Chapter 3

Separation of Substances

Points to be studied

3.1 Substances & Mixtures
3.2 Types of Mixtures
3.3 Need to separate the components of mixture
3.4 Methods of Separation

3.1 Substances and Mixtures

Take one teaspoon of sugar on your palm. You will see , it contains only one type of particles (i.e. sugar).

Now take a handful of sand and observe carefully, it contains different types of particles i.e. soil, gravels , weed etc.

Let us see the difference between the two. Sugar is a substances while Sand is a mixture. Examples of mixtures-Air, Soft drink, ice cream, milk, sea water, sand etc.

Write the components of mixture that are used in our daily life in the Table 3.1 given below.

Table 3.1 Components of mixture that are used in daily life.

S No.	Mixtue	Components
1	Air	Oxygen, Nitrogen, Carbondioxide water vapour etc
2	Jaggery	Sugar and Other Extracts
3	Soft Drink	
4	Soda Water	
5	Brass	
6	Milk	
7	Blood	

3.2 Types of Mixture

Substances that are present in the mixture are called its components. In Some mixtures components are easily visible while in others it is difficult.

Activity-1

Take a glass half filled with water and add a teaspoon of salt in it and stir. Salt will completely dissolve in water .Salt and water cannot be seen separately in this mixture.

Those mixtures in which two or more components are present but can not be seen separately are called homogeneous mixtures. Eg. mnixture of water & salt

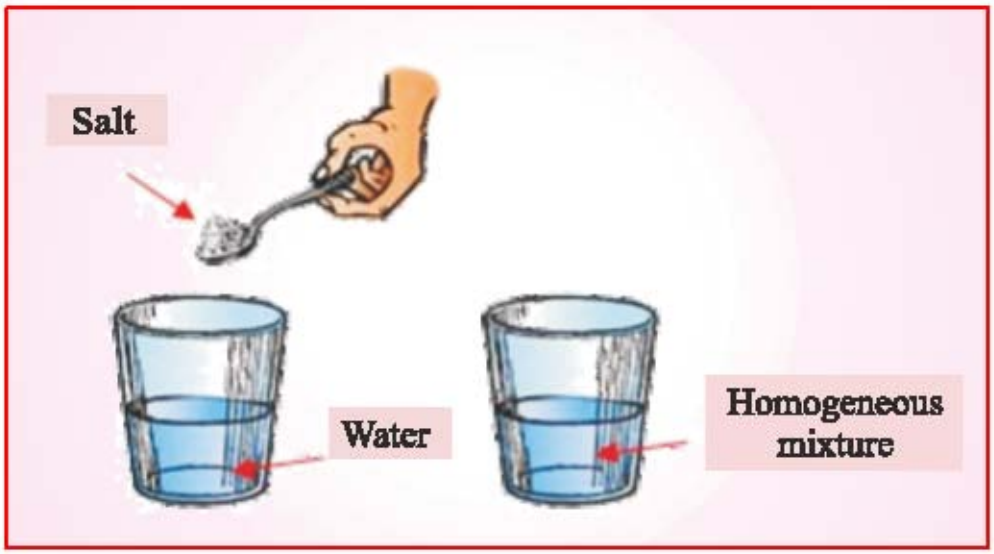


Fig. 3.1 Homogeneous mixture

Activity-2

Take some water in a beaker. Add a teaspoon of groundnut oil or mustard oil in it and stir. What do you observe? You will observe two separate layers of water and oil in the beaker. Hence, those mixtures in which its components can be seen separately are called **heterogeneous** mixtures. E.g. Mixture of Water and Oil.

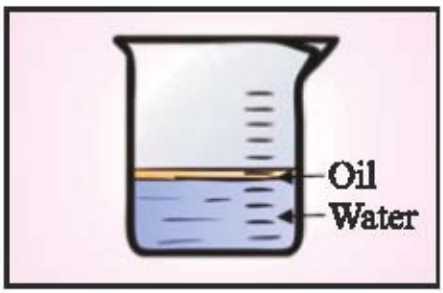
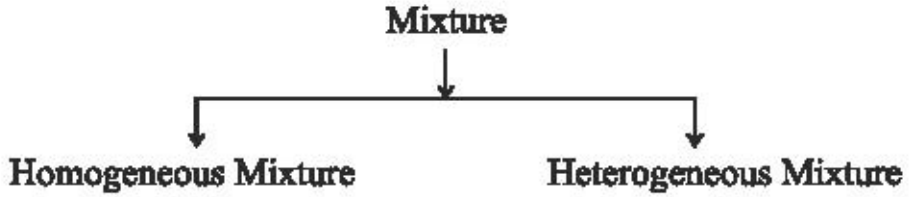


Fig. 3.2 Heterogenous mixture

So, the mixtures can be classified into two different types on the basis of nature of their substances.

