

PART 1 - CHEMISTRY

Topic : Solutions

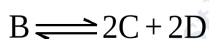
SECTION-B : (Maximum Marks : 20)

- This section contains **ONE** paragraph.
- Based on each paragraph, there are **FIVE** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct answer is entered;

Zero Marks : 0 In all other cases.

1. In a solvent S, a compound B is partially dissociated into C and D as given below:



B, C and D are non-volatile in nature. The molar mass of B is 10 times the molar mass of S. The standard boiling point and the standard enthalpy of vaporization of S are 400 K and $10R \text{ J mol}^{-1}$, respectively (R is the gas constant in $\text{J K}^{-1} \text{ mol}^{-1}$). A solution of B in S with an initial concentration of B as 0.25% (mass/mass) has a boiling point of 408 K at 1 bar pressure. In this solution, the mole percent of B that has been dissociated is ____.

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Paragraph for Questions 2 and 3

Two volatile liquids A and B form an ideal solution. Consider a 5 molal solution of B in A inside a closed container having a total vapour pressure of 100 mm Hg at 300 K. The vapour pressure of pure A at 300K is 105 mm Hg. Assume that A and B behave as ideal gases in the vapour phase.

Given:

The gas constant $R = 0.08 \text{ L atm K}^{-1} \text{ mol}^{-1}$ Molar mass of A is 50 g mol^{-1} Molar mass of B is 57 g mol^{-1} Density of liquid B at 300 K is 0.5 g/mL $1 \text{ atm} = 760 \text{ mm Hg}$

2. At 300 K, the ratio of the molar volume of pure B in vapour phase to its molar volume in liquid phase is ____.

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Space for Rough Work

3. The mole fraction of B in vapour phase which is in equilibrium with this solution is ____.

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4. At 300 K, an ideal dilute solution of a macromolecule exerts osmotic pressure that is expressed in terms of the height (h) of the solution (density = 1.00 g cm^{-3}) where h is equal to 2.00 cm. If the concentration of the dilute solution of the macromolecule is 2.00 g dm^{-3} , the molar mass of the macromolecule is calculated to be $X \times 10^4 \text{ g mol}^{-1}$. The value of X is ____.

Use: Universal gas constant (R) = $8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ and acceleration due to gravity (g) = 10 m s^{-2}

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5. Vessel-1 contains $w_2 \text{ g}$ of a non-volatile solute X dissolved in $w_1 \text{ g}$ of water. Vessel-2 contains $w_2 \text{ g}$ of another non-volatile solute Y dissolved in $w_1 \text{ g}$ of water. Both the vessels are at the same temperature and pressure. The molar mass of X is 80% of that of Y. The van't Hoff factor for X is 1.2 times of that of Y for their respective concentrations.

The elevation of boiling point for solution in Vessel-1 is ____ % of the solution in Vessel-2.

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JEE ADVANCED SOLUTIONS — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-B

Ques.	1	2	3	4	5					
Ans.	31.60 to 33.33	1991 to 2053	0.16	2.4 to 2.55	150					