Is Matter Around Us Pure

Matter

Pure substance

A pure substance consists of a single type of particles. For example, Elements and compounds.
Examples: Elements (O_2, C, N) and Compounds (H_2O, CO_2)

Impure substance (Mixture)

A combination of two or more substances.

Homogeneous mixture

A mixture that has a uniform composition throughout. For example salt in water.

Heterogeneous mixture

A mixture, which contains physically distinct parts and has non-uniform composition. For example chalk in water.

Solution

- ★ A solution is a homogeneous mixture of two or more substances.
- ★ Depending on the solute present in a solution, it can be called a dilute, concentrated, or saturated solution.
- ★ The particles of a solution are smaller than 1 nm (10^{-9} meters) in diameter. So, they cannot be seen by the naked eye.
- ★ Don't show the Tyndall effect.
- ★ Solute particles cannot be separated by filtration.
- ★ The solute particles do not settle down when left undisturbed, that is, a solution is stable.

Suspension

A suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium.

The particles of a suspension can be seen by the naked eye. The solute particles settle down when a suspension is left undisturbed, that is, a suspension is unstable.

Colloid

A colloidal solution is a heterogeneous mixture. For example, milk. Because of the small size of colloidal particles, we cannot see them with the naked eye.

- Shows the Tyndall effect.
- The particles size lie between 1-100 nm in diameter.
- They do not settle down when left undisturbed, that is, a colloid is quite stable.

Solubility

★ The amount of the solute present in the saturated solution at a given temperature is called its solubility.

★ For solids: solubility increases with temperature and does not affected by pressure.

★ For gases: solubility decreases with temperature and increases by applying pressure.

Solubility

The concentration of a solution is the amount (mass or volume) of solute present in a given amount (mass or volume) of solution.

(i) Mass by mass percetage of solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

(ii) Mass by volume percetage of solution

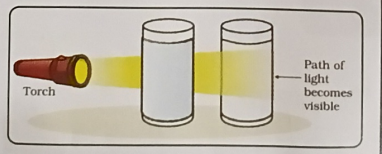
$$= \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

(iii) Volume by volume percetage of solution

$$= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

Tyndall Effect

The scattering of light by the suspended particles.



Separation techniques

Evaporation

Used to separate volatile substances from non-volatile impurities. For example, dyes can be separated from ink by evaporation.

Centrifugation

The principle is that the denser particles are forced to the bottom and the lighter particles stay at the top when spun rapidly. For example, Used in dairies and at home to separate butter from cream.

Separating funnel

The principle is that immiscible liquids separate out in layers depending on their densities. For example, To separate the mixture of oil and water.

Sublimation

Used to separate such mixtures that contain a sublimable volatile substances from a non-sublimable impurity. For example, solids that sublime are ammonium chloride and iodine crystals.

Chromatography

Chromatography is the technique used for the separation of those solutes that dissolve in the same solvent. For example, To separate colors in a dye and drugs from the blood.

Physical changes

- ★ No new substances formed.
- ★ Very less energy is released or absorbed.
- ★ Examples, density, melting point, and boiling point.

Chemical changes

- ★ New substances are formed with different properties.
- ★ Sufficiently high energy is released or absorbed.
- ★ Examples, combustion, and corrosion.

Crystallisation

The crystallization method is used to purify solids. Crystallization is a process that separates a pure solid in the form of its crystals from a solution. Used in the Purification of salt that we get from seawater. In cities, drinking water is supplied by water works.

Distillation

It is used for the separation of components of a mixture containing two miscible liquids that boil without decomposition and have sufficient difference in their boiling points.

For example, a mixture of acetone and water can be separated by distillation.

If the difference in boiling point is less than 25K then fractional distillation has to be used. For example, a mixture of alcohol and water, and the separation of different gases from air.