IIT/EKLAVYA BATCH
THE GURUKUL INSTITUTE

PLOT 5C, 2ND FLOOR, GANAPATI COMPLEX, SEC-13, OPP. JAIPURIA SCHOOL, VASUNDHARA, GHAZIABAD (U.P)PH.NO.9810780903

DAILY PRACTICE PROBLEMS -2

LIQUID SOLUTIONS

1. Calculate the vapor pressure of a solution at 100^{o}C containing 3 g of cane sugar in 33 g of water?
2. Calculate the osmotic pressure of
   a) 0.01 M solution of Urea at 300K
   b) 10% solution of cane- sugar at 15^{o}C
   c) 0.001 n solution of cane sugar at 27^{o}C
3. Blood plasma has he following composition (milli- equivalents per litre). Calculate osmotic pressure at 37^{o}C.
   Na^+ = 138, Mg^{2+} = 5.2, Ca^{2+} = 2, K^+ = 4.5, Cr^- =105, HCO_3^- = 25, PO_4^{3-} = 2.2, SO_4^{2-} = 0.5, proteins = 16, others = 1.
4. Osmotic pressure of a sugar solution at 24^{o}C is 2.5 atm. Determine the concentration of solution in gm mole per litre.
5. A cane sugar solution has an osmotic pressure of 2.46 atmospheres, at 27^{o}C. Determine strength of the solution.
6. A 3.42% solution of cane- sugar is isotonic with 3% solution of an unknown organic compound. Calculate the molecular weight of the unknown compound.
7. 20 g of substance were dissolved in 500 ml of water and the osmotic pressure was found to be 600 mm of Hg at 15^{o}C. Determine the molecular weight of the substance?
8. A solution of 0.45 gm of Urea (molecular weight 60)in 22.5 g of water showed 0.170^{o}C of elevation in boiling point. Calculate K_b of water?
9. Calculate the boiling point of the solution containing 0.45 g of Camphor (mol. Wt. =152) dissolved in 33.4 g of acetone (B. P = 56.3^{o}C). K_b per 100 gm of acetone is 17.2^{o}C.
10. 0.15 g of a substance dissolved in 15 g of solvent boiled at a temperature higher than 0.216^{o}C than that of pure solvent. Calculate the molecular weight of the substance. K_b= 2.16^{o}C kg $Kmol^{-1}$.
11. A solution of 4. 5 g of pure non-electrolyte in 100 g of water was found to freeze at –0.465^{o}C. Determine the molecular weight of the substance. K_f = 1.86 kg $Kmol^{-1}$.
12. A solution of Urea in water has a boiling point of 100.130^{o}C. Calculate the freezing point of the same solution, K_f and K_b for water are 1.87^{o}C and 0.520^{o}C respectively.
13. A 0.001 molal solution of a complex of a molecular formula $[Pt(NH_3)_4Cl_4]$ in water has a freezing point depression of 0.0054^{o}C. If K_f for water is 1.80, determine the correct formula of the above molecule.
14. To 500 cm^3 of water, 3 x 10^{-3}kg of acetic acid is added. If 23% of acetic acid is dissociated, what will be the depression in freezing point? K_f = 4. 9 kg $Kmol^{-1}$. What is the % association of acid if it forms double molecule in solution.
15. 2g of Benzoic Acid is dissolved in 25 g of C_6H_6 shows a depression in freezing point of 1.62 K. K_f = 1.86 K kg mol^{-1} , density = 0.997 gcm^{-3}.
16. 75.2 g of phenol is dissolved in 1 kg of solvent. K_f = 14 K molality $^{-1}$. If the depression in freezing point is 7K, calculate % dimerisation of phenol.
17. The freezing point of 0.02 mole fraction of acetic acid in Benzene is 277.4K. Acetic acid exists as dimer. Calculate equilibrium constant for dimerisation. Freezing point of

Benzene is 278.4K, heat of fusion of benzene is 10.042 KJ/ mol. Assume molarity and molality are same.

18. The freezing point of 0.08 $NaSO_4$ is – 0. 345°C. Calculate the % of HSO_4^- ions that transfers a proton to water. Assume 100% ionization of $NaHSO_4$ and K_f for H_2O is = 1.86 kmolality^{-1}.
19. The vapor pressure of a very dilute solution and pure water are 17 and 17.39 mm at 20°C. Calculate the osmotic pressure at 20°C and density of water vapors at 20°C.
20. A 10% (wt/wt) solution of cane sugar undergoes partial conversion into glucose and fructose to how inversion as follows:

Sucrose + water → Glucose + Fructose

If the solution boils at 100.27°C at this state, calculate the average mass of the dissolved material. What fraction of the sugar has inverted? K_b for water = 0.512 K kg mol^{-1}.

21. Calculate the osmotic pressure of a solution obtained by mixing 100 cm^3 of 0.25 M solution of urea and 100 cm^3 of 0.1 M solution of cane – sugar at 293 K.
22. 1g of non- volatile solute was dissolved in 100 g of acetone at 298 K. The vapor pressure of solution was found to be 192. 5mm of Hg. Calculate molar mass of the solute.[the vapor pressure of acetone at 298 K is 195 mm of Hg]
23. In a solution of Urea, 3g of it is dissolved in 100 mL of solution of water. What will be the freezing point of the solution? State the approximation made.[K_f = 1.86 K kg mol^{-1}]
24. An aqueous solution of glucose is made by dissolving 10 g of glucose in 90g of water at 303 K. if the vapor pressure of pure- water at 303 K. if vapor pressure of pure – water 303 K be 32. 8 mm Hg, what would be the vapor pressure of solution?
25. Vapor pressure of pure water at 35°C is 31.82 mm Hg. When 27 g of solute is dissolved in 100 g of water, the resulting vapor pressure is 30. 95 mm Hg. Calculate molar mass of solute.
26. The solubility of $Ba(OH)_2.8H_2O$ in water at 288 K s 5.6 g per 100 g of water. What is the molality of the hydroxide ion in saturated solution of $Ba(OH)_2.8H_2O$ at 288 K.
27. An aqueous solution of $BaCl_2$ contains 1.248g of $BaCl_2$ in 100 g of water, boils at 100.0832°C. Calculate % of dissociation of $BaCl_2$. [K_b = 0.52 K kg mol^{-1}]
28. Assuming complete ionization, calculate expected freezing point of solution prepared by dissolving 6g of Glauber's Salt $Na_2SO_4.10H_2O$ in 0.1kg of water. [K_f = 1.86 K kg mol^{-1}]
29. K_f for C_6H_6 = 4.90 k kg mol^{-1}. Selenium exists as polymer of the type Se_x. When 3.26 g of Selenium is dissolved in 226 g f Benzene, the observed freezing point is 0.112°C lower than for pure benzene. Deduce molecular formula of Selenium. [Atomic Mass of Selenium = 78.8 g]
30. A decimolar solution of K_4[$Fe(CN)_6$] is 30% dissociated, at 300 K . Calculate osmotic pressure of the solution.