Types of Mixture



Separation

You must have seen your mother picking wheat. Your mother separates out the tiny gravels or other impurities by picking with her hand. IF you are given a mix of wheat, barley and corn and asked to segregate the three then what will you do? You will separate the mixture of wheat, barley & corn on the basis of their identification by picking with your hands. This is called Separation.

3.3 Need to separate the components of mixture

We can improve the quality, purity, capability and utility of a mixture by removing the impurities from the mixture. It is also possible to find the ration of different components in a mixture. Like impurities in cement reduces its capability. Impurity in gold reduces its shine. Drinking impure water can make us sick. Hence we can say that separating mixture from its components is an important part of our lives. There are so many methods of seperation of components from mixture, Let's knows.

3.4 Methods of Separation

1. Hand Picking

In wheat, rice, Pulses, many impurities like gravels, soil, and other impurities are mixed. These impurities are present in less quantity. These are different in colour & shape from wheat, rice and pulses. These impurities are separated with the hands. This is called hand picking.

Fig. 3.3 Picking

2. Sieving

Fig. 3.4 Seiving

Fig. 3.5 Seiving

Your mother sieves flour before kneading it. Husk & other impurities remain in the sieve and we get pure flour. You must have witnessed at the construction site that gravels & pebbles are separated out from sand with the help of sieves. This process is called Sieving.

3. Filtration

Let us see how to remove insoluble impurities from dirty water?

Activity-3

Take a filter paper and fold it to make a cone as given in diagram-3.6 Place it inside a funnel. Pour the dirty water on filter paper slowly until 2/3rd part of funnel is filled .We will observe that filter paper will prevent soil gramuels & pebbels & allows only water to pass through it.

Filter paper can separate soil and water.

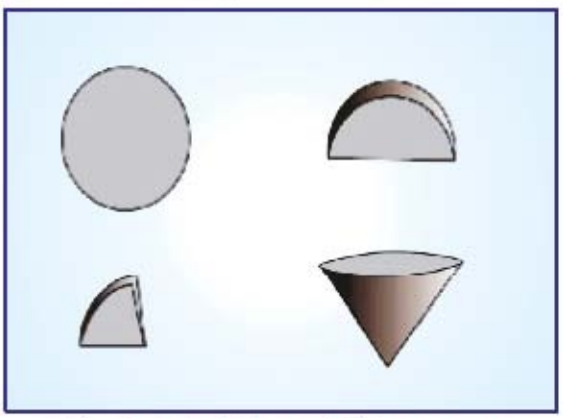


Fig. 3.6 Folding of filter paper

Fig. 3.7 Filtration

The process of separation of components from a solid or liquid mixture is called filtration.

4. Winnowing -

In your house you must have seen your mother cleaning wheat and rice by winnowing. Method of separating minor impurities from grains with the help of suup is called winnowing. Farmers make the grains fall from a certain height in the fields. Grains being heavier fall nearby while on the other hand impurities being lighter in weight fall away with the flow of wind. This Method of separating impurities from mixtures is called **Winnowing.**

Fig. 3.8 Winnowing

5. Centrifugation -

You must have seen separating of butter and butter milk from curd. How does this takes place? Let us learn-

Curd is rotated in circular direction with the help of churn due to which butter milk being heavier in weight goes downwards while butter being lighter in weight comes upwards. This process is called **Centrifugation.**

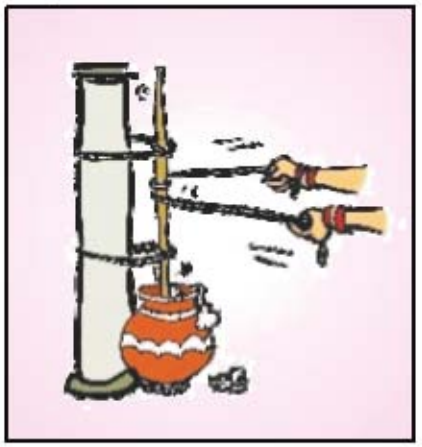


Fig. 3.9 Centrifugation

6. Threshing -

Plants of different pulses and grains are dried in the fields. Simultaneously to separate out the grains, dried plants are beaten on rocks or wooden planks. Separating out the food grains from dried plants is called threshing.

These days threshing machine is also used for this purpose.

Fig. 3.10 Threshing

7. Vaporisation -

How do we find Salt from sea water?

