# 3 Separation of Substances

We come across many substances around us. How are these substances made? Here below, the list of some substances is given in the table. Will you be able to say from which they are made of ?

| No | Name of the substance | Made of |
|---|---|---|
| 1 | Tea | |
| 2 | Lemonade | |
| 3 | Soil | |
| 4 | Sea water | |

You can see that the each of the above substances is made of two or more constituents. Such substance is called mixture.

The constituents with which a mixture is made may be of any state either solid, liquid or gaseous. Names of some mixtures are given below in a table. Place its constituents according to the their form in the proper column.

| No | Name of the mixture | From which constituents it is made? | | |
|---|---|---|---|---|
| | | Solid | Liquid | Gaseous |
| 1 | Mixture of rice and pulses | | | |
| 2 | Lemons juice | | | |
| 3 | Air | | | |
| 4 | Sugar solution | | | |
| 5 | Soda-water | | | |
| 6 | Fog | | | |
| 7 | Fermented dough for Dhokalas | | | |

**On the basis of the state of the components, there are seven different types of mixtures :**

1. Mixture of solid substances.
2. Mixture of liquid substances.
3. Mixture of gaseous substances.
4. Mixture of solid and liquid substances.
5. Mixture of gaseous and liquid substances.
6. Mixture of gaseous and solid substances.
7. Mixture of solid, liquid and gaseous substances.

**Having discussed with your friends, find out some examples of each of this.**

Sometimes a necessity arises to separate the components of a mixture such as,

(1) To remove non-required components. For example, to remove bran (peel off the skin) from roasted salty peanuts.

(2) To get rid of harmful components. For example, to remove small pieces of stones from grains.

(3) To know the proportion of the components. For example, to know the proportion of sand, clay, silt and organic materials in the soil.

(4) To separate the components as per requirement. For example, to separate wheat and rice from the mixture.

(5) To obtain pure sample for an experiment. For example, to obtain distilled water.

**Method to separate components of a mixture is called 'Separation'.** For separation there are different methods. On the basis of the properties of the constituents of the mixture a proper method for separation is used. Come on. Let us know about such methods through activities.

## Picking

**What is required?** Grains mixed with small pieces of stones, plate.

**What to do?**

- Take grains mixed with small pieces of stones in a plate.
- Picking the small pieces of stones from the grains and remove.

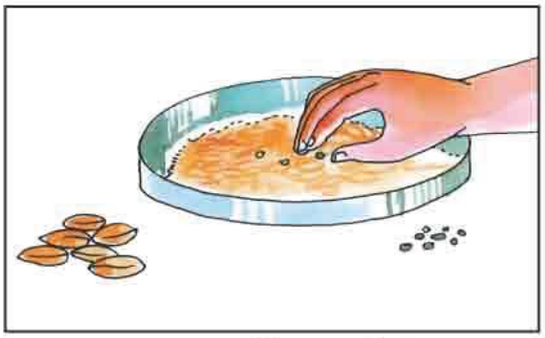

**Figure 3.1**

Generally two solid subtances which do not mix with each other are separated from a mixture by picking with hand. This method is known as 'Picking '.

(1) Why are small pieces of stones separated from grains?

(2) Do you use 'Picking' method anywhere else?

## Sieving

**What is required?** Wheat flour, sieve, plate.

**What to do?**

- Keeping a sieve on a plate, take a small quantity of flour in it.
- Shaking the sieve slowly, sieve the flour.
- After sometime, touching the flour left in the sieve with impurities and the flour collected in the plate, make your observation.

**Figure 3.2**

If the solid substances are not of the same size and they do not mix with each other. The process by which they can be separated from the mixture with an appliance having a wire mesh fixed tightly in a frame like a sieve is called 'Sieving'.

(1) Why do we separate the substance left in the sieve from the flour?

(2) Have you seen the use of this method anywhere else?

### 3. Winnowing

**What is required?** Roasted salty peanuts.

**What to do?**

- Take salty peanuts in the hands and crush them with both the hands.
- Transfer them from one hand to the other hand and meanwhile blow some air slowly on them.

**Figure 3.3**

**What did you see?**

In a mixture, the substances which are light in weight can be separated with blowing some wind on them. Such a method is known as 'Winnowing'.

From a mixture, to separate the components with winnowing method, it is necessary that there should be difference between their densities.

(1) Why do we remove the husk of salty peanuts?

(2) Have you seen the use of this method anywhere else?

## Decantation

**What is required?** Dirty water, two transparent glasses.

**What to do?**

- Take dirty water in a transparent glasses
- Keep this glass on a plane surface like table.
- Let the glass be on the table for about thirty to forty minutes and then observe it.

**Figure 3.4**

**What did you see?**

Now, slowly take the upper water from the glass in the other glass. Observe the water obtained in the other glass.

The method to seperate the substances which are insoluble in liquid as well as have different densities method to separate called 'Decantation'.

(1) Have you seen the use of decantation method anywhere else?

(2) Why are dust and dirt separated here from water?

**From the mixture of liquids having different densities, separating funnel is used in laboratory to separate each constituent.**

**What is required?** Mixture of kerosene and water, a separating funnel and two beakers.

**What to do?**

- Fill the separating funnel with the mixture of kerosene and water.
- Keep it steady for some time.

