

$$= 1.834g$$

## Vapour Pressure of Liquid Solutions:-

- \* Liquid solutions are formed when solvent is liquid.
- \* The solute can be gas, liquid or solid.
- \* Solutions of gases ~~and~~ liquid
- \* Here, we have to study about solutions of liquids and solids in a liquid.
- \* Such solutions may contain one or more volatile components.

Generally the liquid solvent is volatile.

19) | near. Some fungi are parasite (when

The solute may or may not be volatile. (20)

Here we are going to study about binary solutions, namely the solutions of:-

- i) liquids in liquids.
- ii) solids in liquids

Vapour pressure of liquid-liquid Soln:-

Vapour pressure of a liquid/solution is the pressure exerted by the vapours in equilibrium with the liquid/solution at particular temp.

Let us consider a binary soln of 2 volatile liquids and denote the components as 1 and 2.

When taken in a closed vessel, both the components would evaporate and eventually an equilibrium would be established between vapour phase and liquid phase.

Let the total vapour pressure at this stage be

$P_{total}$  and  $p_1$  and  $p_2$  be the partial vapour pressures of 2 components 1 and 2 respectively.

These partial pressures are related to the mole fractions  $x_1$  and  $x_2$  of the 2 components 1 and 2 respectively.

The French chemist, Raoult gave the quantitative relationship bet<sup>n</sup> partial pressures and mole fractions which is known as Raoult's law which states that -

For a solution of volatile liquids, the partial vapour pressure of each component in the solution is directly proportional to the mole fraction present in solution.

Thus for component 1,

$$P_1 \propto x_1$$

$$\text{and } P_1 = P_1^0 x_1 \quad \text{--- (i)}$$

where,  $P_1^0$  is the vapour pressure of the pure component 1 at the same temp.

Similarly for component 2:-

$$P_2 = P_2^0 x_2 \quad \text{--- (ii)}$$

where  $P_2^0$  is the vapour pressure of the pure component 2 at the same temp.

According to Dalton's law of partial pressures, the total pressure ( $P_{\text{total}}$ ) over the solution phase in the container will be the sum of the partial pressures of the components of the soln and is given as:-

Here, Some things are characteristic laws.

(22)

$$P_{\text{total}} = p_1 + p_2$$

Substituting  $p_1$  and  $p_2$  we get -

$$P_{\text{total}} = x_1 p_1^{\circ} + x_2 p_2^{\circ}$$

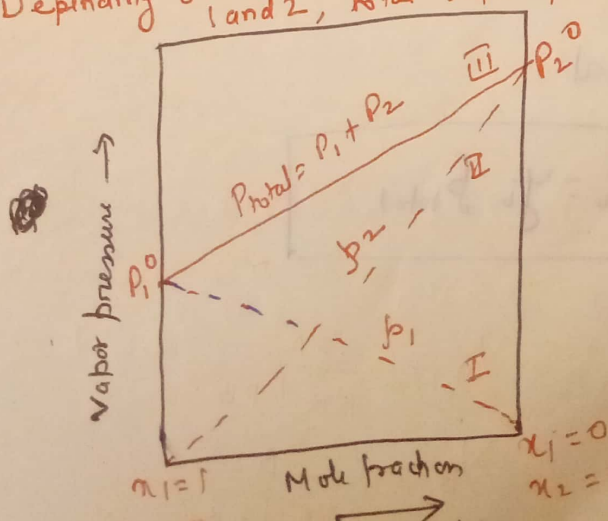
$$P_{\text{tot}} = x_1 (1 - x_2) p_1^{\circ} + x_2 p_2^{\circ} \quad (\text{Since } 1 - x_2 = x_1)$$

$$P_{\text{total}} = p_1^{\circ} - p_1^{\circ} x_2 + x_2 p_2^{\circ}$$

$$P_{\text{total}} = p_1^{\circ} + x_2 (p_2^{\circ} - p_1^{\circ}) \quad \text{--- (3)}$$

Following conclusions can be drawn from equation 3 -

- (i) Total vapour pressure over the solution can be related to mole fraction of any one component.
- (ii) Total vapour pressure over the solution varies linearly with mole fraction of component 2.
- (iii) Depending on the vapor pressures of pure components 1 and 2, total vapor pressure over the soln increases or decreases with the increase of ~~one~~ mole fraction of 1 component.



increases or decreases with the increase of ~~one~~ mole fraction of 1 component.