

Grouping

Olympiad
Comprehensive
Book



ITHO
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Grouping Materials and their Separation

Sorting Materials into Groups

All the objects that we see around us are made up of matter called materials. Like, animals, insects, birds, plants, trees, houses, machines, tools, tables, chairs, clothes, etc. are objects which are made up of matter.

To understand the process of classification, first we have to know the basis of classification.

Basis of Classification

The characteristics or properties, which are taken as the base for the classification of given objects, are called basis of classification.

There are a number of characteristics which are taken as the basis for classification. Like 'living and non-living', 'natural and artificial', 'solid, liquid and gas', 'shape', 'colour', etc.

Note: You can also classify the materials by selecting the characteristics as per your own choice.

Properties of Matter

Now let us understand some properties of matter.

Appearance

Some objects have shiny appearance called lustre whereas some materials have dull appearance. For example, gold, silver, copper have shiny appearance whereas paper, wood, rubber have dull appearance.

Hardness and Softness

The materials can be classified on the basis of hardness and softness. Candle, wax, rubber are the examples of soft materials whereas iron, diamond, glass are the examples of hard materials.

Solubility

Some materials are soluble in water whereas others are not. Sugar, common salt, washing soda, lemon juice are soluble in water whereas glass, plastic, iron, mustard oil, coconut oil are not soluble in water.

Density

Density is the mass per unit volume of a substance. The substances which sink in the water have higher density than water and the substances which float on the water have lower density than water. Substances like iron, copper, aluminium, silver, gold and glass have higher density than water whereas wood, plastic, ice, oil and petrol have lower density than water.

Transparency

All the materials have been classified into three groups on the basis of transparency.

- ❖ **Transparent:** The materials through which light can pass are called transparent materials. For example, glass, water, air, alcohol, etc.
- ❖ **Translucent:** The materials through which light can pass partially are called translucent materials. For example, Butter paper, ground-glass, muddy water, etc.
- ❖ **Opaque:** The materials through which light cannot pass are called opaque materials. For example, metals, stones, books, woods, etc.

Pure Substances

The substances which are made up of only one kind of atoms or molecules are called pure substances. For example gold, silver, copper, etc.

Mixture

When two or more than two different substances are mixed up together a mixture is formed.

For example, air is a mixture of many gases like nitrogen, oxygen, carbon dioxide and some other gases.

Constituents of a Mixture

The different substances which are present in a mixture are called constituents of the mixture.

For example, nitrogen, oxygen, carbon dioxide and many other gases which are present in the air are constituents of air.

- ❖ **Homogeneous mixture:** A mixture that is uniform in composition is called Homogeneous mixture. For example, air, milk, salt water solution, etc.
- ❖ **Heterogeneous mixture:** A mixture that is not uniform in composition is called Heterogeneous mixture. For example, mixture of air and water, sandy water, orange juice with pulp in it, etc.

Separation of Substances

Most of the substances available in the nature are in the mixture form. Mixtures are separated into their constituents as per our requirement. In this chapter we will study about mixtures and some methods of their separation.

Methods of Separation

The different methods of separation has been discussed below:

Threshing

This method is used to separate grains from their stalks. In this method stalks of grains are beaten to separate grains. Threshing is done by hands, by machines or by cattles.

Winnowing

This method is used to separate husk from grains with the help of wind. Husk is very light whereas grains are comparatively heavy. So when mixture of husk and grains are slowly fallen down from a height, wind carry away the husk, thus husk is separated from the grains.

Hand-picking

By this method, undesirable substances like small pieces of stones are separated out from the grains by hands.

Sieving

This method is used to separate the constituents of a mixture whose particles are of different sizes.

Sedimentation and Decantation

By this method insoluble solid particles present in a liquid are separated out. Insoluble solid particles, which are heavier than the liquid, are allowed to settle down at the bottom of the container by keeping the solution undisturbed for sometime. This process is called sedimentation. The liquid is then poured out from the container without disturbing the sediments. This process is known as decantation.

Loading

Fine solid particles have very small weight therefore they do not easily settle down in a liquid. Loading is the process of adding weight to the fine solid particles so that solid particles easily settle down in the liquid.

Filtration

By this method insoluble solid particles present in a liquid are separated out using a filter paper.

Evaporation

By this method dissolved solid particles in a liquid are separated out. In this method liquid is evaporated by heating and collected in separate container by condensation. When all the liquid is evaporated, dissolved particles are left behind as a solid residue.

Distillation

This is the method of separating a liquid from a mixture of liquids having different boiling points. The liquid with low boiling point evaporates first and its vapors are then collected by condensing it.

Saturated Solution

A solution in which no more substance can be dissolved at that temperature, is called saturated solution.

- ❖ Water can dissolve large number of substances in it therefore, water is called universal solvent.