Activity-4

Take a ceramic dish, fill it half with water. Put a tea spoon of salt in it and stir. Now heat the water as per picture 3.11After some time we observe that all the water converts into vapour & only salt remains in the ceramic dish. This method is used to find salt from sea. In which, water is made to accumulate in small lagoons . Water turns into water vapour with the heat of the sun and salt remains in the lagoons. Hence we can say that conversion of any liquid to its vapours is called **Vaporisation.**

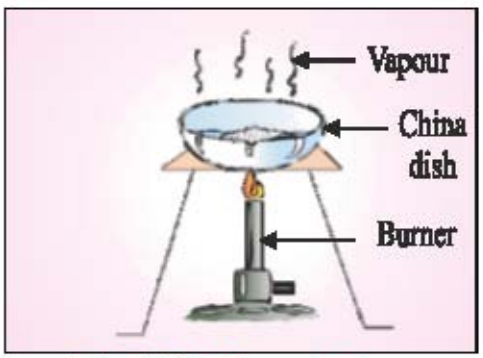


Fig. 3.11 Vaporisation

Fig. 3.12 Making Salt from sea water

8. Magnetic Separation Process

Activity 5

Take a mixture of sand and chips of iron on a piece of paper. Place a magnet near the mixture. Repeat this process again and again. We will see that chips of iron will get attracted to the magnet while sand will remain unaffected on paper. In this way magnetic substances are separated from non magnetic substances through magnetic separation.

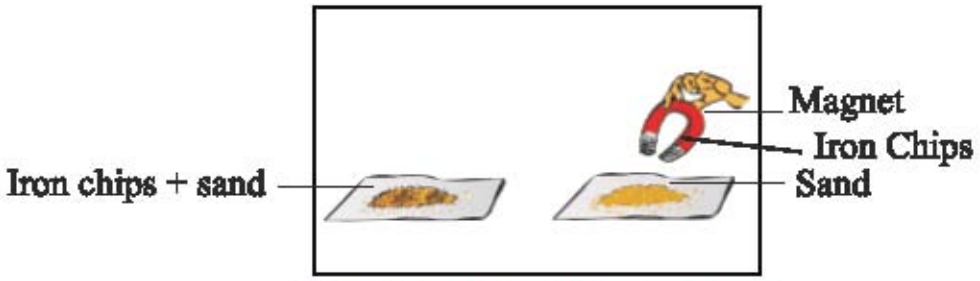


Fig. 3.12 Magnetic Separation

9. Sublimation -

In houses we often use white naphthalene balls for protecting woollen clothes. We see that after some time those naphthalene balls reduce in size or even diminish. Why does this happens? Let us know.

Some solids on heating directly get converted into vapours while turn directly into solids on cooling without getting converted into liquid. This process is called **Sublimation.**

We will separate mixture of salt and ammonium chloride through sublimation. Let us try.

$$\text{Solid} \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} \text{Vapour}$$

Activity 6

Take mixture of ammonium chloride and salt in china dish Place it on a tripod stand and place a funnel over the china dish so that it covers the china dish. Close the lid of the funnel with cotton. Heat the mixture till you see white smoke. Now stop heating the mixture, and let the funnel cool down for some time. We will see the white substance on the surface of the funnel. This is ammonium chloride and salt remains in the china dish.

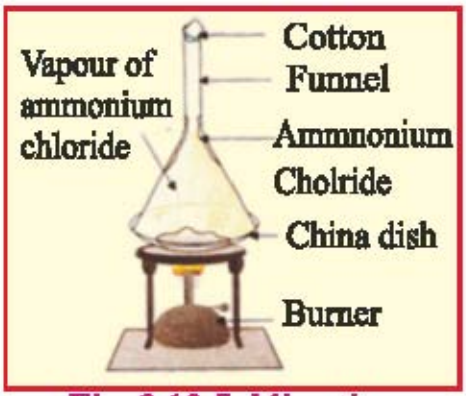


Fig. 3.13 Sublimation

10. Sedimentation and Decantation

Activity 7

Take a glass beaker, fill it half with water. Put a teaspoon of sand in it and stir. What do you observe? You will see that sand will settle down at the base of the beaker. Settling down of heavier impurities present in the mixture is called **sedimentation.** Transferring of sedimentated mixture carefully without stirring into another beaker is called **decantation.**

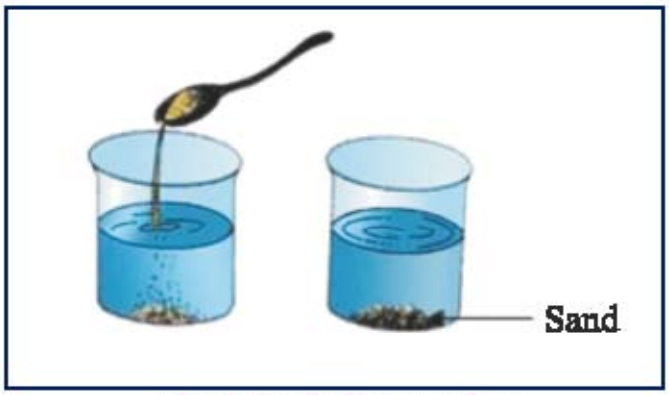


Fig. 3.15 Sedimentation

Fig. 3.16 Decantation

Why Potash alum is used in dirty water.

