(21.) Two liq. A & B form an ideal Soln. V.P. of Soln containing 1 mole of A & 2 mole of B is 550 mm of Hg. If one mole of A & B is added to Soln then V.P. increases by 10 mm of Hg. Cal. P_A° & P_B°.

Sol. given $P_S = 550$ mm of Hg.

$n_A = 1$ mol ; $n_B = 2$ mol

$n_{Total} = 3$

$X_A = 1/3$; $X_B = 2/3$

$550 = P_A^\circ \cdot 1/3 + P_B^\circ \cdot 2/3$

$P_A^\circ + 2P_B^\circ = 1650$ - (1) $\times 2$

$2P_A^\circ + 4P_B^\circ = 3300$ - (1')

given $P_S = 550 + 10 = 560$

$n_A' = 1+1 = 2$; $n_B' = 2+1 = 3$

$n_T' = 2+3 = 5$. $X_A = \frac{2}{5}$; $X_B = 3/5$

$560 = P_A^\circ \cdot \frac{2}{5} + P_B^\circ \cdot 3/5$

$2P_A^\circ + 3P_B^\circ = 2800$ - (2)

eq (1') - (2)

$P_B^\circ = 500$

Put in new (2)

$2P_A^\circ = 1300$

$P_A^\circ = 650$

Q.2. V.P. of two liq. A & B in pure State are 0.6 & 0.4 bar respectively. Cal. the mole fraction of liq. A, at which both liq. have equal Partial Pressure.

Sol. given :- $P_A^\circ = 0.6$ bar ;
$P_B^\circ = 0.4$ bar ;
$x_A = ?$

$P_A = P_B$
$P_A^\circ \cdot x_A = P_B^\circ x_B$
$0.6\, x_A = 0.4 (1 - x_A)$
$3 x_A = 2 - 2 x_A$
$5 x_A = 2$
$x_A = 2/5$
$x_A = 0.4$
$x_B = 0.6$

$x_A + x_B = 1$
$x_B = 1 - x_A$

Q.3. Two liq. A & B form an ideal Soln V.P. of Soln is given by $P_S = 235 - 135X$, where P_S is V.P. of Soln X mole Fraction of B
Cal. P_A° & P_B°

Sol. given :- $P_S = 235 - 135X$ - (1)
$P_S = P_A^\circ x_A + P_B^\circ x_B$
$P_S = P_A^\circ (1 - x_B) + P_B^\circ x_B$

$P_S = P_A^\circ - P_A^\circ x_B + P_B^\circ x_B$
$P_S = P_A^\circ + x_B (P_B^\circ - P_A^\circ)$ - (2)

Compare eq. ① & ②

$P_A^\circ = 235$; $P_B^\circ - P_A^\circ = -135$

$P_B^\circ = -135 + P_A^\circ \Rightarrow P_B^\circ = -135 + 235$

$P_B^\circ = 100$

④.4. V.P. of pure liq. A is 40 bar. When Sol of 'B' is prepared in liq. A then V.P. is found to be 32 bar. Cal. X_B.

Sol. given $P_A^\circ = 40$ bar ; B → is Non Volatile.

$P_S = 32$ bar. ; $\hookrightarrow P_B^\circ = 0$

$P_S = P_A^\circ \cdot X_A \Rightarrow 32 = 40 \cdot X_A \Rightarrow X_A = \frac{8}{10} = 0.8$

$X_B = 1 - 0.8 = 0.2$

④.5. 18 gm of glucose, 6 gm of Urea & 34.2 gm Sugar are dissolved in 1000 gm of water. Cal. V.P. of Soln. if V.P. of water in pure State is 150 mm. of Hg.