

# Solutions

Solutions are homogeneous mixtures of two or more than two components.

Homogeneous mixtures  $\rightarrow$  mixture in which solute and solvent are in the same phase.

its composition and properties are uniform throughout the mixture.

Solutions have generally two components.

(A) Solvent :- which is present in the largest quantity.

(B) solute :- which is present in the less quantity.

Classify the Solutions (1) According to no. of components.

no. of components

solution type

2

Binary solution

3

Ternary solution

4

quaternary solution.

(2) According to the physical state :- 3 Types of Solutions.

(1) Gaseous solutions -

S. no.

Solute

Solvent

Common example.

1.

Gas

Gas

Air, mixture of  $N_2$  and  $O_2$

2.

Liquid

Gas

Fog.

3.

Solid

Gas.

Smoke, Camphor in  $N_2$  gas.

## ② Liquid Solutions.

1	Gas	Liquid	Soda water
2	Liquid	Liquid	Alcohol dissolved in water
3	Solid	Liquid	Salt dissolved in water.

## ③ Solid Solution.

1	Gas	Solid	H <sub>2</sub> in Pd
2	Liquid	Solid	Hg in Zn
3	Solid	Solid	Copper dissolved in Gold.

## Expressing Concentration of Solution :-

① Molarity (M) :- It is defined as the no of moles of solute dissolve per litre of solution.

unit = mol L<sup>-1</sup>

$$\text{Molarity} = \frac{\text{No. of moles of solute}}{\text{Volume of solution in litre.}}$$

$$= \frac{\text{Mass of solute}}{\text{molecular mass} \times \text{Volume of solution in litre}}$$

$$= \frac{W_B}{M_B \times V \text{ (in litre)}} \quad \left\{ \begin{array}{l} W_B = \text{mass of solute} \\ M_B = \text{molar mass of solute} \\ V = \text{Volume of solution,} \end{array} \right.$$

② Molality (m) :- It is defined as the no. of moles of solute dissolve per kg of solvent.

Unit =  $\text{mol kg}^{-1}$

$$\text{molality} = \frac{\text{moles of solute}}{\text{mass of solvent in kg}}$$

$$m = \frac{\text{mass of solute}}{\text{molar mass of solute} \times \text{mass of solvent in kg}}$$

$$= \frac{W_B}{M_B \times W_A (\text{in kg})}$$

- Q 30 gm of Urea ( $\text{NH}_2\text{CONH}_2$ ) dissolve in 600 gm of water. Calculate the molality of solution.
- Q 60 gm Glucose presence in 500 ml solution. Calculate the molarity of solution.
- Q Calculate the molarity of a solution containing 5 gm of NaOH in 450 ml solution.
- Q Calculate the molality of 5 gm ethanoic acid in 250 gm of  $\text{CCl}_4$ .
- Q Calculate the mass of Urea required in making 2.5 kg of 0.25 molar aqueous solution.

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Atomic mass of some elements :-

①  $\text{H} = 1$

$\text{C} = 12$

$\text{N} = 14$

$\text{O} = 16$

$\text{Na} = 23$

$\text{Mg} = 24$

$\text{Al} = 27$

$\text{S} = 32$

$\text{Cl} = 35.5$

$\text{K} = 39$