Solutions

Q.No.1:
Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type.

CBSE Board Paper 2010

Q.No.2:
A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 g of benzene has a boiling point of 80.31 °C. Determine the molar mass of this compound. (B.P. of pure benzene = 80.10 °C and K_b for benzene = 2.53 °C kg mol^{-1})

CBSE Board Paper 2010

Q.No.3:
(a) Differentiate between molarity and molality for a solution. How does a change in temperature influence their values?
(b) Calculate the freezing point of an aqueous solution containing 10.50 g of $MgBr_2$ in 200 g of water. (Molar mass of $MgBr_2$ = 184 g) (K_f for water = 1.86 K kg mol^{-1})
OR
(a) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property? Explain.
(b) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250.0 g of water. (K_b for water = 0.512 K kg mol^{-1}), (Molar mass of NaCl = 58.44 g)

Q.No.4:
A 1.00 molal aqueous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point. The solution has the boiling point of 100.18°C. Determine the van't Hoff factor for trichloroacetic acid. (K_b for water = 0.512 kg mol^{-1})
OR
Define the following terms:

(i) Mole fraction
(ii) Isotonic solutions
(iii) Van't Hoff factor
(iv) Ideal solution

CBSE Board Paper 2012

Q.No.5:
15.0 g of an unknown molecular material was dissolved in 450 g of water. The resulting solution was found to freeze at −0.34°C. What is the molar mass of this material? (K_f for water = 1.86 K kg mol^{-1})

CBSE Board Paper 2012

Q.No.6:
18 g of glucose, $C_6H_{12}O_6$ (Molar Mass = 180 g mol^{-1}) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil?
(K_b for water = 0.52 K kg mol^{-1}, boiling point of pure water = 373.15 K)

CBSE Board Paper 2013

Q.No.7:
Determine the osmotic pressure of a solution prepared by dissolving 2.5×10^{-2} g of K_2SO_4 in 2L of water at 25°C, assuming that it is completely dissociated.
(R = 0.0821 L atm K^{-1} mol^{-1}, Molar mass of K_2SO_4 = 174 g mol^{-1})

CBSE Board Paper 2013

Q.No.8: Calculate the mass of a compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K (K_f = 5.12 K kg mol^{-1}).

CBSE Board Paper 2014

Q.No.9: What type of intermolecular attractive interaction exists in the pair of methanol and acetone?

CBSE Board Paper 2014

Q.No.10: State Raoult's law for the solution containing volatile components. What is the similarity between Raoult's law and Henry's law?

CBSE Board Paper 2014

Q.No.11: What is meant by positive deviations from Raoult's law? Give an example. What is the sign of $\Delta_{mix}H$ for positive deviation?

OR

Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law ? Give an example. **CBSE Board Paper 2015**

Q.No.12: 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the van't Hoff factor and predict the nature of solute (associated or dissociated).
(Given : Molar mass of benzoic acid = 122 g mol^{-1}, K_f for benzene = 4.9 K kg mol^{-1}) **CBSE Board Paper 2015**

Q.No.13:
(a) Calculate the freezing point of solution when 1.9 g of $MgCl_2$ (M = 95 g mol^{-1}) was dissolved in 50 g of water, assuming $MgCl_2$ undergoes complete ionization.
(K_f for water = 1.86 K kg mol^{-1})
(b) (i) Out of 1 M glucose and 2 M glucose, which one has a higher boiling point and why?
(ii) What happens when the external pressure applied becomes more than the osmotic pressure of solution?

OR

(a) When 2.56 g of sulphur was dissolved in 100 g of CS_2, the freezing point lowered by 0.383 K. Calculate the formula of sulphur (S_x).
(K_f for CS_2 = 3.83 K kg mol^{-1}, Atomic mass of sulphur = 32 g mol^{-1}]
(b) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing
(i) 1.2% sodium chloride solution?
(ii) 0.4% sodium chloride solution?

CBSE Board Paper 2016

Q.No.14: A 10% solution (by mass) of sucrose in water has freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water, if freezing point of pure water is 273.15 K.
Given : (Molar mass of sucrose = 342 g mol^{-1})
(Molar mass of glucose = 180 g mol^{-1})

CBSE Board Paper 2017

Q.No.15: Define the following terms:
(i) Abnormal molar mass
(ii) van't Hoff factor (i) **CBSE Board Paper 2017**