

Is Matter Around us Pure



KEY POINTS

PURE SUBSTANCE

A homogeneous material which contains particles of only one kind and has a definite set of properties, is called a pure substance.

Element : It is defined as the simplest or basic form of a pure substance which cannot be broken into anything simpler than it by physical or chemical methods. A pure substance which is made up of one kind of atoms only is called an element **for e.g. Iron, copper**

Compounds : Elements react to form new compounds. The composition of each new substance is always fixed. **for e.g. Water, common salt**

Colloidal Solutions :

- (i) Particle size is less than 10^{-9} m/ 10^{-7} cm/1 nm
- (ii) Particles invisible to naked eye but visible under powerful microscope.
- (iii) Particles settle down under high centrifugation.; no residue is formed.
- (iv) Heterogeneous and translucent

MIXTURES

Elements or compounds just mix together to form a mixture and no new compound is formed. A mixture has variable composition.

Heterogeneous mixture : A mixture in which different constituents are not mixed uniformly, is called a heterogeneous mixture. **for e.g. Sand in Water.**

Homogeneous mixture : A mixture in which different constituents are mixed uniformly, is called a homogeneous mixture. **for e.g. Sugar in Water.**

True Solution :

- (i) Particle size is less than 10^{-9} m/ 10^{-7} cm/1 nm
- (ii) Particles invisible to naked eye and under powerful microscope.
- (iii) Particles do not settle down; no residue is formed.
- (iv) Homogeneous, clear and transparent

Suspensions :

- (i) Particle size is greater than 10^{-6} m/ 10^{-4} cm / 1000 nm
- (ii) Particles are visible to the naked eye.
- (iii) Particles settle down due to gravity; residue is formed.
- (iv) Heterogeneous, translucent or opaque

Solubility

The maximum amount of solute in grams which can be dissolved in 100 g of the solvent at a given temperature to form a saturated solution is called solubility of the solute in that solvent at that particular temperature.

On the basis of concentration solution are of three types

- ◆ Saturated solution
- ◆ Unsaturated solution
- ◆ Super saturated solution

Methods to express concentration of solution

The concentration of a solution is the amount of solute present in a given quantity of the solution or solvent.

◆ Mass by mass percentage(w/w)

$$= \frac{\text{Mass of solute (in g)}}{\text{Mass of solution (in g)}} \times 100$$

$$\text{Mass of solution} = \text{Mass of solute} + \text{Mass of solvent}$$

◆ Mass by volume percentage(w/v)

$$\text{Mass by volume percentage} = \frac{\text{Mass of solute (g)}}{\text{Volume of solution (ml)}} \times 100$$

◆ Volume by volume percentage or simply volume percentage(v/v).

$$\text{Volume by volume percentage} = \frac{\text{Volume of solute (ml)}}{\text{Volume of solution (ml)}} \times 100$$

A solution contains 40 g of common salt in 320 g of water. Calculate the concentration in terms of mass by mass percentage of the solution.

Solution:

Mass of solute (salt) = 40 g

Mass of solvent (water) = 320 g

We know,

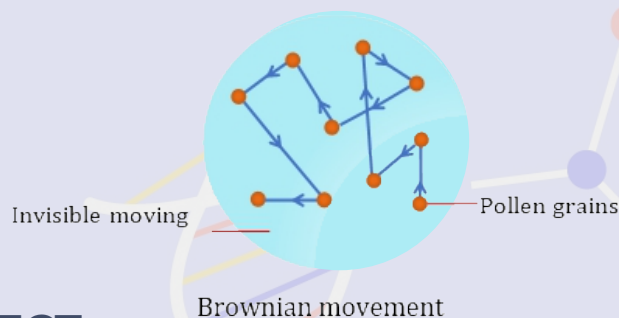
Mass of solution = Mass of solute + Mass of solvent = 40 g + 320 g = 360 g

$$\text{Mass percentage of solution} = \frac{40}{360} \times 100\% = 11.1\%$$

Types of colloids			
Dispersed Phase	Dispersion medium	Type of colloid	Examples
Solid	Solid	Solid sol	Coloured glass, gemstones, pearls, milky glass
Solid	Liquid	Sol	Paints, starch, proteins, milk of magnesia, mud, blood
Solid	Gas	Solid Aerosol	Smoke, dust in air, smog, automobile exhaust
Liquid	Solid	Gel	Jellies, cheese, butter, boot polish
Liquid	Liquid	Emulsion	Milk, hair cream, emulsified oils, medicines, cold cream
Liquid	Gas	Liquid Aerosol	Mist, Fog, clouds, insecticide sprays
Gas	Solid	Solid foam	Foam, pumice stone, ice-cream, rubber, sponge
Gas	Liquid	Foam, Froth	Whipped cream, froth, shaving cream

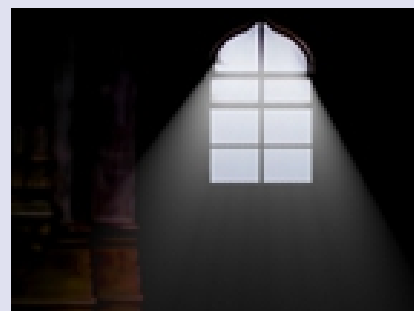
► PROPERTIES OF COLLOIDS

Particle in a colloidal solution follow zig zag path (Brownian movement). Brownian movement may be defined as continuous zig-zag movement of colloidal particles in a colloid. This Brownian movement arises due to hitting of the colloidal particles by the particles of the dispersion medium from different directions with different forces.



► TYNDALL EFFECT

This scattering of a beam of light by colloidal particles is called the Tyndall effect. The reason for this observation is that the particles of a colloidal solution are big enough to scatter light and hence path of light becomes visible i.e. the Tyndall effect is observed.



PHYSICAL AND CHEMICAL CHANGES

There are some changes during which no new substances are formed. Changes during which new substances are formed. On the basis of whether new substances are formed or not, we can classify all the changes into two groups

PHYSICAL CHANGES

- Changes in which no new substances are formed, are called physical changes.
- The change that takes place only in state, colour, texture, electrical and magnetic properties. However, composition (molecular properties) remains the same.
- Specific properties of the substance do not change.
- There is no net absorption or release of energy.
- It is a temporary change and can be reversed.



Cutting of vegetables
Physical Change

CHEMICAL CHANGES

- Changes in which new substances are formed, are called chemical changes.
- The change that takes place in state, colour, texture, etc. along with the change in composition (molecular properties).
- Specific properties of a substance change completely.
- There is always net absorption or release of energy.
- It is a permanent change and cannot be reversed.



Curdling of milk
(Chemical Change)