SOLUTION & COLLIGATIVE PROPERTIES

TYPES OF SOLUTIONS

BRIEF INTRODUCTION OF SOLUTION:

Definition of Solution

A solution is formed when two or more substances that do not chemically react with each other are mixed to create a homogeneous mixture.

HOMOGENEOUS MIXTURE:

If a solution consists of only two chemical substances, it is referred to as a binary solution. Likewise, it is termed a ternary solution if composed of three components, and a quaternary solution if made up of four components

Solution = Solute + Solvent

Solute:

Generally, the constituent present in a solution in a lesser quantity than the other component is referred to as the solute.

Solvent:

Generally, the component that surpasses any or all other components in quantity is termed the solvent.

* Physical state of solvent and solution is same.

Ex. In a syrup (liquid solution) containing 60% sugar (a solid) and 40% water

(a liquid - same aggregation as solution), water is termed as the solvent.

Dilute Solution:

A solution characterized by the dissolution of a relatively small amount of solute in a substantial amount of solvent is termed a dilute solution.

Concentrated solution:

A solution characterized by the presence of a relatively large amount of solute is referred to as a concentrated solution.

Saturated solution:

The maximum quantity of solute, measured in grams, that can be dissolved in 100 g of a solvent at a specific temperature is known as the solubility of the solute. A solution exhibiting this maximum solubility is called a saturated solution.

Super saturated solution:

A solution containing an excess amount of solute beyond the saturation point for a given quantity of solvent at a specific temperature is termed a supersaturated solution.

* It is unstable system.

SOLUTION AND ITS TYPE: TYPES OF SOLUTIONS

S.NO.	SOLUTE	SOLVENT	TYPES OF SOLUTIONS	EXAMPLES
SOLID SOLUTIONS				
1	Solid	Solid	Solid in solid	All alloys like brass, bronze, an alloy of copper and gold, etc.
2	Liquid	Solid	Liquid in solid	Amalgam of mercury with Na, CuSO4.5H2O. FeSO4.7H2O
3	Gas	Solid	Gas in solid	Solution of H ₂ in Pd, dissolved gases in minerals.
LIQUID SOLUTIONS				
4	Solid	Liquid	Solid in liquid	Sugar solution, salt solution, I_2 in CCl ₄
5	Liquid	Liquid	Liquid in liquid	Benzene in toluene, alcohol in water.
6	Gas	Liquid	Gas in liquid	CO_2 in water, NH_3 in water etc.
GAS IN LIQUID				
7	Solid	Gas	Solid in gas	Iodine vapours in air, camphor vapours in N ₂ .
8	Liquid	Gas	Liquid in gas	Water vapours in air, CHCl3 vapours in N_2 .
9	Gas	Gas	Gas in gas	Air $(02 + N_2)$

Sp. Note: The dissolution of a liquid in a gas or a solid in a gas is not feasible as the components cannot create a homogeneous mixture.

Properties of a solution

- (i) A solution is characterized by a single phase, making it a monophasic system.
- (ii) Being uniform throughout, a solution exhibits consistent properties such as density, refractive index, etc.
- (iii) The size of solute particles in a solution fall within the order of 10^{-7} 10^{-8} cm.
- (iv) Components of a solution are not easily separable through physical methods.
- (v) The properties of a solution are reflective of its components; thus, the components retain their individual properties.
- (vi) The composition of a solution is not fixed but can vary within specific limits.
- (vii) Certain solution properties, including density, viscosity, surface tension, boiling point, and freezing point, vary with the solution's composition.