Chapter – "Solutions"

ASSIGNMENT - 1

Colligative Properties

Q1. A solution containing 62g ethylene glycol in 250 g of water is cooled to -10° C. If K_f for water is 1.86 K Kg mol^{-1} , the amount of water (in g) separated as ice w1ll be ?

Q2. Molecules of the benzoic acid dimerises in benzene. 'w' g of the acid dissolved in 30 g of the benzene shows a depression in the freezing point equal to 2 K .If the percentage association of the acid to form the dimer in the solution is 80 , then 'w' will be ?

Q3. The depression in freezing point observed for a formic acid solution of concentration $0.5 mL L^{-1}$ is $0.0405 ^\circ C$. Density of formic acid is $1.05 g mL^{-1}$. The Van't Hoff factor of the formic acid solution is nearly : (Given for water $k_f = 1.86 K kg mol^{-1}$)

Q4. Solute A associates in water. When 0.7g of solute A is dissolved in 42.0g of water, it depresses the freezing point by $0.2 ^\circ C$. The percentage association of solute A in water, is
[Given : Molar mass of $A = 93 g mol^{-1}$. Molal depression constant of water is $1.86 K kg mol^{-1}$]

Q5. What is the mass ratio of ethylene glycol required for making 500 g of 0.25 molal aqueous solution and 250 ml of 0.25 molar aqueous solution ?

Q6. The Henry's law constant for the solubility of the N_2 gas in water at 298 K is 1 x 10^5 atm . The mole fraction of N_2 in air is 0.8 . The number of moles of N_2 from air dissolved in 10 moles of water at 298 K and 5 atm pressure will be ?

Q7. A solution is prepared by dissolving 0.6 g of urea (molar mass $= 60 g mol^{-1}$) and 1.8 g of glucose (molar mass $= 180 g mol^{-1}$) in 100 mL of water at $27 ^\circ C$. The osmotic pressure of the solution will be ?
($R = 0.08206 L atm K^{-1} mol^{-1}$)

Q8. 1g of the non-volatile non-electrolyte solute is dissolved in 100g of two different solvent A & B whose ebullioscopic constants are in the ratio of 1:5 . The ratio of the elevation in their boiling points will be ?

Q9. A 0.6 % solution of the urea would be isotonic with which of the solution :

(i) 0.1M glucose
(ii) 0.1M KCl
(iii) 0.6% Glucose solution
(iv) 0.6% KCl solution

Q10. Two solutions A and B are prepared by dissolving 1g of non-volatile solutes X and Y. respectively in 1kg of water. The ratio of depression in freezing points for A and B is found to be 1:4. The ratio of molar masses of X and Y is ?