**What did you see?**

- Now keep a beaker just below the separating funnel and open the cock of the separating funnel.
- Once the water from the separator funnel comes out completely, close the cock of the separating funnel.
- Now keep the other beaker just below the separating funnel and open the cock again.
- Observe the liquids collected in both the beakers.
- This process of separation is called separation method. It is a type of 'Decantation method'.

## 5. Filtering

**What is required?** Decanted water obtained from the previous method, a piece of cotton cloth, two beakers, a string.

**What to do?**

- As shown in the figure 3.6, tie a piece of cotton cloth on the mouth of a beaker with a string.
- Now, slowly pour the water obtained from decantation on the cloth tied to the beaker.
- Observe carefully the water collected in the second beaker and substances.
- Solid substances which do not dissolve in liquid are separated by the method with network mater is called 'Filtering'.

**Figure 3.6**

(1) Why are the insoluble solid impurities removed from water?

(2) Have you seen the use of this method anywhere else?

**Figure 3.7**

In modern times, for purification of water, modren purifiers are used. In which diffrant kinds of harmful materail as well as virus wastes are removed and water is made drinkable.

## 6. Magnet Method

**What is required?** Saw dust,Iron filings, paper, magnet

**What to do?**

- Mix saw dust and Iron filings on a paper.
- Move a magnet through the mixture.

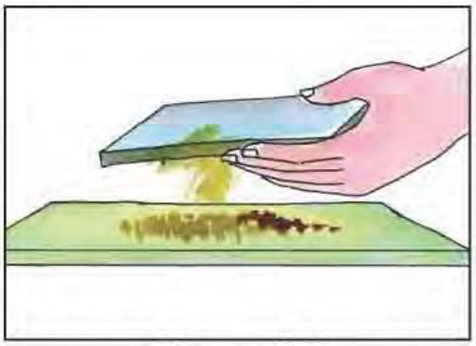

**Figure 3.8**

**What did you see?**

The method of separating iron from the mixture is called 'Magnet Method'.

(1) Which components from the mixture can be separated by this method? Why?

(2) Have you seen the use of this method anywhere else?

## 7. Sublimation

### What is required?

Camphor, common salt, evaporating bowl, glass funnel,cotton, tripod, wire gauze, spirit lamp, match box.

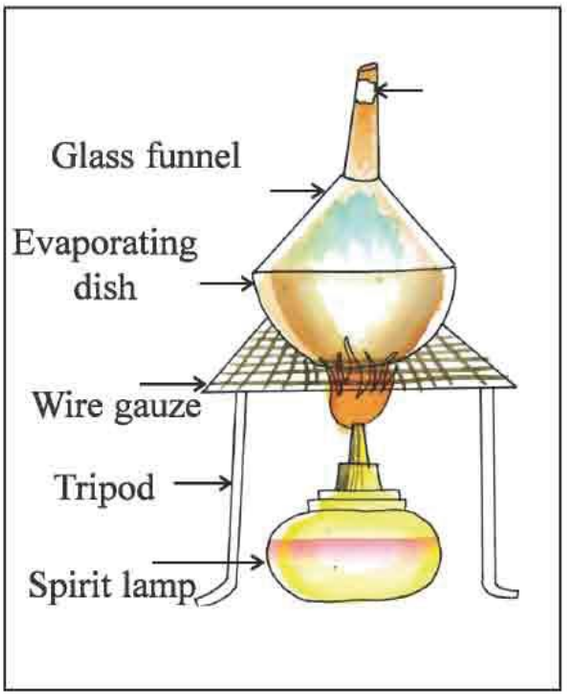


**Figure 3.9**

### What to do?

- Take mixture of camphor and common salt in an evaporating dish.
- Close the nozzle of the glass funnel with cotton.
- Keeping a wire gauze on the tripod,place an evaporating dish.
- As shown in the figure: 3.9, place the glass funnel upside down over the evaporating dish.
- Light the spirit lamp and put it under the tripod.
- Go on observing the evaporating dish bowl and the funnel for some time.
- Once the white smoke starts rising up in the nozzle of the funnel, wait for a moment and then extinguish the spirit lamp.
- Allow the glass funnel to cool down for some time, then observe the white substance deposited on the inner side of the funnel.

When some substances in a solid state are heated then they directly change into gaseous state and if cooled the gaseous state directly turned into solid state. This type of substances are called sublimating stances.

eg. Camphor, Napthalene-pill, iodine, dry ice.

To separate sublimating substances from a mixture the special method used is called 'Sublimation'.

## Evaporation

**What is required?** A beaker, Water, Common salt, spoons, a saucer.

**What to do?**

- Take some water in a beaker.
- Add some common salt and prepared soluation it salt by stirring with spoon
- From this solution, take some amount of solution in a saucer.
- Keep this saucer outside in the afternoon sun shine for two to three hours.
- After that, observe the solution in the saucer.

