

Ch-1 Solution

Homogeneous mixture of two or more substances in the same phase.

Types of solutions - 9 types

	Solute	Solvent	Example
(i)	Solid	Liquid	Sugar + H ₂ O
(ii)	Solid	Solid	Alloy
(iii)	Solid	Gas	Ammonia gas
(iv)	Liquid	Solid	Gel
(v)	Liquid	Liquid	Ethanol + H ₂ O
(vi)	Liquid	Gas	Fog
(vii)	Gas	Solid	H ₂ in palladium distilled in copper
(viii)	Gas	Liquid	Carbon dioxide
(ix)	Gas	Gas	Air

Another classification :-

(i) True solution :- solution in which size of solute particles is less than 1 Å. Example: true solution eg:- sugar in H₂O.

(ii) colloidal solution :- solution in which size of solute particles is 10³ Å. called colloidal solution eg:- milk or dye in hot water.

(iii)

Supersaturation solution :-

Size of solute particles is greater than 1000, called supersaturation solution.

eg:- dirty water, shaken water.

(iv)

cause of solubility :-

↓

(i)

cause of solid-liquid solubility :-

↓

• Two factors responsible :-

(a)

Hydration energy (H.E) :-

Amount of energy released when 1 mole of hydrated salt is formed, called hydration energy. eg:- $\text{CaSO}_4 + 5\text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot 5\text{H}_2\text{O} + \text{H.E.}$

(b)

Lattice energy (L.E) :-

Amount of energy released when 1 mole of ionic compound is formed from their ion constituents.

eg:- $\text{Na}^+ + \text{Cl}^- \rightarrow \text{NaCl} + \text{L.E}$

(v)

condition for solubility :-

(i)

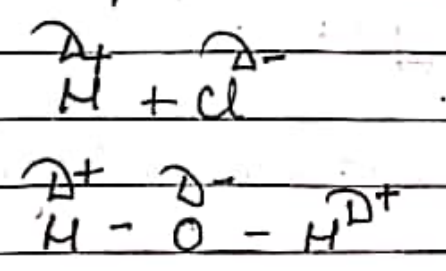
$\text{H.E} > \text{L.E}$ then salt is soluble in H_2O .

For eg:- BaSO_4 is insoluble in H_2O but BeSO_4 is soluble in H_2O because L.E of BaSO_4 is more than its H.E but in case of BeSO_4 H.E is more than L.E.

(11) cause of liquid-liquid solubility:-

(a) like dissolve like:-

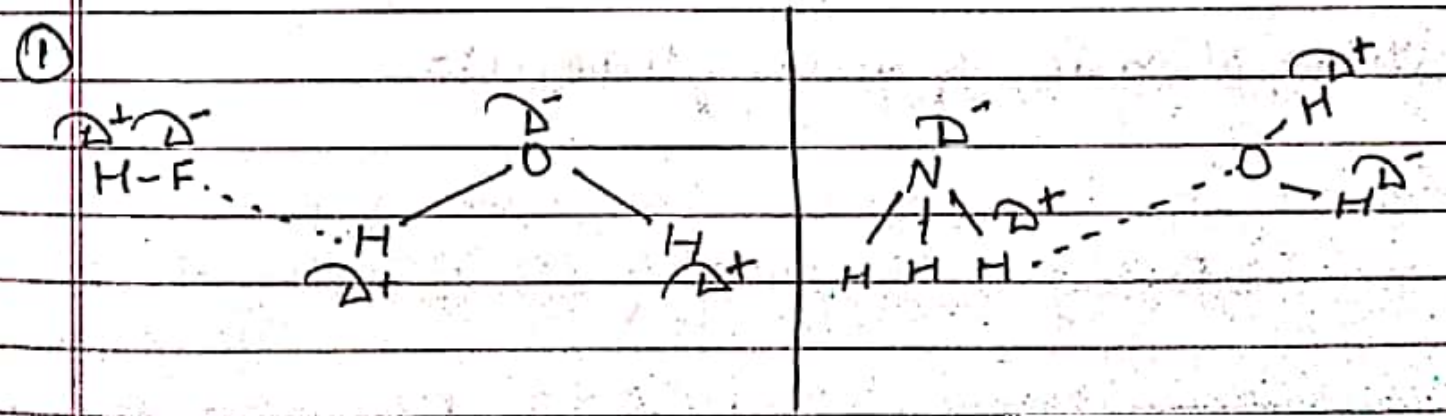
Polarsolute dissolved in polar solvent.
 For eg:- HCl dissolves in H_2O because both is polar.



(b) Hydrogen bonding:-

Solute which can form hydrogen bonding with H_2O is soluble in water.

For eg:- HF is soluble in H_2O because it forms hydrogen bonding with H_2O .



③ Cause of gas-liquid solubility:-

It is affected with pressure, this can be explained by Henry's law.

• Henry's law:-

states that solubility of gas in liquid is directly proportional to applied pressure at constant temperature 1.0°C.

$P \propto x$
 x = amount of gas
 P = applied pressure

$P = K_H x$

K_H = Henry's constant

also,
 $P \propto m$
 $P = K_H m$
 m = molality.

• Significance of Henry constant:-

→ Higher value of K_H lower the solubility of gas in liquid.

④ Application of Henry's law:-

① cold drink bottle is covered at high pressure so that gas completely soluble in water.

② ~~Scuba divers~~ divers add helium gas in gas

cylinder so that pressure inside cylinder increases.

(ii) People live higher altitude suffering from anaemia because of atmospheric pressure is low at higher altitudes so that inhalation of oxygen is lesser.

(*) Strength of true solution:-

There are following units for measurement of strength of true solⁿ:-

- (i) Molarity
- (ii) Molality
- (iii) Mole-fraction
- (iv) Normality
- (v) Formality
- (vi) ppm.

(i) Molarity:- (M)

No. of grams mole of solute dissolve in per litre of solution is called molarity, i.e.

$$M = \frac{g \times 10}{\text{Gmm}}$$

OR

$$\frac{WB \times 1000}{MB \times V(\text{ml})}$$