

Clausius Clapeyron equation :-

$$P \propto e^{-\frac{\Delta H}{RT}} \Rightarrow \boxed{P = k \cdot e^{-\frac{\Delta H}{RT}}}$$

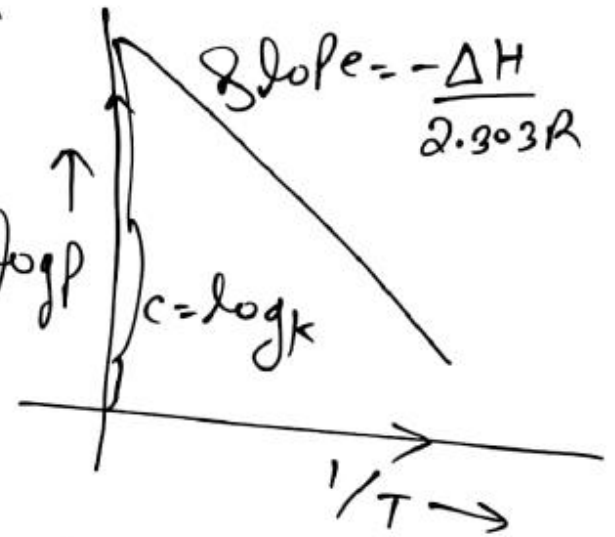
Take ln Both Side

$$\ln P = \ln(k \cdot e^{-\Delta H/RT})$$

$$\ln P = \ln k + \ln e^{-\Delta H/RT}$$

$$\boxed{\ln P = -\frac{\Delta H}{RT} + \ln k} \Rightarrow 2.303 \log P = -\frac{\Delta H}{RT} + 2.303 \log k$$

$$\boxed{\log P = -\frac{\Delta H}{2.303RT} + \log k}$$



$$T \rightarrow T_1; P \rightarrow P_1$$

$$T \rightarrow T_2; P \rightarrow P_2$$

$$\log\left(\frac{P_2}{P_1}\right) = \frac{\Delta H}{2.303R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right] \text{***}$$

- # At constant Temp. Vapour pressure (V.P.) of liquid remain constant.
- # V.P. of water at 100°C (B.P. of water) 1 atm or 760 mm of Hg.
- # V.P. of liquid at it's B.P. is 1 atm or 760 mm of Hg.
- # more volatile liquid has more V.P.
- # V.P. of liquid is intensive property.
- # V.P. of liquid do not depend on surface area & shape of the container.

