CHEMISTRY

NCERT - NCERT CHEMISTRY (GUJRATI)

COLLIGATIVE PROPERTIES

Problems

1. The vapour pressure of CCl_4 at $30^\circ C$ is 143 mm of Hg.0.5 gm of a nonvolatile non electrolyte substance with molar mass 65 is dissolved in 100 ml of CCl_4. What will be the vapour pressure of the solution. Density of CCl_4 at $30^\circ C = 1.58\ \text{gm per cc.}$

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2. Dry air was passed successively through a solution of 5 gm of solute dissolved in 80.0 gm of water and through pure water. The loss in weight of the solution was 2.5 gm and that of the pure solvent was 0.04 gm. What is the molecular weight of the solute?

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3. Calculate the vapour pressure of the solution. The molefraction of the solute is 0.25. The vapour pressure of the pure solvent is 0.8atm.

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4. 1.00 g of a non-electrolyte dissolved in 50.5g of benzene lowered its freezing point by 0.40K. The freezing point depression constant of benzene is $5.12\mathrm{K.kg\ mol}^{-1}$. Find the molecular mass of the solute.

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5. What is the freezing point of solution containing 3g of a non-volatile solute in 20g of water. Freezing point of pure water is 273K, K_f of water = 1.86 Kkg/mol. Molar mass of solute is 300 g/mol.

$T^\circ - T = K_f m$

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6. A solution containing 2.5 g of a non-volatile solute in 100 gm of benzene boiled at a temperature 0.42K higher than at the pure solvent boiled. What is the molecular weight of the solute? The molal elevation constant of benzene is $2.67\ \mathrm{K\ kg\ mol^{-1}}$.

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7. 0.900g of a solute was dissolved in 100 ml of benzene at $25^\circ C$ when its density is 0.879 g/ml. This solution boiled $0.250^\circ C$ higher than the boiling point of benzene. Molal elevation constant for benzene is $2.52\ \mathrm{K.Kg.mol^{-1}}$. Calculate the molecular weight of the solute.

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8. 10g of an organic substance when dissolved in two litres of water gave an osmotic pressure of 0.59 atm, at $7^{\circ} C$. Calculate the molecular weight of the substance.

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9. A 0.5 percent aqueous solution of KCl was found to freeze at 272.76K. Calculate the Van't Hoff factor and degree of dissociation of the solute at this concentration $\left(K_f \text{ for water} = 1.86\ \text{k.kg.mol}^{-1}\right)$. Normal molar mass of $KCl = 74.5$.

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10. The depression in the freezing point of a benzene solution containing 0.784g of Acetic acid dissolved in 100ml of benzene is 0.35k.

Calculate the van't Hoff factor and the degree of association of the solute at this concentration

$\left(k_f \text{ for benzene} = 5.10\ \text{k.kg.mol}^{-1}, \quad \text{molar mass of acetic acid is } 60.01\right)$.

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Questions Problems

1. The vapour pressure of pure benzene at a certain temperature is 640 mm of Hg. A non-volatile non-electrolyte solid weighing 2.175 g is added to 39 g of benzene. The vapour pressure of the solution is 600 mm of Hg. What is molecular weight of solid substance?

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2. Calculate the freezing point of an aqueous solution of a non-electrolyte having an osmotic pressure 2.0 atm at $300\ \text{K}$. $\text{Kf} = 1.86\ \text{k.kg.mol}^{-1}$. $\text{R} = 0.0821\ \text{lit.atm.k}^{-1}\ \text{mol}^{-1}$

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3. What weight of non-volatile solute (urea) NH_2CONH_2 needs to be dissolved in 100 g of water in order to decrease the vapour pressure of water by $25\ \%$. What will be the molality of solution?

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4. 20 g of sucrose solution in one litre is isotonic with a solution of boric acid containing 1.63 g of boric acid in 450 ml. Find the molecular weight of boric acid.

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5. A solution containing 6 gm of a solute dissolved in 250 ml of water gave an osmotic pressure of 4.5 atmosphere at $27^\circ C$. Calculate the

boiling point of the solution. The molal elevation constant for water is 0.52

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