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Page-II Physical
Day-I (H) - Solution

Topics - Types of Solution

Ideal & Non-Ideal Solution

Solution:- A Solution is defined as a homogeneous mixture of two or more substance whose composition change within certain limits.

examp:- Sugar-Solution, Salt-Solution, urea solution etc.

Characteristics of Solution.

(1) A solution consists of only one phase (state).

examp - Sugar (solid) dissolved in water (liquid) it forms only one-phase.

(2) All non-reacting gases mixed together to form homogeneous solution.

(3) The composition of the solution may change within certain limits.

Different composition present in solution have different importance.

examp - (a) 1 ppm (part per million) fluoride ion in water prevents tooth-decay.

(b) 1.5 ppm cause the teeth mottled (color)

(c) higher concentration may be used as poison.

④ Components of Solution :-

- (a) Solute - present in small amount
- (b) Solvent - present in large scale.

In Salt Solution -

solute - salt, solvent - water

⑤ The property of solution is the property of their components.

⑥ The different components of the solution cannot be separated by filtration, centrifugation etc.

-: Types of Solution :-

There are various types of solution.

① On the basis of number of components -

(a) Binary solution :- only two components
(one) solute + (one) solvent
ex → Sugar solution.

(b) Ternary solution - having three components.
ex → Salt + Sugar + water sol.

② On the basis of nature of solvent.

(a) Aqueous solns → water as solvent

(b) non-aqueous solns → like benzene, ether, alcohol, NH_3 , Li_2SO_4 etc

(3) On the basis of Physical State of Solute & Solvent

There are nine different types of solutions.

Types of Solution	Solvent	Solute	examples
Gaseous Solution	Gases	Solid	Tr vapour in air, Camphor vapour in H_2
		Liquid	Fog, mist etc.
		Gases	all gases reacting gas (mixtures of gases)
Liquid Solution	Liquid	Solid	Salt, Sugar in water
		Liquid	Alcohol in water
		Gases	Carbonated drinks, fog in water, cold drink
Solid Solution	Solid	Solid	alloy of metals
		Liquid	Amalgam of Hg with other metals
		Gases	Absorption of gases on metals (H ₂ /Pt)

Ideal & Non Ideal Solution

The solution of two volatile liquids are two types.

Ideal Solution: Those solution which obey Raoult's law over a wide range of

Concentration & Temp^r

Condition for ideal solution:-

- ① Two liquid A & B form ideal solution when they are similar structure & polarity. In such solution, force of attraction b/w A & B molecule is similar to the force of attraction b/w A-A & B-B molecules.
- ② It should obey's Raoult's law of V.P

$$P_s = P_A + P_B$$

$$P_s = P_A^0 \times X_A + P_B^0 \times X_B$$

P_s = Vapour pressure of solution
 P_A^0 = Vapour pressure of pure liquid A.

X_A = mole fraction of liquid A.
 X_B = mole fraction of liquid B.

③ $\Delta H(\text{mixing}) = \text{Zero}$

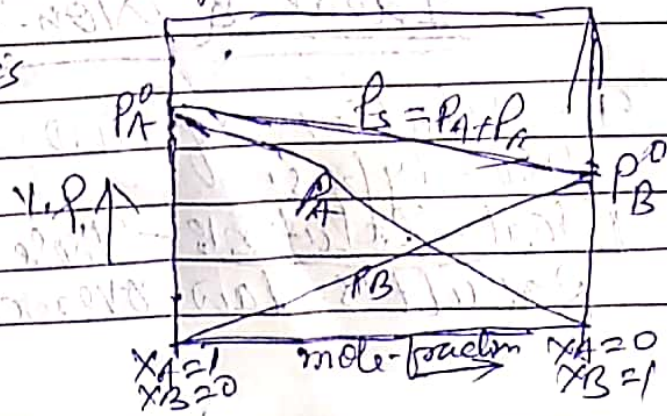
④ $\Delta V(\text{mixing}) = \text{Zero}$

⑤ A dilute solution behaves more closely to ideal solution

⑥ Examples of ideal solution:-

- (a) Methanol & Ethanol (b) Benzene & Toluene
- (c) n-hexane & n-heptane (d) CCl₄ & SiCl₄

Graphically it is represented as



Non-Ideal-Solution:- Those solution which do not obey Raoult's law are called non-ideal solution.

Such solution do not fulfil the condition of an ideal-solution.

characteristic features of non-ideal-sol

(1) They do not obey's Raoult's law of V.P.

(2) For such solution:-
 $\Delta H(\text{mix}) \neq 0$

$\Delta V(\text{mix}) \neq 0$

after mixing these two solution heat is evolved or absorbed.

The volume of mixture is ~~not~~ either increased or decreased.

(3) Interaction b/w A-A & B-B are different & also A-B.

(4) Solution showing the $\pm$ ve deviation

(5) Example -

- | | | |
|---------|-----|--|
| +ve dev | (a) | $\text{H}_2\text{O} + \text{C}_2\text{H}_5\text{OH}$ |
| | (b) | $\text{CH}_3\text{COCH}_3 + \text{C}_2\text{H}_5\text{OH}$ |
| | (c) | $\text{CCl}_4 + \text{CHCl}_3$ |
| | (d) | $\text{H}_2\text{O} + \text{HCl}$ |
| -ve dev | (e) | $\text{CHCl}_3 + (\text{CH}_3)_2\text{CO}$ |
| | (f) | $\text{CH}_3\text{COOH} + \text{C}_5\text{H}_5\text{N (Pyridine)}$ |