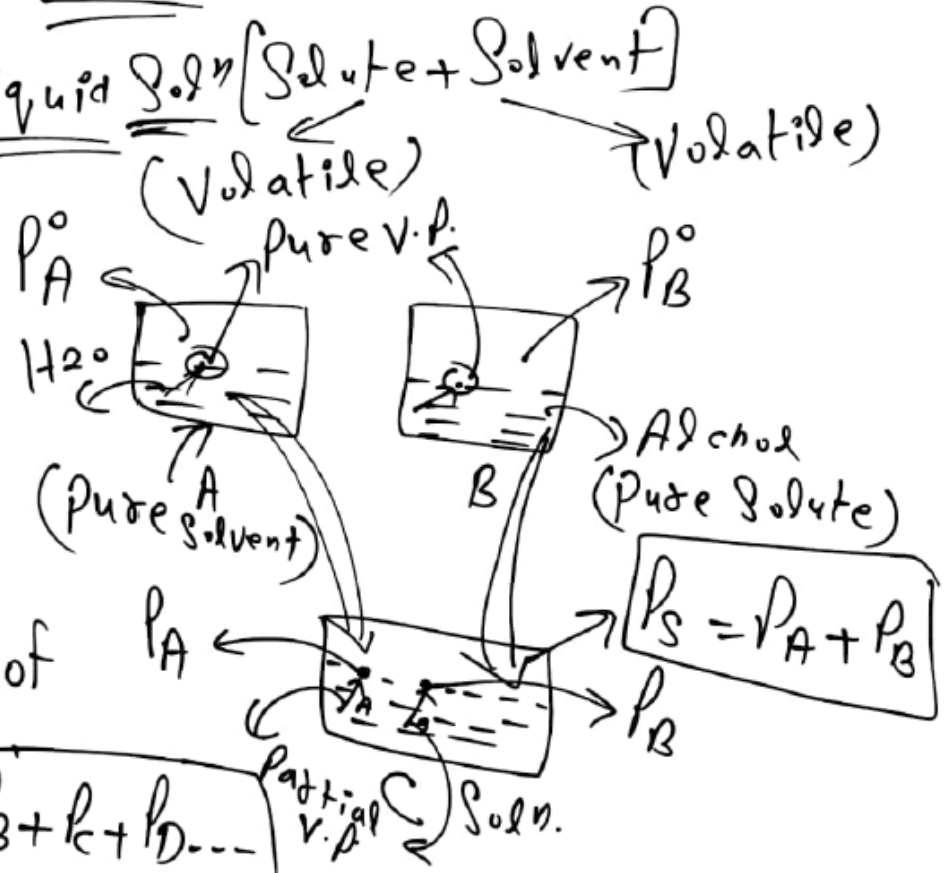
Law's of Vapour Pressure of Solution ÷

Case I Liquid-Liquid Soln (Solute + Solvent)

Dalton Law ÷

V.p. of Solution, containing more than one volatile component then V.p. of Soln is "Sum of Partial V.p. of each component".

A/c to Dalton Law ÷ $P_s = P_A + P_B + P_C + P_D \dots$

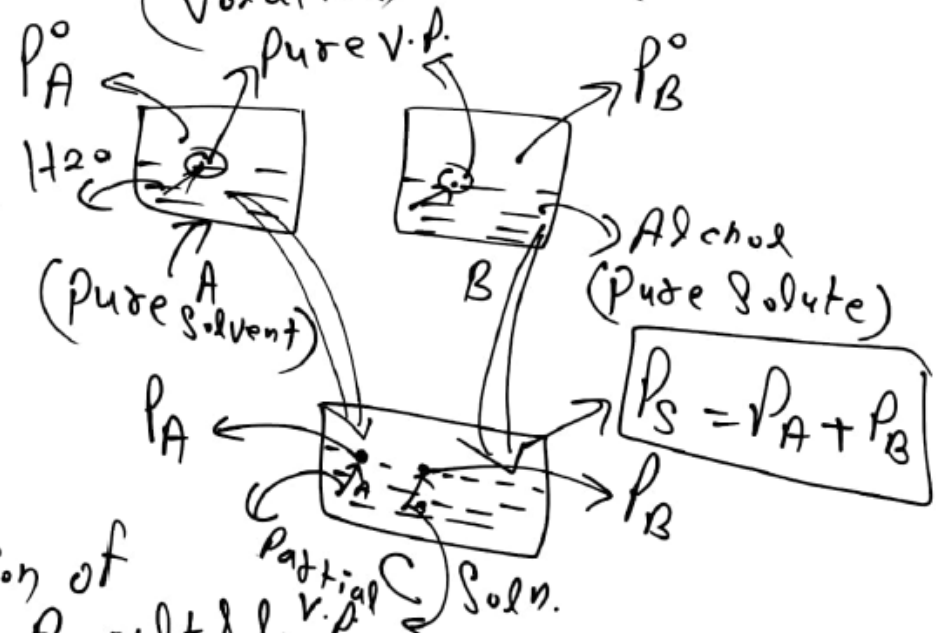


Laws of Vapour Pressure of Solution :

Case I Liquid-Liquid Soln (Solute + Solvent) (Volatile) (Volatile)

Raoult's Law :

Partial V.P. of a component in a mixture containing more than one volatile component is equal pure V.P. of that component multiply by mole fraction of that component. A/c to Raoult's law



$$P_A = P_A^\circ \cdot X_A ; P_B = P_B^\circ \cdot X_B ; \dots$$

Now \div

$$P_S = P_A + P_B$$

$$P_S = P_A^\circ X_A + P_B^\circ X_B$$

Here \div P_A° = pure v.p. of Component A
 P_B° = ——— ——— B
 P_A = Partial v.p. of Component A
 P_B = ——— v.p. of Component B
 X_A = mole Fraction; X_B = mole Fraction of B

$X_A + X_B = 1$

Relation B/w Raoult's law & Dalton's law

Raoult's law is related to liquid phase while Dalton's law is related to vapour phase.