Activity 8

Take some dirty water in a glass beaker. Insert a piece of Potash alum hanging inside it with the help of a thread & stir it. After some time we will observe that sand particles being heavier settle down at the base of the beaker. Clean water can be separated out through decantation.

11. Distillation

Water in reservoirs & tap water contain impurities. Hence such water cannot be used in laboratories & in making medicines. Distill water is used in laboratories & in making medicines for injections.

How dissolved impurities in water do are separated out?

Activity 9

Take some water in a kettle & bring it to heat. Now take some ice on a metal plate. Keep the metal plate just above the valve of the kettle. All the water in the kettle gets converted into vapours. Conversion of liquid into vapour is called Vaporisation. Impurities of water remain in the kettle. When steam comes

in contact with the chilled plate then it gets converted into liquid. This liquid gets coagulate in the beaker drop by drop. Conversion of vapour into liquid is called **condensation.**

Method of separating out liquid with through vaporisation & condensation is called **Distillation.**

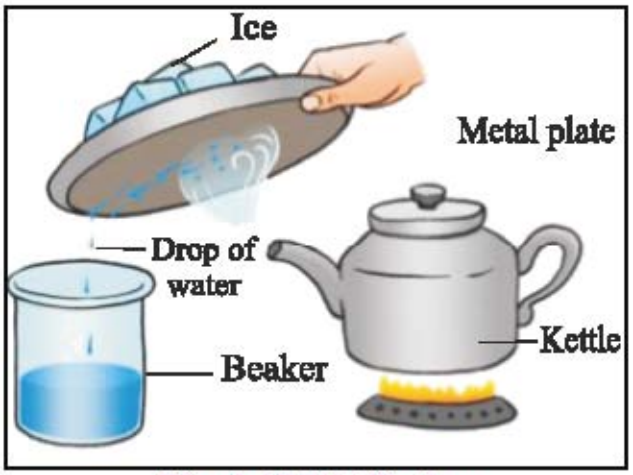


Fig. 3.17 Distillation

$$\text{Liquid} \underset{\text{Condensation}}{\overset{\text{Vaporisation}}{\rightleftharpoons}} \text{Vapour}$$

What have you Learnt?

- Mixing of 2 or more liquids in an indefinite amount makes a mixture.
- Mixtures are of two types-Homogeneous & Heterogeneous.
- Process of Separating out liquids from its components is called Separation.
- Some of the major processes of separation are-Vaporisation, magnetic separation, sublimation, sedimentation & decantation, distillation etc.
- Mixture of salt & ammonium chloride are separated out through Sublimation.
- Process of separating out clean liquid through vaporisation and condensation is called Distillation.

□□□

Exercise

Choose the correct option

1. Which process is used for separating out wheat from impuruties.
   (a) Winnowing (b) Magnetic separation
   (c) Hand Picking (d) Threshing ( )
2. Which process is used for separating curd from butter?
   (a) Distillation (b) Centrifugation
   (c) Sieving (d) Vaporisation ( )
3. Type of Homogeneous mixture
   (a) Mixture of milk and sugar (b) mixture of sand and iron
   (c) Mixture of soil and water (d) Mixture of oil and water ( )
4. Process of converting vapour into liquid is called
   (a) Vaporisation (b) Compaction
   (c) Distillation (d) Threshing ( )

Fill in the blanks

1. Separating out Gram from mixture of Gram and wheat is called ___
2. Conversion of liquid into vapours is called _____.
3. Soft drink is an example of _____.
4. _____ wateris used in making medicines.

Match the following in Column A and Column B

Column A		Column B
(1)	Sublimation	(a) Mixture of sand and iron.
(2)	Sieving	(b) Mixture of salt and ammonium chloride
(3)	Magnetic separation	(c) Separating out dirty water from sand.
(4)	Vaporisation	(d) Salt from sea-water

Short answers type Questions

1. What is Lagoon?
2. Explain homogeneous mixtures with examples.
3. What do you mean by Filtration? Explain with diagram.
4. Explain the difference between hamogenous & hetrogenous mixture.
5. Explain the process of getting pure salt from impure salt with diagram.

Long Answer type Questions

1. Write the process of Separating out sand, salt, iron chips from mixture.
2. Explain with diagram any four techniques of Separation.
3. What is the importance of separation of substances? Explain.

Activity

Make the following mixtures & separate out the basic components from them.

(a) Camphor + Salt

(b) Water + Baking Soda

(c) Salt + Sand

(d) Soil + Iron Chips

(e) Water + Mustard Oil

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