Lowering of vapour pressure

When a non-volatile solute is dissolved in a solvent, the vapour pressure of the solvent decreased. This phenomenon is known as lowering of vapour pressure.

~~let pure solvent~~ let vapour pressure of pure solvent be P_0. When non-volatile solute is dissolved in pure solvent, the vapour pressure of solution be P_s.

Hence,

∴ lowering of vapour pressure = $\boxed{P_0 - P_s}$

Relative lowering of vapour pressure — for dilute soln, The ratio of the lowering of vapour pressure and vapour presure of pure solvent is called relative lowering of vapour pressure.

Hence —

∴ Relative lowering of vapour pressure = $\boxed{\frac{P_0 - P_s}{P_0}}$

Raoult's law — According to Raoult's law — The relative lowering of vapour pressure of a solution is equal to the mole fraction of solute.

let ~~mole fraction~~ no. of moles of solute in dilute solute be n and no. of moles of solvent be N.

from Raoult's law —

$$\boxed{\frac{P_0 - P_s}{P_0} = \frac{n}{n+N}}$$

Determination of Molecular mass of solute —

$$\therefore \frac{P_0 - P_s}{P_0} = \frac{n}{n+N}$$

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$\therefore n = \frac{a}{m}$ & $N = \frac{b}{M}$ where —

a = wt. in gms of solute

b = wt. in gms. of solvent

m = Molecular mass of solute

M = molecular mass of solvent

$\therefore$ for dilute sol —

a/m is negligible —

$$\therefore \frac{P_0 - P_s}{P_0} = \frac{a/m}{(0 + \frac{b}{M})}$$

$$\boxed{\frac{P_0 - P_s}{P_0} = \frac{a \times M}{b \times m}}$$