e., quartz and feldspar. Quartz (SiO_2) is made up of silicon and oxygen.

Geography