Ravi Maths Tuition

1. Solutions

12th Standard

Chemistry

Multiple Choice Question 202 x 1 = 202

1) Brass is

(a) Solid solution (b) Liquid solution (c) Gas solution (d) All of these

2) 200 mL of water is added to 500mL of 0.2 M solution. What is the molarity of the dilluted solution ?

(a) 0.5010 M (b) 0.2897 M (c) 0.7093 M (d) 0.1428 M

3) In which mode of expression, the concentration of solution remains independent of temperature ?

(a) Molarity (b) Normality (c) Formality (d) Molality

4) Increasing the temperature of an aqueous solution will cause

(a) Decrease in molality (b) decrease in molarity (c) decrease in mole fraction (d) decrease in % w/w

5) Molarity of the liquid HCL if density of the solution is 1.17 g/cc is

(a) 36.5 (b) 18.25 (c) 32.05 (d) 42.10

6) 5ml of 1 N HCl, 20ml of N/2 H_2SO_4 and 30ml of N/3 HNO_3 are mixed together and the volume made to one litre. The normality of the resulting solution is

(a) N/5 (b) N/10 (c) N/20 (d) N/40

7) Which one of the following gases has the lowest value of the Henry's law constant ?

(a) N_2 (b) He (c) H_2 (d) CO_2

8) An aqueous solution of methanol in water has vapour pressure

(a) equal to that of water (b) equal to that of methanol (c) more than that of water (d) less than that of water

9) 12.0g of urea is dissolved in 1 litre of water and 68.4g sucrose is dissolved in 1 litre of water. The relative lowering of vapour pressure of urea solution is

(a) greater than sucrose solution (b) less than sucrose solution (c) double that of sucrose solution

(d) equal to that of sucrose solution

10) Formation of a solution from two components can be considered as
(i) pure solvent $\longrightarrow$ seperated solvent molecules, ΔH_1
(ii) pure solute $\longrightarrow$ seperated solute molecules,ΔH_2
(iii) separated solvent and solute molecules $\longrightarrow$ solution,ΔH_3
Solution so formed will be ideal if.

(a) $\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$ (b) $\Delta H_{soln} = \Delta H_1 + \Delta H_2 - \Delta H_3$

(c) $\Delta H_{soln} = \Delta H_1 - \Delta H_2 - \Delta H_3$ (d) $\Delta H_{soln} = \Delta H_3 - \Delta H_1 - \Delta H_2$

11) The system that forms maximum boiling azeotrope is

(a) carbon disulphide-acetone (b) benzene-tolune (c) acetone-chloroform (d) n-hexane-n-heptane

12) The molal freezing point constant of water is 1.86° C/M. Therefore the freezing point of 0.1 M NaCl solution in water is expected to be

(a) - 1.86°C (b) - 0.186°C (c) - 0.372°C (d) + 0.372°C

13) What is the osmotic pressure of a 0.0020 mol dm^{-3} sucrose ($C_{12}H_{22}O_{11}$) solution at 20°C ? (Molar gas constant, R = 8.314 $JK^{-1}mol^{-1}$)

(a) 4870 Pa (b) 4.87 Pa (c) 0.00487 Pa (d) 0.33 Pa

14) Camphor is often used in molecular mass determination because

(a) it is readily available (b) it has a very high cryoscopic constant (c) it is volatile

(d) it is solvent for organic substances

15) A 5% solution of cane sugar (molar mass 342) is Isotonic with 1% of a solution of an unknown solute. The molar mass of unknown solute in g/mol is

(a) 136.2 (b) 171.2 (c) 68.4 (d) 34.2

16) The osmotic pressure of 0.1 M aqueous solution of NaCl is ..... Osmotic pressure of 0.1 M aqueous solution of glucose

(a) equal to (b) less than (c) half of (d) nearly double

17) Ethylene glycol is used as an antifreeze in a cold clomate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it form freezing at 60°C will be : [K_f for water = 1.86 K kg mol^{-1}, and molar mass of ethylene glycol = 62g mol^{-1}]

(a) 204.30g (b) 400.00g (c) 304.60g (d) 804.32g

18) If an aqueous solution of glucose is allowed to freeze, then crystals of which will be separated out first ?

(a) glucose (b) water (c) both of these (d) none of these

19) If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point of water (ΔT_f) , when 0.01 mol of sodium sulphate is dissolved in 1 kg of water, is (K_f = 1.86 K kg mol^{-1}).

(a) 0.0744K (b) 0.0186K (c) 0.0372K (d) 0.0558K

20) Which of the following 0.1 M aqueous solution is likely to have tha highest boilling point ?

(a) Na_2SO_4 (b) KCl (c) Glucose (d) Urea

21) Four solutions of K_2SO_4 with the concentrations 0.1 m, 0.01 m, 0.001 m and 0.0001 m are available. The maximum value of van't Hoff factor, i, correaponds to.

(a) 0.0001 m solution (b) 0.001 m solution (c) 0.01 m solution (d) 0.1 m solution

22) Van't Hoff factor for 0.1 M ideal solution is

(a) 0.1 (b) 1 (c) -0.01 (d) none of these

23) The depression in freezing point for 1 M urea, 1 M glucose and 1 M NaCl are in the ratio

(a) 1:2:3 (b) 3:2:2 (c) 1:1:2 (d) None of these.

24) The van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively

(a) Greater than one and greater than one (b) Less than one and greter than one

(c) Less than one and less than one (d) Greater than one and less than one

25) The solubility of a substance in ether is 2.0×10^{-3} M. The distribution coefficient of the substance in ether - water mixture is 4. The solubility of the substance in ether is.

(a) $3.0 \times 10^{-4} M$ (b) $5.0 \times 10^{-4} M$ (c) $6.0 \times 10^{-4} M$ (d) $8.0 \times 10^{-4} M$

26) Which of the following units is useful in relating concentration of solution with its vapour pressure ?

(a) mole fraction (b) parts per million (c) mass percentage (d) molality

27) On dissolving sugar in water at room temperature, solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid ?

(a) Sugar crystals in cold water (b) Sugar crystals in hot water (c) Powdered sugar in cold water

(d) Powdered sugar in hot water

28) At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is ..... .

(a) less than the rate of crystalisation (b) greater than the rate of crystallisation

(c) equal to the rate of crystalisation (d) zero

29) A beaker contains a solution of substance 'A'. Precipitation of substance 'A' takes place when small amount of 'A' is added to the solution. The solution is ..... .

(a) saturated (b) supersaturated (c) unsaturated (d) concentrated

30) Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon _____.

(a) Temperature (b) Nature of solute (c) Pressure (d) Nature of solvent

31) Low concentration of oxygen in the blood and tissues of people living at high altitude is due to _____.

(a) low temperature (b) low atmospheric pressure (c) high atmospheric pressure

(d) both low temperature and high atmospheric pressure

32) Considering the formation, breaking and strength of hydrogen bond, predict which of the following mixtures will show a positive deviation from Raoult's law?

(a) Methanol and acetone (b) Chloroform and acetone (c) Nitric acid and water (d) Phenol and aniline

33) Colligative properties depend on ..... .

(a) the nature of the solute particles dissolved in solution (b) the number of solute particles in solution

(c) the physical properties of the solute particles dissolved in solution (d) the nature of solvent particles

34) The unit of ebullioscopic constant is _____.

(a) K kg mol^{-1} or K $(molality)^{-1}$ (b) mol kg K^{-1} or K^{-1} (molality) (c) kg mol^{-1} K^{-1} or K^{-1} $(molality)^{-1}$

(d) K mol kg^{-1} or K (molality)

35) In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M $MgCl_2$ solution is _____.

(a) the same (b) about twice (c) about three times (d) about six times

36) An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because _____.

(a) it gains water due to osmosis (b) it loses water due to reverse osmosis

(c) it gains water due to reverse osmosis (d) it loses water due to osmosis

37) At a given temperature, osmotic pressure of a concentrated solution of a substance ..... .

(a) is higher than that at a dilute solution (b) is lower than that of a dilute solution

(c) is same as that of a dilute solution (d) can not be compared with osmotic pressure of dilute solution.

38) Which of the following statements is false ?

(a) Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point.

(b) The osmotic pressure of a soltion is given by the equation $\Pi = CRT$ (where C is the molarity of the solution)

(c) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is $BaCl_2 > KCl > CH_3COOH >$ sucrose.

(d) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution.

39) The values of van't Hoff factors for KCl, NaCl and K_2SO_4, respectively, are ..... .

(a) 2,2 and 2 (b) 2,2 and 3 (c) 1,1, and 2 (d) 1,1 and 1

40) Value of Henry's constant K_H _____.

(a) increases with increase in temperature (b) decreases with increase in temperature (c) remains constant

(d) first increases, then decreases

41) The value of Henry's constant K_H is _____.

(a) greater for gases with higher solubility (b) greater for gases with lower solubility (c) constant for all gases

(d) not related to the solubility of gases

42) We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1 M, 0.01 M, respectively. The value of van't Hoff factor for these solutions will be in the order ..... .

(a) $i_A < i_B < i_C$ (b) $i_A > i_B > i_C$ (c) $i_A = i_B = i_C$ (d) $i_A < B > i_C$

43) On the basis of information given below mark the correct option.

Information :

(A) In bromoethane and chloroethane mixture, intermolecular interactions of A - A and B - B type are nearly same as A - B type interactions.

(B) In ethanol and acetone mixture, A - A or B - B type intermolecular interactions are stronger than A - B type interactions.

(C) In chloroform and acetone mixture, A - A or B - B type intermolecular interactions are weaker than A - B type interactions.

(a) Solution (B) and (C) will follow Raoult's law (b) Solution (A) will follow Raoult's law

(c) Solution (B) will show negative deviation from Raoult's law

(d) Solution (C) will show positive deviation from Raoult's law

44) If two liquids A and B form minimum boiling azeotrope at some specific composition, then ..... .

