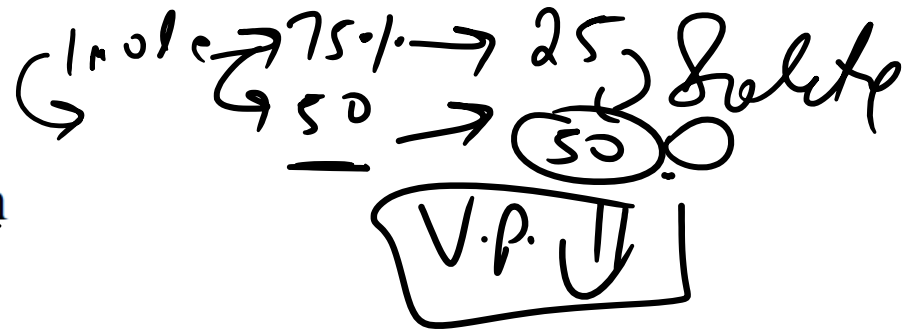Which of the following statement is not correct?

$\Rightarrow$ Sol^n

(1) Vapour pressure of solvent containing non-volatile solute is less than the vapour pressure of a solvent.

(2) The relative lowering of vapour pressure is equal to the mole fraction of the non-volatile solute.

(3) The lowering of vapour pressure of a solution does not depend on the amount of the solute particles present in it.

(4) If mole fraction of the solvent in a solution decreases, then vapour pressure of solution decreases.

$$\frac{P_A^o - P_s}{P_A^o} = x_B$$

R.L.V.P

1 mole $\Rightarrow$ 75% $\rightarrow$ 25 $\Big\}$ solute
$\Rightarrow$ 50 $\rightarrow$ 50

$\boxed{V.P. \downarrow}$

1

If $P°$ and P are the vapour pressures of solvent and solution, respectively, and N_1 and N_2 are the moles of solute and solvent, then

(1) $(P° - P)/P° = N_1/N_1 + N_2$

(2) $(P° - P)/P = N_1/N_2$

(3) $P = P° \times N_2/(N_1 + N_2)$

(4) All

$$\frac{P_A° - P_S}{P_A°} = x_B = \frac{N_2}{N_1 + N_2}$$

$$\boxed{\frac{P° - P}{P°} = \frac{N_1}{N_1 + N_2}} \rightarrow Solut_-$$

$$P_S = P_A° \, X_A + P_B° \, X_B$$

$$\boxed{P_S = P_A° \frac{N_2}{N_1 + N_2}}$$

$$\frac{P_A° - P_S}{P_S} = \frac{n}{N} \rightarrow Solute$$

$$\boxed{\frac{P° - P_S}{P_S} = \frac{N_1}{N_2}} \checkmark$$

The vapour pressure of a solvent decreased by 10 mm of Hg when a non-volatile solute was added to the solvent. The mole fraction of solute in solution is 0.2. What would be the mole fraction of solvent if decrease in vapour pressure is 20 mm?

(1) 0.8

(2) 0.6

(3) 0.4

(4) 0.2

$X_B = 0.2$

$X_A = 0.8$

$P_A^0 - P_S = 10 \, mm \rightarrow Case \, ①$

$X_B = 0.2, \quad X_A \rightarrow 0.8$

$\dfrac{P_A^0 - P_S}{P_A^0} = X_B \quad -①$

$\dfrac{(P_A^0 - P_S)'}{P_A^0} = X_B' \quad ②$

$P_A^0 - P_S = 20 \, mm$

$X_A' = ?$

$① / ② \quad \dfrac{P_A^0 - P_S}{(P_A^0 - P_S)'} = \dfrac{X_B}{X_B'}$

$\dfrac{10}{20} = \dfrac{0.2}{X_B'}$

$X_B = 0.4$

$X_A = 1 - 0.4 = 0.6$

The relative lowering of vapour pressure of a solution of 6 g of urea in 90 g of water is close to ⑥

(1) 0.02

(2) 0.04

(3) 0.06

(4) 0.03

$$\frac{P_A^0 - P_s}{P_A^0} = X_B$$

$$n_B = \frac{6}{60} = 0.1 = 1/10$$

$$n_A = \frac{90}{18} = 5$$

$$R.L.V.P. = X_B = \frac{n_B}{n_A + n_B}$$

$$= \frac{1/10}{\frac{1}{10} + 5} = \frac{1/10}{51/10}$$

$$= \frac{100^2}{51} \times 10^{-2}$$

$$= 0.02$$

A 6% glucose solution and 2% solution of X show same relative lowering of vapour pressure. Assuming X to be a non-electrolyte molecular weight of X is