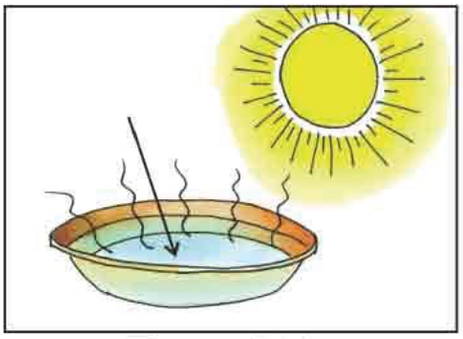

**Figure 3.10**

**What did you see?**

With the heat of the sun, water from the solution changes to water-vapour .Thus water and salt are separated from the salt-solution. This process is called 'Evaporation'.

**Where is this method used ?**

## 9. Distillation

**What is required?** Flask, cork, thermometer, tripod, wire-gauze, condenser, receiver flask, spirit lamp, match box, water.

**What to do?**

- Arrange the apparatus as shown in the figure: 3.11.
- Light the spirit lamp. When the mercury of the thermometer shows the temperature $100^0$ C keep an empty beaker near the opening end of the condenser.

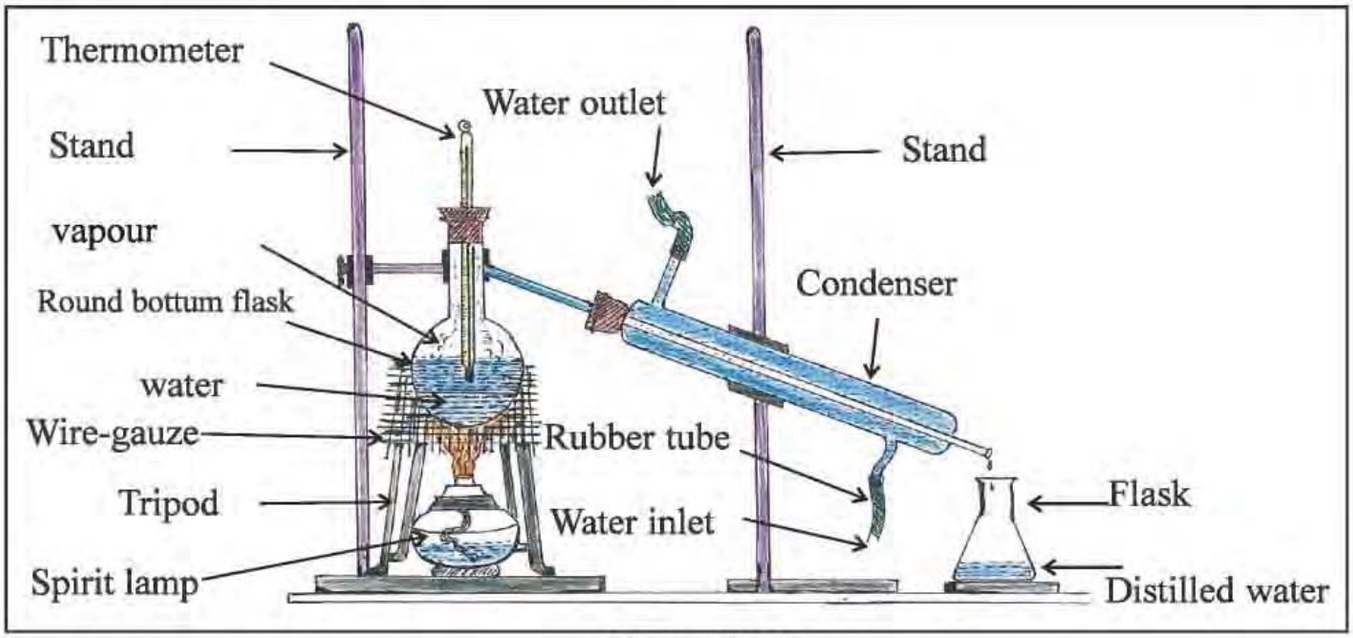


**Figure 3.11**

**What did you see?**

The components are separated from the mixture of liquids having different boiling points and are obtained in the pure form by the process which is called 'Distillation'.

The water collected in the receiver flask by this method is 'Distilled water'.

**(1) Where do we use distilled water?**

**(2) Is distilled water proper for drinking? Why?**

Crude oil is distilled in the 'Fractional distillation towers' and at different temperatures petrol, naphtha, kerosene, diesel, tar, wax, etc. substances are separated.

**Where else is distillation method used in practice?**

**Q.1 Below is the list of some mixtures given. To separate the components from the mixtures, which method will you apply? Mention the method, giving the reason for it :**

(1) Mixture of Sulphur and iron filings

(2) Mixture of oil and water

(3) Mixture of peanuts and grams

(4) Mixture of common salt and Naphthalene balls

(5) Solution of sugar

**Q.2 Explain the differences :**

(1) Filtering and Decantation

(2) Sieving and Picking

(3) Evaporation and Distillation

**Q.3 Thinking the forms of the state of the components of the mixture, mention the mixtures are of the what type :**

(1) Fermented syrup for Jalebi

(2) Soil

(3) Air

(4) Lemon juce

(5) Solution of glucose

**Q.4 Make a list of the different methods for isolation which you generally use in every daily life.**