(a) A - B interactions are stronger than those between A - A or B - B

(b) vapour of solution increases because more number of molecules of liquids A and B can escape from the solution.

(c) vapour pressure of solution decreases because less number of molecules of only one of the liquids escape from the solution.

(d) A - B interactions are weaker than those between A - A or B - B.

45) On the basis of the information given below mark the correct option.

Information: On adding acetone to methanol some of the hydrogen bonds between methanol molecules break.

(a) At specific composition, methanol - acetone mixture will form minimum boiling azeotrope and will show positive deviation from Raoult's law.

(b) At specific composition, methanol - acetone mixture forms maximum boiling azeotrope and will show positive deviation from Raoult's law

(c) At specific composition methanol - acetone mixture will form minimum boiling azeotrope and will show negative deviation from Raoult's law

(d) At specific composition methanol - acetone mixture will form maximum boiling azeotrope and will show negative deviation from Raoult's law

46) K_H value for Ar(g), CO_2(g), HCHO (g) and CH_4 (g) are 4.39,1.67,1.83 x 10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility.

(a) $\mathrm{HCHO} < \mathrm{CH_4} < \mathrm{CO_2} < \mathrm{Ar}$ (b) $\mathrm{HCHO} < \mathrm{CO_2} < \mathrm{CH_4} < \mathrm{Ar}$

(c) $\mathrm{Ar} < \mathrm{CO_2} < \mathrm{CH_4} < \mathrm{HCHO}$ (d) $\mathrm{Ar} < \mathrm{CH_4} < \mathrm{CO_2} < \mathrm{HCHO}$

47) Which following factor (s) affect the solubility of a gaseous solute in the fixed volume of liquid solvent ?
(i) nature of solute
(ii) temperature
(iii) pressure

(a) (i) and (iii) at constant T (b) (i) and (ii) at constant P (c) (ii) and (iii) only (d) (iii) only

48) A 5.5 molal aqueous solution of methyl alcohol, CH_3OH, is supplied. What is the mole fraction of methyl alcohol in the solution ?

(a) 0.190 (b) 0.086 (c) 0.050 (d) 0.100

49) What is the mole fraction of the solute in a 1.00 m aqueous solution ?

(a) 0.0354 (b) 0.0177 (c) 0.177 (d) 1.770

50) The molarity of a solution obtained by mixing 750 mL of 0.5 M HCl with 250 mL of 2 M HCl will be

(a) 0.975 M (b) 0.875 M (c) 1.00 M (d) 1.175 M

51) The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% H_2SO_4 (Molar mass = 98 g mol^{-1}) by mass will be

(a) 1.45 (b) 1.64 (c) 1.88 (d) 1.22

52) Concentrated aqueous sulphuric acid is 98% H_2SO_4 by mass and has a density of 1.80 g mL^{-1}. Volume of the acid required to make one litre of 0.1 M H_2SO_4 solution is

(a) 5.55 mL (b) 11.10 mL (c) 16.65 mL (d) 22.20 mL

53) How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3 ? The concentrated nitric acid is 70% HNO_3

(a) 45.0 g conc HNO_3 (b) 90.0 g conc HNO_3 (c) 70.0 g conc HNO_3 (d) 54.0 g conc HNO_3

54) 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of the solution is

(a) 0.02 M (b) 0.01 M (c) 0.001 M (d) 0.1 M

55) To neutralise completely 20 mL of 0.1 M aqueous solution of phosphorous acid (H_3PO_3), the volume of 0.1 M aqueous KOH solution required is

(a) 10 mL (b) 20 mL (c) 40 mL (d) 60 mL

56) The volumes of 4 N HCl and 10 N HCl required to make 1 litre of 6 N HCl are

(a) 0.75 litre of 4 N HCl and 0.25 litre of 10 N HCl (b) 0.25 litre of 4 N HCl and 0.75 litre of 10 N HCl

(c) 0.67 litre of 4 N HCl and 0.33 litre of 10 N HCl (d) 0.80 litre of a N HCl and 0.20 litre of 10 N HCl

(e) 0.50 litre of 4 N HCl and 0.50 litre of 10 N HCl

57) A person is considered to be suffering from lead poisoning if its concentration in him is more than 15 micrograms of lead per decilitre of blood. Concentration in parts per billion parts is

(a) 1 (b) 10 (c) 100 (d) 1000

58) The molarity of 900 g of water is

(a) 50 M (b) 55.5 M (c) 5 M (d) cannot be calculated

59) Which one of the following statements is not true ?

(a) Dissolution of all solid solutes in water is exothermic.

(b) Common salt is more soluble in water than canesugar at the same temperature.

(c) Solubility of sodium sulphate decahydrate crystals first increases upto a certain temperature and then decreases

(d) Enthalphy of solution can be found using Clausius - Clapeyron equation

60) The mole fraction of a gas dissolved in a solvent is giving by Henry's law. If the Henry's law constant for a gas in water at 298 K is 5.55×10^7 Torr and the partial pressure of the gas is 200 Torr, then what is the amount of the gas dissolved in 1.0 kg of water ?

(a) $2.0 \times 10^{-4} mol$ (b) $2.5 \times 10^{-5} mol$ (c) $3.7 \times 10^{-6} mol$ (d) $1.2 \times 10^{-8} mol$

61) The solubility of a gas in water at 300 K under a pressure of 100 atmospheres is $4 \times 10^{-3} kg\ L^{-1}$. Therefore, the mass of the gas in kg dissolved in 250 mL of water under a pressure of 250 atmospheres at 300 K is

(a) 2.5×10^{-3} (b) 2.0×10^{-3} (c) 1.25×10^{-3} (d) 5.0×10^{-3} (e) 3×10^{-3}

62) The amount of solute (molar mass 60 g mol^{-1}) that must be added to 180 g of water so that the vapour pressure of water is lowered by 10% is

(a) 30 g (b) 60 g (c) 120 g (d) 12 g (e) 24 g

63) At 80°C, the vapour pressure of pure liquid 'A' is 520 mm Hg and that of pure liquid 'B' is 1000 mm Hg. If a mixture solution of 'A' and 'B' boils at 80°C and 1 atm pressure, then amount of 'A' in the mixture is (1 atm = 760 mm Hg)

(a) 48 mol percent (b) 50 mol percent (c) 52 mol percent (d) 34 mol percent

64) Two liquids X and Y form an ideal solution. The mixture has a vapour pressure of 400 mm at 300 K when mixed in the molar ratio of 1:1 and a vapour pressure of 350 mm when mixed in the molar ratio of 1:2 at the same temperature. The vapour pressures of the pure liquids X and Y respectively are

(a) 250 mm, 550 mm (b) 350 mm, 450 mm (c) 350 mm, 700 mm (d) 500 mm, 500 mm

(e) 550 mm, 250 mm

65) Two liquids X and Y form an ideal solution. At 300 K, vapour pressure of the solution containing 1 mol of X and 3 mol of Y is 550 mm Hg. At the same temperature if 1 mol of Y is furthur added to this solution, vapour pressure of the solution increases by 10 mm Hg. Vapour pressure (in mm Hg) of X and Y in their pure states will be respectively.

(a) 200 and 300 (b) 300 and 400 (c) 400 and 600 (d) 500 and 600

66) If two substances A and B have $p_A^o : p_B^o = 1 : 2$ and have mole fraction in solution 1 : 2, then mole fraction of A in vapours is

(a) 0.33 (b) 0.25 (c) 0.52 (d) 0.2

67) The relative lowering of vapour pressure of an aqueous solution containing non - volatile solute is 0.0125. The molality of the solution is

(a) 0.70 (b) 0.50 (c) 0.60 (d) 0.80 (e) 0.40

68) If x_1 and x_2 represent the mole fraction of a component A in the vapour phase and liquid mixture respectively and p_A^o and p_B^o represent vapours pressures of pure A and B, then total vapour pressure of the liquid mixture is

(a) $\frac{p_A^o x_1}{x_2}$ (b) $\frac{p_A^o x_2}{x_1}$ (c) $\frac{p_B^o x_1}{x_2}$ (d) $\frac{p_B^o x_2}{x_1}$

69) An ideal solution is formed by mixing two volatile liquids A and B. X_A and X_B are the mole fractions of A and B respectively in the solution and Y_A and Y_B are the are the mole fractions of A and B respectively in the vapour phase. A plot of $1/Y_A$ along y - axis against $1/X_A$ along x - axis gives a straight line. What is the slope of the straight line ?

(a) p_B^o/p_A^o (b) p_A^o/p_B^o (c) $p_B^o - p_A^o$ (d) $p_A^o - p_B^o$

70) One component of a solution follows Raoult's law over the entire range $0 \leq x_1 \leq 1$. The second component must follow Raoult's law in the range when x_2 is

(a) close to zero (b) close to 1 (c) $0 \leq x_2 \leq 0.5$ (d) $0 \leq x_2 \leq 1$

71) The vapour pressure of a solvent decreases by 10mm of mercury when a non - volatile solute was added to the solvent. The mole fraction of the solute in the solution is 0.2. What should be the mole fraction of the solvent if the decrease in vapour pressure is to be 20 mm of mercury ?

(a) 0.8 (b) 0.6 (c) 0.4 (d) 0.4

72) Which of them is not equal to zero for an ideal solution ?

(a) ΔV_{mix} (b) $\Delta P = P_{observed} - P_{Raoult}$ (c) ΔH_{mix} (d) ΔS_{mix}

73) The vapour pressure of acetone at 20°C is 185 torr. When 1.2 g of non - volatile was dissolved in 100 g of acetone at 20°C, its vapour pressure was 183 torr. The molar mass (g mol^{-1}) of the substance is

(a) 128 (b) 488 (c) 32 (d) 64

74) Dry air is passed through a solution containing 10 g of the solute in 90 g of water and then through pure water. The loss in weight of solution is 2.5 g and that of pure solvent is 0.05 g. Calculate the molecular weight of the solute.

