Is Matter Around Us Pure Separation Of Mixtures

Techniques for Separation of Mixture:

SEPARATION OF MIXTURE OF TWO SOLIDS

1. Separation by a Suitable Solvent

A mixture of sugar and sand can be separated by using water as solvent. The mixture of sugar and sand is taken in a beaker and water is added to it. The mixture is stirred to dissolve the sugar in water. The sand remains undissolved.



Magnetic separation can be used to separate the components from a mixture if one of them is of magnetic nature while the other is non-magnetic.

The sugar solution containing sand is filtered by pouring over a filter paper kept in a funnel.

• To Separate a Mixture of Sulphur and Sand

A mixture of sulphur and sand can be separated by using carbon disulphide as solvent.

2. Separation by Sublimation

The changing of a solid directly into vapours on heating, and of vapours into solid on cooling is called sublimation.

To Separate a Mixture of Common Salt and Ammonium Chloride

We can separate ammonium chloride from a mixture of 'common salt and ammonium chloride' by the process of sublimation. The mixture of common salt and ammonium chloride is taken in a china dish. The china dish is covered with an inverted glass funnel. A loose cotton plug is put in the upper, open end of the funnel to prevent the ammonium chloride vapours from escaping into the atmosphere. On heating the mixture, ammonium chloride changes into white vapours. These vapours rise up and get converted into solid ammonium chloride on coming in contact with the cold, inner walls of the funnel. Pure ammonium chloride collects on the inner sides of the funnel in the form of a sublimate and can be removed.



3. Separation by a Magnet

If a mixture contains iron as one of the constituents, it can be separated by using a magnet. For example, a mixture of iron fillings and sulphur powder can be separated by using a magnet.

Separation of Scrap Iron

In factories, scrap iron is separated from the heap of waste materials by using big electromagnets fitted to a crane.

SEPARATION OF MIXTURE OF A SOLID AND A LIQUID

1. Separation by Filtration

Filtration is used for separating insoluble substances from a liquid. A mixture of chalk and water is separated by filtration. When the mixture of chalk and water is poured on the filter paper fixed in a funnel, then clear water passes through the filter paper and collects as filtrate. The chalk particles remain behind on filter paper as residue.

2. Separation by Centrifugation

Centrifugation is a method for separating the suspended particles of a substance from a liquid in which the mixture is rotated at a high speed in a centrifuge.



This is a centrifuge. A centrifuge is used to separate suspended solid particles from a liquid, quickly. When the centrifuge is switched on, the test-tubes (containing suspension) held in it swing out and spin (or rotate) at high speed. The centrifugal force acts on suspended particles which forces them to go to the bottom of test-tubes and clear liquid remains on top (This sketch shows four test-tubes spinning at the same (time).

• Separation of Cream from Milk

The process of centrifugation is used in dairies to separate cream from milk. The milk is put in a closed container in big centrifuge machine. When the centrifuge machine is switched on, the milk is rotated. Due to this, the milk separates into 'cream' and 'skimmed milk'. Thus, cream is separated from milk by centrifugation.



3. Separation by Evaporation

Evaporation is used to separate a solid substance that has dissolved in water. The use of process of evaporation for separating a mixture is based on the fact that liquids vaporise easily whereas solids do not vaporise easily.

The common salt dissolved in water can be separated by the process of evaporation. The solution of common salt and water is taken in a china dish and heated gently by using a burner. The water present in salt solution will form water vapours and escape into atmosphere. The process of evaporation is used on a large scale to obtain common salt from sea-water.



4. Purification by Crystallisation

The process of cooling a hot, concentrated solution of a substance to obtain crystals is called crystallisation.

Crystallisation is a better technique than 'evaporation to dryness' because of the following reasons:

- (i) Some solids (like sugar) decompose or get charred on heating to dryness during evaporation. There is no such problem in crystallisation.
- (ii) The soluble impurities do not get removed in the process of evaporation. But such impurities get removed in crystallisation.

5. Separation by Chromatography

Chromatography is a technique of separating two (or more) dissolved solids which are present in a solution in very small quantities. There are many types of chromatography but the simplest form is the paper chromatography. By using paper chromatography, we can separate two (or more) different substances present in the same solution. Kroma in Greek means colour. There are many types of chromatography like gas chromatography, liquid chromatography etc. but the simplest form is the paper chromatography.

