Separation of substances

A pure substance is has particles of one kind only for example distilled water contains particles of water only while a Mixture is a combination of two or more types of particles for example air has particles of oxygen, nitrogen, carbon dioxide, water in the form of vapour. Dust and smoke particles are also present in air. The substances present in a mixture are called its components so oxygen, nitrogen, carbon dioxide, water in the form of vapour, dust and smoke particles are the components of air.

WHY DO WE NEED TO SEPARATE MIXTURES?

Most of the substances around us are mixtures and a very few are pure substances. Separation of mixtures becomes necessary for several reasons mentioned below:

1. **TO OBTAIN USEFUL COMPONENTS** Petroleum is refined to separate petrol, Kerosene, diesel and Vaseline etc as petroleum cannot be used as such and metals are extracted from their natural forms which are mixtures before they can be used.

2. **TO GET PURE SUBSTANCE FROM A MIXTURE**

   Distilled water can be obtained from any water sample by simple distillation.

3. **TO REMOVE HARMFUL COMPONENTS**

   Sometimes rice or pulses might contain small stones which can be harmful for us.

   **HANDPICKING**

   This method can be used when the components of the mixture differ in size, shape or colour and when the component to be separated from the mixture is present in small quantity. In this method the component of the mixture which is bigger in size is removed from the mixture by hand. For example stones can be removed from rice by handpicking. (ILLUSTRATION)

   **WINNOWING**

   When the components of a mixture have difference in their weight, for example one component is heavier than the other, the mixture is made to fall from a height and the component of the mixture which is heavier will fall down almost vertically and the lighter component will be blown away by the wind and form a heap at a distance. For example chaff is separated from the grains by winnowing as chaff is lighter than the grains.
**SIEVING**

This method is used when a mixture has particles of different sizes and a sieve can be used to separate them, the pores in the sieve will allow the smaller particles of the mixture to pass through them and retain the particles which are bigger in size. This method can be commonly used at home separate bran from the wheat flour.

---

**Question drill 4 :**

How will you separate a mixture of

- Atta and chick peas
- A specific fruit from a no of fruits kept in a basket.
- Husk from rice

---

**SEPARATING A SOLID FROM A LIQUID**

Solid substances may be soluble or insoluble in a liquid like salt is completely soluble in water whereas chalk powder when dissolved in water remains insoluble in it , we have to use separate methods for separation of soluble and insoluble substances from their respective solution.

---

**SEPARATING SOLUBLE SOLIDS FROM THEIR SOLUTIONS :**

The soluble solids can be separated from liquids by using the following methods : –

- Evaporation.
- Distillation

**Evaporation:** In this method the mixture of a soluble solid in a liquid is heated and the liquid evaporates leaving behind the solid .This method is commonly used to separate a soluble substance from its solution by heating the mixture. Salt is separated from sea water by this method.

**Distillation:** Another method of separating a soluble solid from a solution is distillation. The solution is heated so that the liquid evaporates and their vapours are then cooled till they
condense to give the pure liquid. Distilled water used in laboratories is obtained using this method. A special apparatus has to be used for carrying out distillation. The clear liquid thus obtained is known as distillate.

**SEPARATING INSOLUBLE SOLDS FROM LIQUIDS**

Solids like chalk powder, sand and dust particles are insoluble in water. Particles of such solids can be separated from their solutions by using one of the following methods:

- Sedimentation and decantation
- Filtration
- Loading

**Sedimentation and Decantation:** Insoluble substances like sand which are heavier than water settle down on their own due to gravity. These particles which settle down form the sediment. This process is called sedimentation. The clear liquid is carefully poured into another container without disturbing the sediment. This process of pouring the liquid is known as decantation.

**Filtration** is commonly used for the separation of insoluble solids from their solutions by using a filter through which only the liquid can pass.

Correct these statements:

- A mixture of oil and water cannot be separated.
- Distillation should be used to separate a mixture of sand and water.
- Loading slows down sedimentation.
- Distillate and filtrate are the same.

**Separation Of A Mixture Of Two Liquid**

The two liquids don't mix even on stirring. Such liquids which are insoluble in one another are called **immiscible liquids.** These liquids can be separated by using a separating funnel.

**Magnetic Separation**

A magnet can be used to separate iron pieces which are attracted by a magnet from the other substance which is not attracted by the magnet like sand. The iron pieces stick to the magnet but sand does not.

**SOLUTIONS AND SOLUBILITY**

A **solution** is a homogeneous mixture composed of two or more substances. In such a mixture, a **solute** is dissolved in another substance, known as a **solvent.** Generally the component of the mixture
which is larger in amount is called solvent and the one which is smaller in amount is called solute.

\[ \text{Solute} + \text{solvent} = \text{solution} \]

For example:

In a sugar solution

- Solute = sugar
- Solvent = water

Sugar (lesser in amount) + water (more in amount) = sugar solution