(a) 50 (b) 180 (c) 100 (d) 25 (e) 51

75) The mass of glucose that should be dissolved in 50 g of water in order to produce the same lowering of vapour pressure as produced by dissolving 1 g of urea in the same quantity of water is

(a) 1 g (b) 3g (c) 6 g (d) 8 g

76) The vapour pressure of a solution of a non - volatile electrolyte (A) in solvent (B) is 95% of the vapour pressure of the solvent at the same temperature. If molar mass of B is 30% of molar mass of A, the mass ratio of the solvent and solute are

(a) 0.15 (b) 0.20 (c) 4.0 (d) 5.7

77) A a certain temperature, the value of the slope of the plot of osmotic pressure (π) against concentration (C in mol L^{-1}) of a certain polymer solution is 291 R. The temperature at which osmotic pressure is measured is (R is gas constant)

(a) 271°C (b) 18°C (c) 564 K (d) 18 K

78) The empirical formula of a non - electrolyte is CH_2O. A solution containing 3 g L^{-1} of the compound exerts the same osmotic pressure as that of 0.05 M glucose solution. The molecular formula of the compound is

(a) CH_2O (b) $C_2H_4O_2$ (c) $C_4H_8O_4$ (d) $C_3H_6O_3$

79) A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass = 60g mol^{-1}) in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 g cm^{-3}, molar mass of the substance will be

(a) 210.0 g mol^{-1} (b) 90.0 g mol^{-1} (c) 115.0 g mol^{-1} (d) 105.0 g mol^{-1}

80) Insulin $(C_2H_{10}O_5)_n$ is dissolved in a suitable solvent and the osmotic pressure (π)of solutions of various concentrations (c) is measured at 20°C. The slope of the plot of π (atm) versus C (in g/cm^3) is found to be 4.65×10^{-3} . The molecular weight of insulin is

(a) 3.17×10^6 (b) 4.17×10^6 (c) 5.17×10^6 (d) 6.17×10^6

81) Osmotic pressure of insulin solution at 298 K is found to be 0.0072 atm. Hence, height of the water column due to this pressure will be (Given density of Hg = 13.6g mL^{-1})

(a) 7.4 mm (b) 7.4 cm (c) 74 cm (d) 760 mm

82) A solution of protein (extracted from crabs) was prepared by dissolving 0.75 g in 125 cm^3 of an aqueous solution. At 4°C, an osmotic pressure rise of 2.6 mm of the solution was observed. Then molecular weight of protein is (Assume density of solution is 1.00 g/cm^3 .

(a) 9.4×10^5 (b) 5.4×10^5 (c) 5.4×10^{10} (d) 9.4×10^{10}

83) An aqueous solution of urea is found to boil at 100.52°C. Give K_b for water is 0.52 K kg mol^{-1} , the mole fraction of urea in the solution is

(a) 1 (b) 0.5 (c) 0.018 (d) 0.25

84) For a dilute solution containing 2.5 g of a non - volatile, non - electrolytic solute in 100 g of water, the elevation in boiling point at 1 atm pressure is 2°C. Assuming concentration of the solute is much lower than the concentration of the solvent, the vapour pressure (mm of Hg) of the solution is (take K_b = 0.76 K kg mol^{-1})

(a) 724 (b) 740 (c) 736 (d) 718

85) A solution containing 1.8 g of a compound (empirical formula CH_2O) in 40 g of water is observed to freeze at -0.465°C. The molecular formula of the compound is (K_f of water = 1.86 kg K mol^{-1})

(a) $C_2H_4O_2$ (b) C_3H_6 (c) $C_4H_8O_4$ (d) $C_5H_{10}O_5$ (e) $C_6H_{12}O_6$

86) A solution containing 0.10 g of non - volatile solute X (molar mass : 100) in 200 g of benzene depresses the freezing point of benzene by 0.25°C while 0.50g of another non - volatile solute Y in 100 g of benzene also depresses by 0.25°C. What is the molecular mass of Y ?

(a) 50 (b) 100 (c) 150 (d) 1000

87) A solution of urea (mol.mass 56 g mol^{-1}) boils at 100.18°C at the atmospheric pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, the above solution will freeze at

(a) - 6.54°C (b) - 0.654°C (c) 6.54°C (d) 0.654°C

88) In 100 g of naphthalene, 2.423 g of S was dissolved. Melting point of naphthalene = 80.1°C. $\Delta T_f = 0.661^oC. L_f = 35.7 \quad cal/g$ of naphthalene. Molecular formula of sulphur added is

(a) S_2 (b) S_4 (c) S_6 (d) S_8

89) K_f for water is 1.86 K kg mol^{-1} . If your automobile radiator holds 1.0 kg of water, how many grams of ethylene glycol ($C_2H_6O_2$) must you add to get the freezing point of the solution lowered to - 2.8°C ?

(a) 27 g (b) 72 g (c) 93 g (d) 39 g

90) When mercuric iodide is added to the aqueous solution of potassium iodide

(a) freezing point is raised (b) freezing point is lowered (c) freezing point does not change

(d) boiling point does not change

91) A solution containing 50 g of ethylene glycol in 200 g water is cooled to - 9.3°C. The amount of ice that will seperate out will be (K_f = 1086 Km^{-1})

(a) 18.71 g (b) 28.71 g (c) 38.71 g (d) 48.71 g

92) An element X of atomic mass 25.0 exists as X_4 in benzene to the extent of 100%. When 10.30 g of saturated solution of X in benzene is added to 20.0 g of benzene, the depression in freezing point of the resulting solution is 0.51 K. If K_f for benzene is 5.1 K kg mol^{-1}, the solubility of X in 100 g of benzene will be

(a) 3.0 g (b) 2.7 g (c) 0.30 g (d) 0.27 g

93) Which one of the following electrolytes has the same value of van't Hoff factor (i) as that of $Al(SO_4)_3$ (if all are 100% ionized)

(a) K_2SO_4 (b) $K_3[Fe(CN)_6]$ (c) $Al(NO_3)_3$ (d) $K_4[Fe(CN)_6]$

94) The correct equation for the degree of association 'α 'of an associating solute,'n' molecules of which undergo association in solution is

(a) $\alpha = \frac{n(i-1)}{1-n}$ (b) $\alpha = \frac{i(n+1)}{1-n}$ (c) $\alpha = \frac{i(n+1)}{1-n}$ (d) $\alpha = \frac{i(n+1)}{n-1}$ (e) $\alpha = \frac{n(1-i)}{1-n}$

95) The molar mass of the solute sodium hydroxide obtained from the measurement of osmotic pressure of its aqueous solution at 27°C is 25 g mol^{-1}. Therefore, its ionization percentage in the solution is

(a) 75 (b) 60 (c) 80 (d) 70

96) 1 g of a monobasic acid in 100 g of water lowers the freezing point by 0.168°. If 0.2 g of the same acid requires 15 mL of N/10 alkali for complete neutralisation, the degree of dissolution of the acid is (K_f for water = 1.86 K kg mol^{-1})

(a) 9.8% (b) 19.6% (c) 4.9% (d) 1.68%

97) 0.6 mL of acetic acid is dissolved in 1 litre of water. The value of van't Hoff factor is 1.04. What will be the degree of dissociation of the acetic acid ?

(a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04

98) The boiling point of 0.2 mol kg^{-1} solution of X in water is greater than equimolal solution of Y in water. Which one of the following statements is true in this case ?

(a) Molecular mass of X is less than molecular mass of Y

(b) Y is undergoing dissociation in water while X undergoes no change (c) X is undergoing dissociation in water

(d) Molecular mass of X is greater than the molecular mass of Y

99) The freezing point (in ^oC) of a solution containing 0.1 g of $K_3[Fe(CN)_6]$ (Mol. Wt. 329) in 100 g of water (K_f = 1.86 K kg mol^{-1}) is

(a) -2.3×10^{-2} (b) -5.7×10^{-2} (c) -5.7×10^{-3} (d) -1.2×10^{-2}

100) The van't Hoff factor for $BaCl_2$ at 0.01 M concentration is 1.98. The percentage dissociation of $BaCl_2$ at this concentration is

(a) 49 (b) 69 (c) 89 (d) 98 (e) 100

101) The freezing point depression constant for water is - 1.86^oCm^{-1}. If 5.00 g Na_2SO_4 is dissolved in 45.0 g H_2O, the freezing point is changed by -3.82° C. Calculate the van't Hoff factor for Na_2SO_4

(a) 0.381 (b) 2.05 (c) 2.63 (d) 3.11

102) A 0.1 molal aqueous solution of a weak acid is 30% ionized. If K_f for water is 1.86° C/m, the freezing point of the solution will be

(a) - 0.18^oC (b) - 0.54^oC (c) - 0.36^oC (d) - 0.24^oC

103) Benzoic acid undergoes dimerisation in benzene solution. The van't Hoff factor (i) is related to the degree of association 'x' of the acid as

(a) i = (1 - x) (b) i = (1 + x) (c) i = (1 - x/2) (d) 1 = (1 + x/2)

104) A 0.004 M solution of Na_2SO_4 is isotonic with a 0.010 M solution of glucose at the temperature. The apparent degree of dissociation of Na_2SO_4 is

(a) 25% (b) 50% (c) 75% (d) 85%

105) van't Hoff factors x,y and z for association, dissociation and no change of solute in the solution respectively are in the order :

(a) x< y< z (b) x > z > y (c) x< z< y (d) x > y > z

106) For a weak monobasic acid, if pK_a = 4, then at a concentration of 0.01 M of the acib solution, the van't Hoff factor is

(a) 1.01 (b) 1.02 (c) 1.10 (d) 1.20

107) The pH of 1 M solution of a weak monobasic acid (HA) is 2. Then, the van't Hoff factor is

(a) 1.01 (b) 1.02 (c) 1.10 (d) 1.20

108) At a certain Hill station, water boils at 96°C. The amount of NaCl that should be added to one litre of water so that it boils at 100°C will be (K_b for H_2O = 0.52 K/m)

(a) $[Co(NH_3)_6]Cl_3$ (b) $[Co(NH_3)_5Cl]Cl_2$ (c) $[Co(NH_3)_4Cl_2]Cl$ (d) None of these

109) Depression in freezing point of 0.01 m aqueous acetic acid solution is found to be .02046K. One molal urea solution freezes at -1.86° C. Assuming molarity equal to molality, pH of acetic acid solution is

(a) 2 (b) 3 (c) 3.2 (d) 4.2

110) The average osmotic pressure of human blood is 7.8 bar at 37° C. What is the concentration of an aqueous NaCl solution that could be used in the bloos stream ?