Raoult's law

$$P_A = P_A^\circ \cdot X_A \text{ --- (1)}$$

$$P_B = P_B^\circ \cdot X_B \text{ --- (2)}$$

Dalton's law

Partial V.P of a component

= mole fraction in vapour phase \times Total v.p. of soln

$$P_A = Y_A \cdot P_s \text{ --- (1')}$$

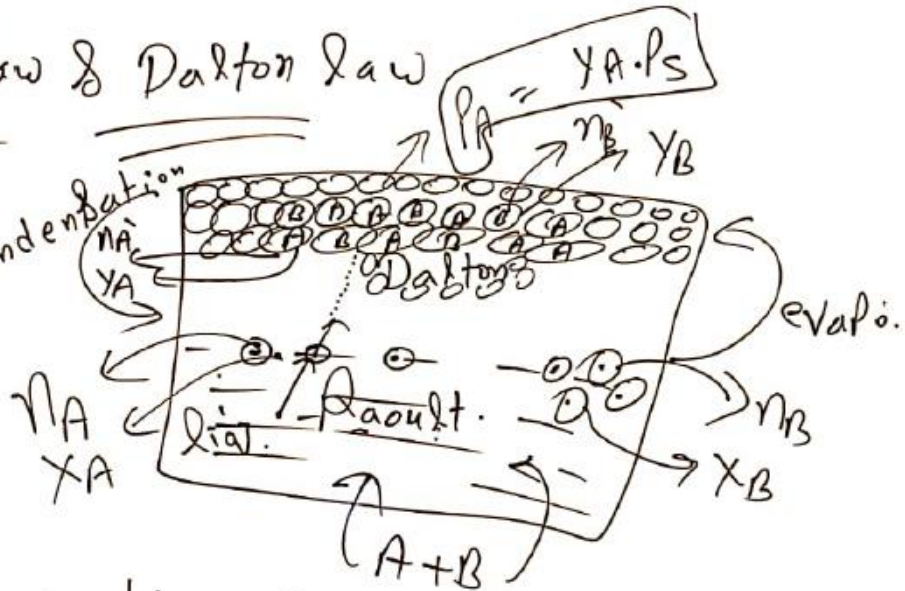
$$P_B = Y_B \cdot P_s \text{ --- (2')}$$

Y_A = mole fraction of component A in vapour phase

Y_B = mole fraction of B in vapour phase.

X_A = mole fraction of component A in liquid phase

X_B = mole fraction of component B in liquid phase.



From eq. (1), (1') & (2) ; 2'

$$P_A^0 X_A = Y_A \cdot P_S$$

$$Y_A = \frac{P_A^0 X_A}{P_S} \quad * \quad i$$

$$Y_A = \frac{P_A}{P_S}$$

$$P_B^0 X_B = Y_B \cdot P_S$$

$$Y_B = \frac{P_B^0 X_B}{P_S} \quad *$$

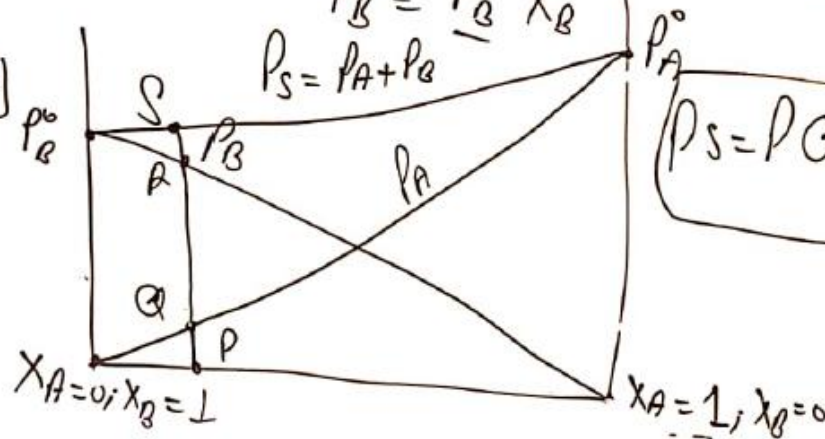
$$Y_B = \frac{P_B}{P_S}$$

$$P_S = P_A + P_B \\ = P_A^0 X_A + P_B^0 X_B \\ = P + P_R$$

Graph ÷ Let A is more volatile than B ($P_A^0 > P_B^0$)

$$P_A = P_A^0 X_A$$

$$P_B = P_B^0 X_B$$



$$P_S = P_Q + P_R$$