Paper chromatography is very useful in separating various constituents of coloured solutes present in a mixture like, ink, dyes etc.



• To Separate the Dyes Present in Black Ink

- 1. Take a thin and long strip of filter paper. Draw a pencil line on it. about 3 centimetres from one end.
- 2. Put a small drop of black ink on the filter paper strip at the centre of the pencil line.
- 3. When the drop of ink has dried, the filter paper strip is lowered into a tall glass jar containing some water in its lower part. The lower end of the paper strip should dip in water but the pencil line should remain above the water level in the jar.
- 4. The water gradually rises up the filter paper strip by capillary action. The dye which is more soluble in water dissolves first, rises faster and produces a coloured spot on the paper at a higher position. In this way, all the dyes present in black ink get separated (by forming separate different coloured spots).

The paper which its separate-coloured spots is called a chromatogram the important application (or uses) of chromatography:

- (i) Chromatography is used to separate solutions of coloured substances.
- (ii) Chromatography is used in forensic science to detect and identify trace amounts of substances in the contents of bladder or stomach.
- (iii) Chromatography is used to separate small amounts of products of chemical reactions.

6. Separation by Distillation

In order to recover both, salt as well as water, from a salt-water mixture (or salt solution), the process of distillation is used.

Distillation is the process of heating a liquid to form vapour, and then cooling the vapour to get back liquid. Distillation can be represented as:



Pure water or distilled water is made from tap water by the process of distillation.

✤ SEPARATION OF MIXTURE OF TWO (OR MORE) LIQUIDS

All the mixtures containing two (or more) liquids can be separated by one of the following two methods:

(i) By the process of fractional distillation.

(ii) By using a separating funnel.

Those liquids which mix together in all proportions and form a single layer (when put in a container), are called miscible liquids. Alcohol and water are miscible liquids. A mixture of miscible liquids is separated by the process of fractional distillation.

Those liquids which do not mix with each other and form separate layers (when put in a container), are called immiscible liquids.

A mixture of immiscib le liquids is separated by using an apparatus called separating funnel.

1.Separation by Fractional Distillation

Fractional distillation is the process of separating two (or more) miscible liquids by distillation, the distillate being collected in fractions boiling at different temperatures. The separation of two liquids by fractional distillation depends on the difference in their boiling points.



Fractional distillation is carried out by using a fractionating column. In most simple terms, a fractionation column can be regarded as an arrangement for providing differnet temperature zones inside it (during distillation), the highest temperature being at the bottom of the column and the lowest temperature near its top.



A fractionating column is a long tube provided with obstruction to the passage of vapours upwards and that to liquid downwards.

A simple fractionating column is a long vertical glass tube filled with glass beads The glass beads provide a large surface area for hot vapours to cool and condense respectively.

Applications of Fractional Distillation

- 1. Fractional distillation is used to separate mixtures of miscible liquids (like alcohol-water mixture and acetone-water mixture) in the laboratory.
- 2. Fractional distillation is used to separate crude oil 'petroleum' into useful fractions such as kerosene, petrol and diesel, etc.
- 3. Fractional distillation (of liquid air) is used to separate gases of the air.

Separation of the Gases of the Air

The various gases of air are separated from one another by the fractional distillation of liquid air. This separation is based on the fact that the different gases of air have different boiling points.

Gas	Boiling point
	(of liquefied gas)
Nitrogen	-196ºC (Lowest boiling point)
Argon	-186ºC
Oxygen	-183ºC (Highest boiling point)



The earth's crust is mode mainly from two elements i.e. oxygen (46.6%) & silicon (27.7%). The rest of the elements are present in lesser proportions. All living things, both plants & animals are made from a few elements only.

These are mainly oxygen carbon, hydrogen, nitrogen, calcium along with same other elements. The major component of air is nitrogen [78.03%]. The second major component of air is oxygen [20.99%] and the third major component of air is argon [0.93%].



2.Separation by a Separating Funnel

A mixture of two immiscible luqids can be separated by using a separating funnel. The separation of two immiscible liquids by a separating funnel depends on the difference in their densities. A mixture of water and kerosene can be separated by using a separating funnel.



Please note that water and alcohol form a homogeneous mixture and hence cannot be separated by using a separating funnel.

A mixture of petrol and water can also be separated by using a separating funnel. A mixture of more than two immiscible liquids can also be separated by using a separating funnel.