(a) 0.15 mol/L (b) 0.30 mol/L (c) 0.60 mol/L (d) 0.45 mol/L

111) Solution A contains 7 g/L $MgCl_2$ and solution B contains 7 g/L of NaCl. At room temperature, the osmotic pressure of

(a) solution A is greater than B (b) both have same osmotic pressure (c) solutin B is greater than A

(d) can't determine.

112) Solution (A) containing $FeCl_3$ is seperated from solution (B) containing $K_4Fe(CN)_6$ by a semipermeable membrane as shown below :

Solution (A)	Solution (B)
$FeCl_3$	$K_4Fe(CN)_6$

If $FeCl_3$ on reaction with $K_4[Fe(CN)_6]$ produces blue colour of $Fe_4[Fe(CN)_6]_3$, the blue colour will apear in

(a) A (b) B (c) In both A and B (d) Neither in A nor in B

113) Pure benzene freezes at 5.3°C. A solution or 0.223 g of phenylacetic acid ($C_6H_5CH_2COOH$) in 4.4 g of benzene (K_f = 5.12 K kg mol^{-1}) freezes at 4.47°C. From this observation, one can conclude that

(a) phenylacetic acid exists as such in benzene (b) phenylacetic acid undergoes partial ionization in benzene

(c) phenylacetic acid undergoes complete ionization in benzene (d) phenylacetic acid dimerizes in benzene

114) Consider seperate solutions of 0.500 M C_2H_5OH (aq), 0.100 M $Mg_3(SO_4)_2$ (aq), 0.250 M KBr (aq) and 0.125 M Na_3PO_4 (aq) at 25°C. Which statement is true about these solutions, assuming all salts to be strong electrolytes ?

(a) 0.500 M C_2H_5OH (aq) has the heighest osmotic pressure (b) They all have the same osmotic pressure

(c) 0.100 M $Mg_3(PO_4)_2$ has the highest osmotic pressure

(d) 0.125 M Na_3PO_4 (aq) has the highest osmotic pressure

115) Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression ?

(a) KCl (b) $C_6H_{12}O_6$ (c) $Al_2(SO_4)_3$ (d) K_2SO_4

116) An azeotropic solution of two liquids has boiling point lower than either of the two liquids when it

(a) shows no deviations from Raoult's law (b) shows a positive deviation from Raoult's law

(c) shows a negative deviation from Raoult's law (d) is saturated.

117) A solution has a 1:4 mole ratio of pentane to hexane. The vapour pressures of the pure hydrocarbons at 20° C are 440 mm of Hg for pentane and 120 mm of Hg for hexane. The mole fraction of pentane in the vapour phase would would be

(a) 0.200 (b) 0.478 (c) 0.549 (d) 0.786

118) The van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is

(a) 91.3% (b) 87% (c) 100% (d) 74%

119) Which one of the following aqueous solutions will have the lower freezing point?

(a) 0.1 molal solution of urea (b) 0.1 molal solution of acetic acid (c) 0.1 molal solution of sodium chloride

(d) 0.1 molal solution of calcium chloride

120) The vapour pressure of the solution at 298 K will be

(a) 0.230 atm (b) 0.233 atm (c) 0.236 atm (d) 0.0239 atm

121) The osmotic pressure of the solution at 298 K will be

(a) 4.29 atm (b) 4.49 atm (c) 4.69 atm (d) 4.89 atm

122) The freezing point of the solution will be

(a) $-0.684^{\circ}C$ (b) $-0.342^{\circ}C$ (c) $-0.372^{\circ}C$ (d) $-0.186^{\circ}C$

123) The mass of sodium chloride that should be dissolved in the same amount of water to get the same freezing point will be

(a) 136.8 g (b) 32.2 g (c) 5.58 g (d) 11.60 g

124) If on dissolving the above amount of NaCl in 1 kg of water, the freezing point is found to be $-0.344^{\circ}C$, the percentage dissociation of NaCl in the solution is

(a) 75% (b) 80% (c) 85% (d) 90%

125) The freezing point of solution M is

(a) 268.7 K (b) 268.5 K (c) 234.2 K (d) 150.9 K

126) The vapour pressure of the solution M is

(a) 39.3 mm Hg (b) 36.0 mm Hg (c) 29.5 mm Hg (d) 28.8 mm Hg

127) Water is added to the solution M such that the mole fraction of water in the solution becomes 0.9. The boiling point of the solution is

(a) 380.4 K (b) 376.2 K (c) 375.5 K (d) 354.7 K

128) One gram of silver gets distributed between 10 cm^3 of molten zinc and 100 cm^3 of molten lead at 800°C. The percentage of silver still left in the lead layer is approximately

(a) 2 (b) 5 (c) 3 (d) 1

129) The ionic strength of a solution containing 0.1 mole/kg of KCl and 0.2 mole/kg of $CuSO_4$ is

(a) 0.3 (b) 0.6 (c) 0.9 (d) 0.2

130) The correct relationship between molarity (M) and molality (m) is (d = density of the solution, in kg L^{-1}, M_2 = molar mass of the solute is kg mol^{-1})

(a) $M = \frac{md}{1+mM_2}$ (b) $M = \frac{m}{1+mM_2d}$ (c) $M = \frac{1+mM_2}{md}$ (d) $M = \frac{1+md}{mM_2}$

131) If P^o and P_s are the vapour pressures of the solvent and its solution respectively and N_1 and N_2 are the mole fractions of the solvent and solute respectively, then

(a) $P_S = P^oN_2$ (b) $P^o - P_S = P^oN_2$ (c) $P_S = P^oN_1$ (d) $(P^o - P_S)/P_S = N_1/(N_1 + N_2)$.

132) The vapour pressure of a dilute solution of a solute is not influenced by

(a) nature of the solute if it is non - electrolyte (b) mole fraction of the solute (c) melting point of the solute

(d) degree of dissociation of the solute

133) Which statements are true about osmotic pressure (π)volume (V) and temperature (T) ?

(a) $\pi\alpha\frac{1}{V} if\ T\ is\ constant$ (b) $\pi\alpha T \quad if\ V\ is\ constant$ (c) $\pi\alpha V\ if\ T\ is\ costant$

(d) $\pi V\ is\ constant\ if\ T\ is\ constant$

134) The colligative properties of a solution are

(a) $\alpha\ molality$ (b) $\alpha\ \frac{1}{molecular\ mass\ of\ the\ solute}$ (c) proportional to each other

(d) independent of the nature of the solute, i.e., electrolyte or non - electrolyte

135) In the depression of freezing point experiment, it is found that

(a) The vapour pressure of the solution is less than that of pure solvent

(b) The vapour pressure of the solution is more than that of pure solvent

(c) Only solute molecules solidity at the freezing point (d) Only solvent molecules solidity at the freezing point.

136) Which of the following mixture do you expect will not show positive deviation from Raoult's law ?

(a) Benzene - Chloroform (b) Benzene - Acetone (c) Benzene - Ethanol (d) Benzene - Carbon tetrachloride

137) Identify the phase of solute and solvent among the options are given below, for a solution as amalgam of mercury with sodium.

(a)

Solute	Solvent
Solid	Liquid

(b)

Solute	Solvent
Solid	Solid

(c)

Solute	Solvent
Liquid	Solid

(d)

Solute	Solvent
Solid	Gas

138) Which of the following is the correct example of solid solution in which the solute is in gas phase?

(a) Copper dissolved in gold (b) Camphor in nitrogen gas (c) Hydrogen in palladium (d) All of these

139) 18 g of sucrose is dissolved in 162 g of water. Calculate the mass percentage of solution.

(a) 18 % (b) 10% (c) 20% (d) 15%

140) 184g ethyl alcohol is mixed with 72g of water. The ratio of mole fraction of alcohol to water is

(a) 3: 4 (b) 1: 2 (c) 1: 4 (d) 1: 1

141) Molarity (in mol/L) of distilled or pure water is

(a) 55.56 (b) 18 (c) 49.87 (d) 81

142) If 0.1M $AgNO_3$ and 0.1M NaCl solutions are mixed in same volume, then what will be the concentration of nitrate ions?

(a) 0.1 M (b) 0.2 M (c) 0.05 M (d) 0.025 M

143) What will be the concentration of 0.2M H_2SO_4 solution in g/L.

(a) 21.4 (b) 39.2 (c) 9.8 (d) 19.6

144) 4 L of 0.02 M aqueous solution of NaCl was diluted by adding 1L of water. The molarity of the resultant solution is _____

(a) 0.004 (b) 0.008 (c) 0.012 (d) 0.016

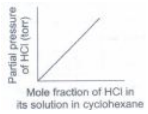
145) The molality of a-urea solution in which 0.0100 g of urea, $[(NH_2)_2CO]$ is added to 0.3000 dm^3 of water at STP is

(a) 0.555 m (b) 5.55×10^{-4} m (c) 33.3 m (d) 3.33×10^{-2} m

146) Molality of an aqueous solution of urea is 4.44 mol/kg. In solution mole fraction of urea is

(a) 0.074 (b) 0.00133 (c) 0.008 (d) 0.0044

147) In the graph given below, what does the slope of the line represent?



