DPP-6 Relative Lowering of Vapour Pressure

Chapter: Solution

"Being ahead is useless if you stop running."

TYPE–1 : Conceptual & Definition Based

1. **When nonvolatile solute is added in a solvent then relative lowering in vapour pressure depends upon:-**
   (1) $\frac{\text{Number of moles of solute}}{\text{Number of moles of solvent}}$
   (2) $\frac{\text{Number of moles of solvent}}{\text{Number of moles of solute}}$
   (3) $\frac{\text{Number of moles of solvent}}{\text{Total number of moles of solution}}$
   (4) $\frac{\text{Number of moles of solution}}{\text{Number of moles of solute}}$
2. **The relative lowering of vapour pressure is equal to the mole fraction of the nonvolatile solute, This statement was given by :**
   (1) Raoult
   (2) Henry
   (3) Joule
   (4) Dalton
3. **The vapour pressure of a solution having solid as solute and liquid as solvent is :**
   (1) Directly proportional to mole fraction of the solvent
   (2) Inversely proportional to mole fraction of the solvent
   (3) Directly proportional to mole fraction of the solute
   (4) Inversely proportional to mole fraction of the solute

TYPE–2 : Raoult's Law Formula Verification

1. **Which one of the following is the incorrect form of Raoult's law**
   (1) $\frac{P_s}{P^0} = \frac{N}{n+N}$
   (2) $\frac{P^0}{P^0 - P_s} = 1 + \frac{N}{n}$
   (3) $\frac{P^0 - P_s}{P_s} = \frac{n}{n+N}$
   (4) $\frac{P_s}{P^\circ - P_s} = \frac{N}{n}$
2. **If P_0 and P_S are the vapour pressure of solvent and its solution respectively. N_1 and N_2 are the mole fraction of solvent and solute respectively then :**
   (1) $P_S = \frac{P_0}{N_2}$
   (2) $P_0 - P_S = P_0 N_2$

(3) $P_S = P_0 N_2$

(4) $\dfrac{(P_0 - P_S)}{P_S} = \dfrac{N_1}{(N_1 + N_2)}$

3. **If P° and P are the vapour pressure of solvent and solution n_1 and n_2 are the moles of solute and solvent then**

   (1) $P^\circ = P\left(\dfrac{n_2}{n_1 + n_2}\right)$

   (2) $P = P^\circ\left(\dfrac{n_2}{n_1 + n_2}\right)$

   (3) $P^\circ = P\left(\dfrac{n_1}{n_1 + n_2}\right)$

   (4) $P^\circ = P \times n_1$

TYPE–3 : Mole Fraction Calculation

1. **The vapour pressure of a dilute aqueous solution of glucose is 750 mm Hg at 373 K. Calculate the mole fraction of solute. (The vapour pressure of pure water is 760 mm Hg at 373 K)**

   (1) 0.013
   (2) 1.3
   (3) 0.13
   (4) None of these

2. **One mol of non volatile solute is dissolved in two mol of water. The vapour pressure of the solution relative to that of water is**

   (1) $\frac{2}{3}$
   (2) $\frac{1}{3}$
   (3) $\frac{1}{2}$
   (4) $\frac{3}{2}$

3. **The vapour pressure of a pure liquid solvent (X) is decreased to 0.60 atm. from 0.80 atm on addition of a non volatile substance (Y). The mole fraction of (Y) in the solution is:-**

   (1) 0.20
   (2) 0.25
   (3) 0.5
   (4) 0.75

4. **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 solute if decrease in vapour pressure is 20 mm of Hg?**