(1) 30

(2) 60

(3) 90

(4) 180

$$\frac{P_A^\circ - P_s}{P_A^\circ} \rightarrow \text{Same} \rightarrow X_B$$

$$X_B = X_B'$$

$$\frac{n_B}{n_A + n_B} = \frac{n_B'}{n_A + n_B'}$$

$$n_A >>> n_B$$

6 gm glucose 100 ml Soln

2 gm X in 100 ml soln, 1 gm/ml → 100 gm

$$\frac{n_B}{n_A} = \frac{n_B'}{n_A} \Rightarrow \frac{6}{30 + 180} = \frac{2}{m_\omega} \Rightarrow \boxed{m_\omega = 60}$$

Freezing point of the solution which has 0.1 mole of sugar dissolved in 250 g water is (freezing point depression constant for water is 1.86°C/molal

(1) −1.86°C

(2) −0.460°C

(3) −0.744°C

(4) −0.460°C

$T_f = ?$

$$\Delta T_f = m \, k_b$$

$$\Delta T_f = \left(\frac{wt_g}{m \cdot w} \right) \times \frac{1000}{Mass \, of \, Solva} \cdot k_b$$

$$= \frac{0.1 \times 1000}{}$$

100 mL of a liquid A was mixed with 25 mL of a liquid B to give a non-ideal solution of A–B mixture having positive deviations. The volume of this mixture would be

(1) 75 mL
(2) 125 mL
(3) just more than 125 mL
(4) just close to 125 mL but not exceeding 125 mL

position

$$\Delta V_{mix} > 0$$

$V_1 + V_2 = 25 + 100 = 125$

124.90

Mixture of volatile components of A and B has total vapour pressure

$P = 254 - 119x$ (x = mol fraction of B)

Hence P_A° and P_B° are

(1) 135, 254

(2) 119, 254

(3) 254, 135

(4) 135, 119

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

$$\boxed{X_A = 1 - X_B}$$

$P_S = P_A^\circ (1 - X_B) + P_B^\circ X_B$

$= P_A^\circ - P_A^\circ X_B + P_B^\circ X_B$

$$\boxed{P_S = P_A^\circ + X_B(P_B^\circ - P_A^\circ)}$$

$$\boxed{P_S = 254 - 119X} \quad \text{Compare}$$

$P_A^\circ = 254 \checkmark$

$P_B^\circ - P_A^\circ = -119$

$P_B^\circ - 254 = -119$

$P_B^\circ = -119 + 254$

$$\boxed{P_B^\circ = 135}$$

For an ideal binary liquid solution, the plot of P_{total} versus χ_A (mole fraction of liquid A) is linear with slope and intercept equal to

(1) $P_A^\circ - P_B^\circ, P_A^\circ$ (2) $P_A^\circ - P_B^\circ, P_B^\circ$

(3) $P_B^\circ - P_A^\circ, P_A^\circ$ (4) $P_B^\circ - P_A^\circ, P_B^\circ$

$$P_S = P_A^\circ X_A + P_B^\circ (1 - X_A)$$

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

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

$$y = x \quad m \quad + c$$

$$m = P_A^\circ - P_B^\circ, \quad c = P_B^\circ$$

1 mol A + 3 mol B (volatile liquids) are in a mixture. $P_A^° = 300$ mm and $P_B^° = 100$ mm. Mol fraction of B in vapour state above the solution is

(1) 0.75

(2) 0.25

(3) 0.50

(4) 0.66

$$Y_B = ?$$

$$Y_B = \frac{P_B}{P_{Total}}$$

$$Y_B = \frac{300/4}{\frac{600}{4}\,2} = \frac{1}{2} = 0.5 \qquad P_B = P_B^° X_B = \frac{100 \times 3}{4} = \frac{300}{4}$$

$$P_{Total} = 300 \cdot \frac{1}{4} + \frac{300}{4}$$

$$= \frac{600}{4}$$

1	2	3	4	5	6	7	8	9	10
3	4	2	1	2	3	3	3	2	3