(a) Partial pressure of the gas in vapour phase (ρ) (b) Mole fraction of gas in the solution (χ)

(c) Henry's law constant (K_H) (d) All of the above

148) Vapour pressure of two liquids P and Q is 80 mm and 60 mm respectively. What will be the vapour pressure of solution obtained by mixing 3 moles of P and 2 moles of Q.

(a) 140 mm (b) 20 mm (c) 68 mm (d) 72 mm

149) P_A and P_B are the vapour pressure of pure liquid components A and B respectively of an ideal binary solution. If x_A represents the mole fraction of component A, the total pressure of the solution will be

(a) $\rho_A + x_A(\rho_B - \rho_A)$ (b) $\rho_A + x_A(\rho_A - \rho_B)$ (c) $\rho_B + x_A(\rho_B - \rho_A)$

(d) $\rho_B + x_A(\rho_A - \rho_B)$

150) Vapour pressure of pure A is 70 mm of Hg at 25°C. It forms an ideal solution with 'B' in which mole fraction of A is 0.8. If the vapour pressure of the solution is 84 mm of Hg at 25°C, the vapour pressure of pure B at 25°C is

(a) 56mm (b) 70mm (c) 140mm (d) 28mm

151) At 40°C the vapour pressure of pure liquids, benzene and toluene, are 160 mmHg and 60 mmHg respectively. At the same temperature, the vapour pressure of an equimolar solution of the two liquids, assuming the ideal solution should be

(a) 140 mmHg (b) 110 mmHg (c) 220 mmHg (d) 100 mmHg

152) Solution of bromoethane and chloroethane

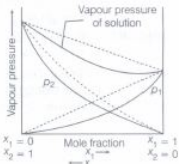
(a) obeys Raoult's law over the entire range of concentration (b) is a non-ideal solution (c) has $\triangle_{mix} V \neq 0$

(d) All of the above

153) Which of the following azeotropic solutions has the boiling point less than the boiling point of its constituents molecules?

(a) $CHCl_3$ and CH_3COCH_3 (b) CS_2 and CH_3COCH_3 (c) CH_3CH_2OH and CH_3COCH_3 (d) CH_3CHO and CS_2

154) Which of the following statements is/are true for the diagram?



(a) The escaping tendency of molecule decreases for each component

(b) Vapour pressure of the solution decreases (c) Solution shows negative deviation from Raoult's law

(d) All of the above

155) 12 g urea was dissolved in 1L water and 68.4 g sucrose was dissolved in 1 L of water. Expected depression in vapour pressure of urea will be

(a) more than that of sucrose solution (b) less than that of sucrose solution

(c) double than that of sucrose solution (d) equal to sucrose solution

156) Which of the following aqueous solutions should have the highest boiling point?

(a) 1.0M NaOH (b) 1.0M Na_2SO_4 (c) 1.0M NH_4NO_3 (d) 1.0M KNO_3

157) What happens to freezing point of benzene when naphthalene is added?

(a) Increases (b) Decreases (c) Remains unchanged (d) First decreases and then increases

158) The order of boiling points of four equimolar aqueous solutions is C < B < A < D. The correct order of their freezing points is

(a) D< C< B< A (b) D > C< B< A (c) D< B > A< C (d) D > A > B > C

159) 29.2% (w/W) HCl stock solution has density of 1.25g mL^{-1}. The molecular weight of HCl is 36.5 mol^{-1}. The volume (mL) of stock solution required to prepare a 200 mL solution of 0.4 M HCl is

(a) 5.0 mL (b) 6.0 mL (c) 8.0 mL (d) 15.0 mL

160) Ratio of O_2 and N_2 in the air is 1: 4. Find out the ratio of their solubilities in terms of mole fractions of O, and N, dissolved in water at atmospheric pressure and room temperature.
[K_H (O_2) = 3.30x 10^7 torr
K_H (N_2) = 6.60.x10^7 torr]

(a) 1:2 (b) 2:1 (c) 1:1 (d) None of these

161) Which one of the following is not correct for an ideal solution?

(a) It must obey Raoult's law (b) $\triangle$ H = 0 (c) $\triangle$ V = 0 (d) $\triangle$ H = $\triangle$ V $\neq$ 0

162) Which of the following statements is false?

(a) Units of atmospheric pressure and osmotic pressure are the same.

(b) In reverse osmosis, solvent molecules move through a semi permeable membrane from a region of lower concentration of solute to a region of higher concentration

(c) The value of molal depression constant depends on nature of solvent

(d) Relative lowering of vapour pressure, is a dimensionless quantity

163) The molality of pure water is

(a) 55.5 (b) 50.5 (c) 18 (d) 60.5

164) The number of mules of NaCl in 3 litres of 3M solution is

(a) 1 (b) 3 (c) 9 (d) 27

165) 4L of 0.02 M aqueous solution of NaCl was diluted by adding one litre of water. The molality of the resultant solution is _____.

(a) 0.004 (b) 0.008 (c) 0.012 (d) 0.016

166) Which of the following statements is false?

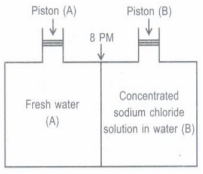
(a) Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point.

(b) The osmotic pressure of a solution is given by the equation IT = CRT
(where C is the molarity of the solution).

(c) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is $BaCl_2$ > KCI > CH_3COOH > sucrose

(d) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution

167) Consider the figure and mark the correct option.



(a) water will move from side (A) to side (B) if a pressure lower than osmotic pressure is applied on piston (B)

(b) water will move from side (B) to side (A) if a pressure greater than osmotic pressure is applied on piston (B).

(c) water will move from side (B) to side (A) if a pressure equal to osmotic pressure is applied on piston (B).

(d) water will move from side (A) to side (B) if pressure equal to osmotic pressure is applied on piston (A).

168) A solution containing 10 g per dm^3 of urea (molar mass 60 g mol^{-1}) is isotonic with 5% solution of non-volatile solute, M_B of solute is

(a) 300 g mol^{-1} (b) 350 g mol^{-1} (c) 200 g mol^{-1} (d) 250 g mol^{-1}

169) Cone. H_2 SO_4 is 98 % H2 S04 by mass has d = 1.84 g cm_3. Volume of acid required to make one litre of 0.1 M H_2SO_4 is

(a) 5.55 mL (b) 10 mL (c) 20 mL (d) 30 mL

170) What is mole fraction of solute in 1.00 m aqueous solution?

(a) 0.0354 (b) 0.0177 (c) 0.177 (d) 1.770

171) When 1 mole of benzene is mixed with 1 mole of toluene (vapour pressure of benzene = 12.8 kPa, Toluene = 3.85 kPa)

(a) The vapour will contain equal amount of benzene and toluene.

(b) Not enough information is given for prediction (c) The vapour will contain a higher percentage of benzene.

(d) The vapour will contain higher percentage of toluene.

172) At 100°C, the vapour pressure of a solution of 6.5 g of solute in 100 g of water is 732 mm. If K_b is 0.52 K/m, the boiling point of solution will be

(a) 102°C (b) 103°C (c) 101°C (d) 100°C

173) Which of the following is incorrect for an ideal solution?

(a) $\mathbf{\Delta H_{mix} = 0}$ (b) $\mathbf{\Delta V_{mix} = 0}$ (c) $\mathbf{\Delta P = P_{obs} - P_{calculated} = 0}$

(d) $\mathbf{\Delta G_{mix} = 0}$

174) If molality of a dilute solution is doubled, the value of molal depression constant (K_f) will be

(a) halved (b) tripled (c) unchanged (d) doubled

175) The temperature at which 10% aqueous solution of (W N) of glucose will show the osmotic pressure of 16.4 atom is ($R = 0.082$ L atom K^{-1} mol^{-1})

(a) 360°C (b) 180 K (c) 300 K (d) 360 K

176) Which has the highest freezing point?

(a) 1 M glucose (b) 1 M NaCl (c) 1 M $CaCl_2$ (d) 1 M AlF_3

177) Which of the following is correct.

(a) K_H increases with increase in temperature (KH is Henry's law constant).

(b) Solubility of gas in liquid decreases with increases in temperature.

(c) K_H decreases with increase in temperature.

(d) Solubility of gas in liquid increases with increase in temperature.

178) Benzoic acid, when dissolved in benzene, which of the following is correct.

(a) The benzoic acid will undergo dissociation. (b) The benzoic acid will undergo association.

(c) Observed molar mass of benzoic acid in benzene will less than normal molar mass.

(d) Observed molar mass of benzoic acid in benzene is more than normal molar mass.

179) Relative lowering of vapour pressure is a colligative property because _____.

(a) It depends on the concentration of a non electrolyte solute in solution and does not depend on the nature of the solute molecules.

(b) It depends on number of particles of electrolyte solute in solution and does not depend on the nature of the solute particles.

(c) It depends on the concentration of a non electrolyte solute in solution as well as on the nature of the solute molecules.

(d) It depends on the concentration of an electrolyte or nonelectrolyte solute in solution as well as on the nature of solute molecules.

180) If P_A° = 100 mm P_B° = 200 mm and mole fraction xA = 0.4. what will be Y_A (mole fraction) in vapour phase?

(a) 0.25 (b) 0.30 (c) 0.75 (d) 0.50

181) Which of the following is maximum boiling azeotropic?

(a) $CH_3COOH + C_5H_5N$ (pyridine) (b) H_2O + ethanol (c) cyclohexane + ethanol (d) H_2O + methanol

182) K_b (molal elevation constant) is inversely proportional to

(a) boiling point of solvent (b) Δ_{vap} H of solvent (c) Molar mas of solvent (d) all of these

183) Out of 1m solution of following dissolved in water. Which one will have lowest freezing point (assuming all are fuel, ionised)

(a) Urea (b) NaCl (c) Na_2SO_4 (d) $Al_2(SO_4)_3$

184) Which of the following will have lowest vapour pressure? (Boiling points are given in brackets)

(a) H_2O(373 K) (b) $CHCl_3$ (334 K) (c) Anilines (457 K) (d) Benzene (353 K)

185) The P_{gas} dissolved a liquid is directly proportion to its

(a) mole fraction (b) molar mass (c) boiling point of liquid (d) molar mass of solvent

186) Henry's law constant of oxygen is 1.4×10^{-3} mol L^{-1} atm^{-1} at 298 K. How much oxygen will be dissolved in 100 ml at 298 K when its partial pressure is 0.5 atm?