   (1) 0.8
   (2) 0.6
   (3) 0.4
   (4) 0.2

TYPE–4 : Calculate Vapour Pressure of Solution

1. **The vapour pressure of water at room temperature is 23.8 mm of Hg. The vapour pressure of an aqueous solution of sucrose with mole fraction 0.1 is equal to :**
   (1) 23.9 mm Hg
   (2) 24.2 mm Hg
   (3) 21.42 mm Hg
   (4) 31.44 mm Hg
2. **18 g of glucose ($C_6H_{12}O_6$) is added to 178.2 g of water. The vapour pressure of this aqueous solution at 100 °C is :**
   (1) 759.00 torr
   (2) 7.60 torr
   (3) 76.00 torr
   (4) 752.40 torr
3. **The vapour pressure of CCl_4 at 25°C is 143 mm Hg. If 0.5 gm of a non-volatile solute (mol. weight = 65) is dissolved in 100 g CCl_4, the vapour pressure of the solution will be**
   (1) 199.34 mm Hg
   (2) 143.99 mm Hg
   (3) 141.43 mm Hg
   (4) 94.39 mm Hg
4. **The vapour pressure of water at 20°C is 17.5 mm Hg. If 18 g of glucose ($C_6H_{12}O_6$) is added to 178.2g of water at 20°C, the vapour pressure of the resulting solution will be :** [AIEEE-2008, 3/105]
   (1) 15.750 mm Hg
   (2) 16.500 mm Hg
   (3) 17.325 mm Hg
   (4) 17.675 mm Hg
5. **18 g glucose ($C_6H_{12}O_6$) is added to 178.2 g water. The vapor pressure of water (in torr) for this aqueous solution is.** [JEE(Main) 2016, 4/120]
   (1) 76.0
   (2) 752.4
   (3) 759.0
   (4) 7.6

TYPE–5 : Calculate Molecular Weight of Solute

1. **The vapour pressure of pure A is 10 torr and at the same temperature when 1 g of B is dissolved in 20 gm of A, its vapour pressure is reduced to 9.0 torr. If the molecular mass of A is 200 amu, then the molecular mass of B is :**
   (1) 100 amu
   (2) 90 amu
   (3) 75 amu
   (4) 120 amu

2. **The vapour pressure of a solution of 5 g. of non electrolyte in 100 g. of water at a particular temperature is 2985 Nm^{-2}. The vapour pressure of pure water at that temperature is 3000 Nm^{-2}. The molecular weight of the solute is :-**
   (1) 180
   (2) 90
   (3) 270
   (4) 200
3. **The vapour pressure of benzene at a certain temperature is 640 mm of Hg. A non-volatile and non-electrolyte solid, weighing 2.175 g is added to 39.08 of benzene. The vapour pressure of the solution is 600 mm of Hg. What is the molecular weight of solid substance?**
   (1) 69.45
   (2) 59.6
   (3) 49.50
   (4) 79.8
4. **The vapour pressure of acetone at 20°C is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 g of acetone at 20°C, its vapour pressure was 183 torr. The molar mass (g mol^{-1}) of the substance is:** [JEE(Main) 2015, 4/120]
   (1) 32
   (2) 64
   (3) 128
   (4) 488
5. **The vapor pressure of benzene is 53.3 kPa at 60.3°C, but it fall to 51.5 kPa when 19 g of a nonvolatile organic compound is dissolved in 500g benzene. The molar mass of the nonvolatile compound is** [NSEC-2015]
   (A) 82
   (B) 85
   (C) 88
   (D) 92

TYPE–6 : Calculate Weight of Solute / Lowering of VP

1. **How many gram of a non volatile solute having a molecular weight of 90 are to be dissolved in 97.5 g water in order to decrease the vapour pressure of water by 2.5 percent :-**
   (1) 25
   (2) 18
   (3) 12.5
   (4) 9
2. **At room temperature, a dilute solution of urea is prepared by dissolving 0.60 g of urea in 360 g of water. If the vapour pressure of pure water at this temperature is 35 mm Hg, lowering of vapour pressure will be : (molar mass of urea = 60 g mol^{-1})** [JEE(Main) 2019 Online (09-04-19)S1, 4/120]
   (1) 0.027 mmHg

(2) 0.028 mmHg
(3) 0.017 mmHg
(4) 0.031 mmHg

3. **Two 5 molal solutions are prepared by dissolving a non-electrolyte non-volatile solute separately in the solvents X and Y. The molecular weights of the solvents are M_X and M_Y, respectively where $M_X = \frac{3}{4}M_Y$. The relative lowering of vapour pressure of the solution in X is "m" times that of the solution in Y. Given that the number of moles of solute is very small in comparison to that of solvent, the value of "m" is :** [JEE(Main) 2018 Online 15-04-18), 4/120]
   (1) $\frac{4}{3}$
   (2) $\frac{3}{4}$
   (3) $\frac{1}{2}$
   (4) $\frac{1}{4}$