(a) 1.4 g (b) 3.2 g (c) 22.4 mg (d) 2.24 mg

187) In isotonic solutions _____.

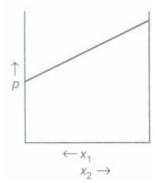
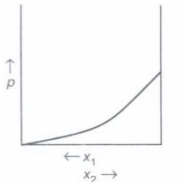
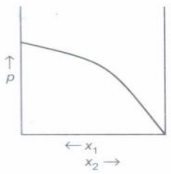
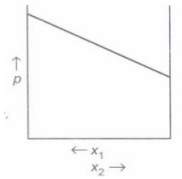
(a) solute and solvent both are same (b) osmotic pressure is same.

(c) solute and solvent mayor may not be same. (d) solute is always same solvent may be different.

188) Which of the following binary mixtures will have same composition in liquid and vapour phase?

(a) Benzene-Toluene (b) Water-Nitric acid (c) Water-Ethanol (d) n-Hexane - n-Heptane

189) For a binary ideal liquid solution, the variation in total vapour pressure versus composition of solution is given by which of the curves?

(a)  (b)  (c)  (d) 

190) Isotonic solutions have the same

(a) density (b) refractive index (c) osmotic pressure (d) volume

191) van't Hoff factor for K_2,SO_4 solution, assuming complete ionisation is

(a) 1 (b) 3 (c) 13 (d) 2

192) Solubility of gases in liquids decreases with rise in temperature because dissolution is an

(a) endothermic and reversible process (b) exothermic and reversible process

(c) endothermic and irreversible process (d) exothermic and irreversible process

193) Pressure does not have any significant effect on solubility of solids in liquids because

(a) solids are highly compressible (b) liquids are highly compressible

(c) solubility of solid in liquid is directly proportional to partial pressure

(d) solids and liquids are highly incompressible

194) K_H value for Ar(g),CO_2 (g), HCHO (g) and CH_4(g) are 40.39, 1.67, 1.83 x 10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility

(a) HCHO < CH_4 < CO_2 < Ar (b) HCHO < CO_2 < CH_4 < Ar (c) Ar < CO_2 < CH_4 < HCHO

(d) Ar < CH_4 < CO_2 < HCHO

195) Which one of the following pairs will not form an ideal solution?

(a) Benzene and toluene (b) n-hexane and n-heptane (c) Ethanol and acetone

(d) Bromoethane and chloroethane

196) The freezing point of a 0.2 molal solution of a non-electrolyte in water is (K, for water=1.86 K kg mol^{-1})

(a) -0.372°C (b) -1.86°C (c) + 0.372°C (d) + 1.86°C

197) How much ethyl alcohol must be added to 1 litre of water so that the solution will freeze at -14°C? (K_f for water=1.86°C/mol)

(a) 7.5 mol (b) 10.5 mol (c) 8.5 mol (d) 9.5 mol

198) The osmotic pressure of a solution increases if2-

(a) the volume of the solution increases (b) the number of solute molecules is increased

(c) temperature is decreased (d) solution constant (R) is increased

199) In which of the following cases blood cells will shrink?

(a) When placed in water containing more than 0.9% (mass/ volume) NaCl solution

(b) When placed in water containing less than 0.9% (mass /volume) NaCl solution

(c) When placed in water containing 0.9% (mass/volume) NaCl solution (d) When placed in distilled water

200) 1 mole of liquid A and 2 moles of liquid B make a solution having a total vapour pressure 40 torr. The vapour pressure of pure A and pure B are 45 torr and 30 torr respectively. The above solution

(a) is an ideal solution (b) shows positive deviation (c) shows negative deviation

(d) is a maximum boiling azeotrope.

201) Isotonic solutions have

(a) same osmotic pressure (b) same boiling point (c) same melting point (d) same vapour pressure

202) A compound undergoes complete tetramerization in a given organic solvent. The van't Hoff factor (i) is

(a) 4.0 (b) 0.25 (c) 0.125 (d) 2.0

Fill up / 1 Marks 40 x 1 = 40

203) Hydrated salts are solutions of ..... in ..... .

204) Molality of a solution is ..... of the solute in ..... of the ..... .

205) An ionic compound dissolves in water if ..... energy is greater than ..... energy.

206) The solubility of a solute decreases with increase of temparature if dissolution is ..... .

207) The temperature above which $Na_2SO_4.10 \quad H_2O$ shows a change in behaviour in the solubility is called ..... .

208) At the same temperature, nitrogen gas is ..... soluble in water than oxygen.

209) According to Henry's law, the plot of ..... versus ..... is linear with slope equal to .....

210) Greater the value of Henry's constant of a gas, ... is its solubility at the same partial pressure and temperature.

211) In deep sea diving, the disease called bends or decompression sickness is caused due to dissolution of ..... in the blood.

212) Sea divers for breathing inside sea use a mixture of O_2 and inert gas ..... .

213) At altitude, concentration of oxygen in the blood is low. People feel weak and unable to think properly. This disease is called ..... .

214) The variation of vapour pressure with temperature is quantitatively studied by ..... equation.

215) For a non-ideal solution showing positive deviations, ΔV_{mixing} is ..... and ΔH_{mixing} is ..... .

216) The constant boiling mixture of two miscible liquids of a definite mole fraction is called ..... .

217) A non-ideal solution showing negative deviations forms an azeotrope with ..... boilind point (lowest or highest).

218) The exact formula which can be applied to dilute as well as concentrated solutions is $\frac{p^o - p_s}{x} = \frac{n_2}{n_1}$ where x is ..... .

219) The relative lowering vapour pressure of a solvent at a given temperature due to dissolution of a non-volatile solute is equal to ..... of ..... in the solution.

220) In osmosis, there is a net flow of ..... from ..... to ..... .

221) Osmotic pressure is the minimum pressure that has to be applied on the ..... to prevent the entry of ..... from ..... to ..... .

222) If pressure greater than osmotic pressure is applied on the solution seperated from the solvent by a semipermeable membrane, the flow of solvent is from ..... to ..... . The process is called ..... .

223) Desalination of sea water is based on ..... .

224) The semipermeable membrane generally used in the reverse osmosis is made up of ..... .

225) Solutions having the same osmotic pressure are called ..... and they have same ..... .

226) The rupturing of a plant or animal cell due to flow of water into it is called ..... .

227) The shrinking of a plant or animal cell due to outflow of water is called ..... .

228) Red blood cells (RBC) are isotonic with ..... % NaCl solution.

229) A solution with lower osmotic pressure is called ..... with respect to a more concentrated solution which is called ..... .

230) People taking a lot of salt develop swelling or puffiness of their tissues. This disease is called ..... .

231) The best colligative property to determine the molecular masses of polymers is ..... .

232) The vapour pressure of water at 100°C is ..... bar.

233) The molal elevation constant of water is ..... while that of benzene is ..... .

234) The molal depression constant of water is ..... while that of benzene is ..... .

235) Rast method is based upon the use of ..... as solvent whose molal depression constant is ..... .

236) van't Hoff factor is the ratio of ..... molecular mass to ..... molecular mass.

237) If van't Hoff factor is less than unity, this shows that the solute undergoes ..... in the solution.

238) The process used for desalination of water is _____.

239) Vapour pressure is _____ proportional to temperature.

240) Ethylene glycol is used as _____.

241) The most suitable colligative property to determine molar mass of polymers is _____.

242) Water boils _____100°C at hill stations.

True or False 5 x 1 = 5

243) All intravenous injections must be isotonic with body fluids. [True/False]

(a) True (b) False

244) Diabetic patients are likely to have high blood pressure. [True/False]

(a) True (b) False

245) Common salt is non-electrolyte. [True/False]

(a) True (b) False

246) Saline water gargles help in sore throat because it is hypertonic solution and aCl is antiviral agent. [True/False]

(a) True (b) False

247) Water is non-volatile solvent. [True/False]

(a) True (b) False

Match the following 10 x 1 = 10

248) Soda water	(1) A solution of gas in solid
249) Sugar solution	(2) Π = CRT
250) German silver	(3) A solution of gas in liquid
251) Air	(4) A solution of solid in solid
252) Hydrogen gas in palladium	(5) A solution of solid in liquid
253) Raoult's law	(6) $p = K_H . x$
254) Henry's law	(7) $\Delta T_f = K_f m$
255) Elevation of boiling point	(8) $p = x_1 p_1^\circ + x_2 p_2^0$
256) Depression in freezing point	(9) A solution of gas in gas
257) Osmotic pressure	(10) $\Delta T_b = K_b m$

Assertion and reason 35 x 1 = 35

258) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Polar solute dissolves in polar solvents and non-polar solute dissolves in non-polar solvents.
Reason (R) Like dissolves like.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

259) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) When scuba divers come towards surface, their capillaries get blocked which is painful and dangerous to life.
Reason (R) There occurred release of dissolved gases as the pressure decreases and leads to the formation of bubbles of nitrogen in the blood.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

260) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Freezing point of solvent is more than that of solution.
Reason (R) When non-volatile solid is added to the solvent, its vapour pressure increases and become equal to solid solvent at the lower temperature.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

261) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Experimentally determined molar mass is always higher than the true value.
Reason (R) Lower molar mass is due to dissociation of solute into ions.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

262) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Ethanol and acetone show positive deviation from Raoult's law.
Reason (R) Pure ethanol molecule show hydrogen bond and on adding acetone hydrogen bond between ethanol molecules breaks
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

263) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) The vapour pressure of 0.1M sugar solution is less than that of 0.1M potassium chloride solution.
Reason (R) Lowering of vapour pressure is directly proportional to the number of species present in the solution.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

264) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) One molar aqueous solution has always higher concentration than one molal.
Reason (R) The molality of a solution depends upon the density of the solution whereas molarity does not.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

265) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) NaCl in water and organic acids in benzene show abnormal molecular mass.
Reason (R) Abnormal molecular mass is obtained when the substance in the solution undergoes dissociation or association.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

266) **Assertion:** A solution is a homogeneous mixture of two or more chemically non-reacting substances.
Reason: Solutions can be made between any two states of matter.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

267) **Assertion:** Amalgam is a homogeneous solution.
Reason: Amalgam is a solution in which mercury is solute and zinc is solvent.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

268) **Assertion:** One molal aqueous solution of urea contains 60 g of urea in 1 kg of water.
Reason: Solution containing one mole of solute in 1000 g solvent is called one molal solution.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

269) **Assertion:** The molality of the solution does not change with change in temperature.
Reason: The molality is expressed in units of moles per 1000 g of solvent.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

270) **Assertion:** Dilute solution of benzene and toluene is an ideal solution.
Reason: Benzene and toluene form H-bonding with each other.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

271) **Assertion:** The pressure exerted by the vapour in equilibrium with a liquid at a given temperature is called its vapour pressure. ,
Reason: If a non-volatile solute is added to a solvent to give a solution, the vapour pressure of the solution is found to be greater than the vapour pressure of the pure solvent.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

272) **Assertion**: Sodium chloride used to clear snow on the roads.
Reason: Sodium chloride depresses the freezing point of water.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

273) **Assertion:** Solutions show deviations from Raoult's law.
Reason: The cause for these deviations lies in the nature of interactions at the molecular level.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

274) **Assertion**: The vapour pressure of a liquid decreases if some non-volatile solute is dissolved in it.
Reason: The relative lowering of vapour pressure of a solution containing a non-volatile solute is equal to the mole fraction of thesolute in the solution.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

275) **Assertion:** Osmotic pressure is a colligative property.
Reason: Osmotic pressure depends only on the number of particles dissolved in solution.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

276) **Assertion:** Water boils at 373 K as the vapour pressure at this temperature becomes equal to atmospheric pressure.
Reason: Vapour pressure of water is less than 1.013 bar at 373 K.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

277) **Assertion:** If a liquid solute, more volatile than the solvent, is added to the solvent, the vapour pressure of the solution may increase i.e., $P_s > p^o$.
Reason: In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

278) **Assertion:** Ifblood cells are placed in pure water, they swell and burst.
Reason: Due to osmosis, the movement of water molecules into the cell, dilutes the salt content.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

279) **Assertion:** Solutions having the same osmotic pressure are called isotonic solutions.
Reason: Ca^{2+} and K^{+} ions are responsible for maintaining proper osmotic pressure balance in the cells of organism.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

280) **Assertion:** If more and more non-volatile solute is added to a solvent, the freezing point of the solution keeps on becoming higher and higher.
Reason: Presence of large am~unt of the solid solute allow the solution to freeze more rapidly.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

281) **Assertion:** When a concentrated solution is diluted by adding more water, the number of moles of solute in the solution remains unchanged.
Reason: Number of moles of a solute is equal to the product of molarity and volume of solution in litres.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

282) **Assertion:** The boiling point of 200 mL of 1 M urea solution is less than that of 200 mL of 2 M glucose solution.
Reason: Elevation of boiling point is directly proportional to the number of species present in the solution.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

283) **Assertion:** Elevation in boiling point and depression in freezing point are colligative properties.
Reason: All colligative properties are used for the calculation of molecular masses.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion .
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

284) **Assertion:** Reverse osmosis is used in the desalination of sea water.
Reason: When pressure more than osmotic pressure is applied, pure water is squeezed out of the sea water through the membrane.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

285) **Assertion :** Camphor is used as a solvent in the determination of molecular masses of naphthalene, anthracene, etc.
Reason: Camphor has high molal elevation constant.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

286) In the following question a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.
Assertion: When methyl alcohol is added to water, boiling point of water increases.
Reason: When a volatile solute is added to a volatile solvent elevation in boiling point is observed.
Codes:
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion and reason both are incorrect statements.
(e) Assertion is wrong statement but reason is correct statement.

287) In the following question a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.
Assertion: When a solution is separated from the pure solvent by a semipermeable membrane, the solvent molecules pass through it from pure solvent side to the solution side.
Reason: Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution.
Codes:
(0) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion and reason both are incorrect statements.
(e) Assertion is wrong statement but reason is correct statement.

288) Assertion (A) : Osmotic pressure is a colligative property.
Reason (R) : Osmotic pressure is proportional to the molality.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct

289) Assertion (A) : When NaCl is added to water, a depression in freezing point is observed.
Reason (R) : The lowering of vapour pressure of a solution causes depression in the freezing point
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct

290) Assertion (A) : Aquatic species are more comfortable in cold water rather than in warm water.
Reason (R) : Different gases have different K_H values at the same temperature.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct

291) Assertion (A) : Nitric acid and water form maximum boiling azeotrope.
Reason (R) : Azeotropes are binary mixture having the same composition in liquid and vapour phase.
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct

292) Assertion (A) : Osmotic pressure is a colligative 208 property.
Reason (R) Osmotic pressure of a solution depends on the molar concentration of solute at any temperature, T
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct

Passage Based Questions 10 x 1 = 10

293) The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis. It is a colligative property as it depends upon the number of solute molecules and not on their nature. Osmotic pressure is proportional to the molarity (C) of the solution at a given temperature (T). Measurement of osmotic pressure provides another method of determining molar masses of solutes. This is widely used to determine molar masses of proteins, polymers and other macromolecules.
Osmotic pressure method has the advantage over other methods. Why?

294) The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis. It is a colligative property as it depends upon the number of solute molecules and not on their nature. Osmotic pressure is proportional to the molarity (C) of the solution at a given temperature (T). Measurement of osmotic pressure provides another method of determining molar masses of solutes. This is widely used to determine molar masses of proteins, polymers and other macromolecules.
What are the different types of solution on the basis of osmotic pressure ?

295) The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis. It is a colligative property as it depends upon the number of solute molecules and not on their nature. Osmotic pressure is proportional to the molarity (C) of the solution at a given temperature (T). Measurement of osmotic pressure provides another method of determining molar masses of solutes. This is widely used to determine molar masses of proteins, polymers and other macromolecules.
Give the relation between molar mass and osmotic pressure?

296) The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis. It is a colligative property as it depends upon the number of solute molecules and not on their nature. Osmotic pressure is proportional to the molarity (C) of the solution at a given temperature (T). Measurement of osmotic pressure provides another method of determining molar masses of solutes. This is widely used to determine molar masses of proteins, polymers and other macromolecules.
Determine the osmotic pressure of a solution prepared by dissolving 50 mg K_2SO_4 in 5L of water at 25°C,assuming that it is completely dissociated.

297) The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis. It is a colligative property as it depends upon the number of solute molecules and not on their nature. Osmotic pressure is proportional to the molarity (C) of the solution at a given temperature (T). Measurement of osmotic pressure provides another method of determining molar masses of solutes. This is widely used to determine molar masses of proteins, polymers and other macromolecules.
The technique of osmotic pressure is useful for the determination of molar masses of biomolecules and polymers. Why?

298) When a non-volatile .solute is added to a solvent, the freezing point of the formed solution is always lower than that of pure solvent. This difference in freezing point is known as depression in freezing point. If ΔT_f^o is the freezing point temperature of pure solvent and Tf is the freezing point temperature of the solution when non-volatile solute is dissolved in it, then depression in freezing point. (ΔT_f) is given by.

$$\Delta T_f = T_f^\circ - T_f$$

$$For\ dilute\ solutions, \Delta T_f = K_f m$$

[where, m = molal concentration of the solution]
Why the freezing point of solution is always lower than that of pure solvent?

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[where, m = molal concentration of the solution]
Write the formula relating depression in freezing point with molar mass of solute.

300) When a non-volatile .solute is added to a solvent, the freezing point of the formed solution is always lower than that of pure solvent. This difference in freezing point is known as depression in freezing point. If ΔT_f^o is the freezing point temperature of pure solvent and Tf is the freezing point temperature of the solution when non-volatile solute is dissolved in it, then depression in freezing point .(ΔT_f) is given by.

$\Delta T_f = T_f^\circ - T_f$

$For\ dilute\ solutions, \Delta T_f = K_f m$

[where, m = molal concentration of the solution]

Define the cryoscopic constant (K_f) .

301) When a non-volatile .solute is added to a solvent, the freezing point of the formed solution is always lower than that of pure solvent. This difference in freezing point is known as depression in freezing point. If ΔT_f^o is the freezing point temperature of pure solvent and Tf is the freezing point temperature of the solution when non-volatile solute is dissolved in it, then depression in freezing point .(ΔT_f) is given by.

$\Delta T_f = T_f^\circ - T_f$

$For\ dilute\ solutions, \Delta T_f = K_f m$

[where, m = molal concentration of the solution]

Write the unit of K_f.

302) When a non-volatile solute is added to a solvent, the freezing point of the formed solution is always lower than that of pure solvent. This difference in freezing point is known as depression in freezing point. If ΔT_f^o is the freezing point temperature of pure solvent and Tf is the freezing point temperature of the solution when non-volatile solute is dissolved in it, then depression in freezing point. (ΔT_f) is given by.

$\Delta T_f = T_f^\circ - T_f$

$For\ dilute\ solutions, \Delta T_f = K_f m$

[where, m = molal concentration of the solution]

Calculate the depression in freezing point of 5% glucose in water. (K_f = 13.962)

2 Marks 457 x 2 = 914

303) 1.00 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is 5.12 K kg mol^{-1}. Find the molar mass of the solute.

304) State Henry's law and mention some important applications.

305) Calculate the mass percentage of benzene (C_6H_6) and carbon tetrachloride (CCl_4) if 22 g of benzene is dissolved in 122 g of carbon tetrachloride.

306) Henry's law constant for CO_2 in water is 1.67×10^8 Pa at 298 K. Calculate the quality of CO_2 in 500 ml of soda water when packed under 2.5 atm CO_2 pressure at 298 K.

307) Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0 g of polymer of molar mass 185,000 in 450 ml of water at 37°C.

308) Calculate the mass percentage of aspirin ($C_9H_8O_4$) in acetonitrile (CH_3CN) when 6.5 g of $C_9H_8O_4$ is dissolved in 450 g of CH_3CN.

309) The partial pressure of ethane over a saturated solution containing 6.56×10^{-3} g of ethane is 1 bar. If the solution contains 5.00×10^{-2} g of ethane then what shall be the partial pressure of the gas?

310) Why do gases always tend to be less soluble in liquids as the temperature is raised?

311) 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0°C. Calculate the van't Hoff factor and dissociation constant of fluoro acetic acid.

312) Calculate molality of 2.5 g of ethanoic acid (CH_3COOH) in 75 g of benzene.

313) Calculate the molarity of each of the following solutions :
(a) 30g of Co $(NO_3)_2$. $6H_2O$ in 4.3 L of solution
(b) 30 mL of 0.5 M H_2SO_4 dilute to 500 mL.

314) Calculate (a) molality (b) molarity and (c) mole fraction of KI if the density of 20% (mass/mass) aqueous KI is 1.202g mL^{-1}.

315) A solution is obtained by mixing 300 g of 25% and 400 g of 40% solution by mass. Calculate the mass percentage of the resulting solution?

316) The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile,non-electrolyte solid weighing 0.5g is added to 39.0g of benzene (molar mass 78g mol^{-1}). The vapour pressure of the solution then is 0.845bar. What is the molar mass of the solid substance?

317) If the density of some lake water is 1.25 g mL^{-1} and contains 92g of Na^+ ions per kg of water, calculate the molality of Na^+ ions in the lake.

318) The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. K_b for benzene is 2.53 K kg mol^{-1}.

319) Concentrated nitric acid used in the laboratory work is 68% nitric acid by mass in aqueous solution. What should be molarity of such sample of the acid if the density of solution is 1.504 g mL^{-1}?

320) Give an example of a solid solution in which the solute is a gas.

321) Calculate the molarity of a solution containing 5 g of NaOH in 450 mL solution.

322) Measurement of which colligative property is preferred for determination of molar mass.

323) Define osmotic pressure.

324) State Raoult's law for a solution containing volatile components.

325) Define 'mole fraction' of a substance in a solution.

326) Define Ebullioscopic constant or molal elevation constant.

327) What is meant by 'reverse osmosis'?

328) State the main advantage of molality over molarity as the unit of concentration.

329) Of 0.1 molal solutions of glucose and potassium chloride respectively, which one will have a higher boiling point?

330) What are azeotropes? Give an example.

331) What is expected value of van't Hoff factor for $K_3[Fe(CN)_6]$ in dilute solution?

332) Give reason when 20ml of ethyl alcohol and 30 ml of water are mixed, the volume of resulting solution is more than 60 ml.

333) What would be the value of van't Hoff factor for a dilute solution of K_2SO_4 in water?

334) In the determination of molar mass of A^+B^- using a colligative property, what may be the value of van't Hoff factor if the solute is 50% dissociated?

335) How is the molality of a solution different from its molarity?

336) 10 ml of liquid A was mixed with 10 ml of liquid B. The volume of the resulting solution was found to be 19.9 ml. What do you conclude?

337) Define Henry's law about solubility of a gas in a liquid.

338) How is osmotic pressure dependent upon number of moles of solute?

339) Why is osmotic pressure considered as a colligative property?

340) Why is ether not miscible in water?

341) If $\triangle T_b$ is the elevation in boiling point of a solvent and 'm' is the number of moles solute per kg of solvent, what is the relationship between $\triangle T_b$ and m?

342) What possible value of 'i' will it have if solute molecules undergo association in solution?

343) What the molarity of acetic acid containing 6 g of acetic acid per litre of solution?

344) What is the molality of ammonia in a solution containing 0.85 g of NH_3 in 100 ml of a liquid of density 0.85 g cm^{-3}?

345) What is expected van't Hoff factor for $K_4[Fe(CN)_6]$?

346) What are the values of $\triangle H$ and $\triangle V$ for an ideal solution of two liquids?

347) What are the value of $\rho_{total'}$ $\triangle H$ and $\triangle V$ for negative deviation from ideality? Give one example.

348) Out of 1 M solution of sugar and 1 M solution of urea, which will have greater boiling point?

349) When outer shell of two eggs are removed, one of the eggs is placed in pure water and other is placed in saturated solution of NaCl. What will be observed and why?

350) State how does osmotic pressure vary with temperature.

351) If the membrane used in determination of osmotic pressure is slightly leaky, how will it influence the measured value of osmotic pressure?

352) Why is osmotic pressure of 1 M KCl higher than that of 1 M urea solution?

353) Which has the highest freezing point?
(a) 1 M glucose
(b) 1 M NaCl
(c) 1 M $CaCl_2$
(d) 1 M AlF_3

354) What is the value of i for Na_2SO_4 . $10H_2O$ assuming complete ionisation?

355) A 10% solution of urea is isotonic with 20% solution of 'x' at same temperature. Calculate molecular weight of x.

356) The elevation in boiling point of 0.1 molal solution of X in water is 0.1536 ^oC. What conclusion do you draw about the molecular state of X?
[Given : K_b = 0.512 k kg mol^{-1}]

357) What is reverse osmosis? Give it use.

358) Can we separate an azeotropic mixture by distillation? Why do we call it a mixture?

359) Define molality in terms of elevation in boiling point.

360) A person suffering from high blood pressure should take less common salt, why?

361) A solution of glucose ($C_6 H_{12} O_6$) in water is labelled as 10% by weight. What would be the molality of the solution?
[Molar mass of glucose = 180 g mol^{-1}]

362) Define the following terms:
(i) Mole fraction
(ii) Isotonic solutions
(iii) van't Hoff factor
(iv) Ideal solution

363) State Raoult's law for a solution conatining volatile components. How does Roult's law become a special case of Henry's law?

364) Derive expression for Raoults law when the solute is non-volatile.

365) An aqueous solution of solidum chloride freezes below 273 K.Explain the freezing points of water with the help of a suitable diagram.

366) A 1.00 molal aqueous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point of 100.18 ^oC. Determine the van't Hoff factor for trichloroacetic acid. (K_b for water = 0.512 K kg mol^{-1})

367) The density of water of a lake is 1.25 g ML^{-1} and one kg of this water contains 92 g of Na^+ ions. What is the molarity and molality of Na^+ ions in the water of the lake? (Atomic mass of Na = 23.00 u)

368) A 0.561m solution of an unknown electrolyte depresses the freezing point of water by 2.93 ^oC. What is van't Hoff factor for this electrolyte? The freezing point depression constant (K_f) for water is 1.86 ^oC mol^{-1}.

369) Find the boiling point of a solution containing 0.520 g of glucose ($C_6 H_{12} O_6$) dissolved in 80.2 g of water. [Given : Kb for water = 0.52 K/m]

370) 200 cm^3 of an aqueous solution of protein contains 1.26 g of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. calculate the molar mass of the protein.

371) Benzene and naphthalene from ideal solution over the entire range of composition. The vapour pressure of pure benzene and naphthalene at 300 K are 50.71 mm Hg and 32.06 mm Hg respectively. Calculate the mole fraction of benzene is mixed with 100 g of naphthalene.

372) What type of non-idealities are exhibited by cyclohexane-ethanol and acetone-chloroform mixture? Give reasons for your answer.

373) 10 g of an organic substance is dissolved in two litres of water and gave an osmotic pressure of 0.60 atm at 27°C calculate the molecular mass of the substance.(R = 0.082 L atm mol^{-1} k^{-1})

374) A sugar syrup of weight 214.2 g contains 34.2 g of sugar ($C_{12}H_{22}O_{11}$). Calculate
(i) mole fraction of sugar,
(ii) molality of sugar syrup

375) Calculate the molality of K_2CO_3 solution which is formed by dissolving 2.5 g of it one litre of solution.Density of solution is 0.85 g mL^{-1}.(At.wt. of K = 39, C =12,O =16).

376) The freezing point of a solution composed of 5.85 g of NaCl in 100 g of water is - 3.348 °C calculate the van't Hoff factor 'i' for this solution. K_f (Water) = 1.86 K kg mol^{-1}

377) The boiling point of a solution of urea in water is 100.13°C. Calculate the freezing point of solution.(K_f and K_b for water are 1.86 K kg mol^{-1} and 0.52 K kg mol^{-1} respectively).

378) Arrange the following aqueous solutions, each of strength 0.1 M, in order of increasing freezing and boiling points. C2H5OH, $Ba_3(PO_4)_2$, Na_2SO_4, KCl Li_3PO_4. Justify your answer.

379) What volume of 10 M HCl should be diluted to 500 cm^3 such that 50.0 cm^3 of this solution is exactly neutralised by 25.0 cm^3 of a solution of Na_2CO_3 containing 10.6 g of it in 100 cm^3 of the solution? [At. ,mass of Na = 23, C = 12,O = 16].

380) The molality of an aqueous solution is 1.002 mol/kg. what is the mole-fraction of solute?

381) 5 g of a compound was dissolved in 100 g of water at 303 K. The vapour pressure of the solution was found to be 4.16 kilopascal. If the vapour pressure of pure water is 4.24 kPa at this temperature, what is the molecular mass of the compound?

382) In aqueous solution, NaCl is completely ionised into Na^+ and Cl^- ions. Compute the osmotic pressure of 0.255 M solution of NaCl at 300 K.

383) The degree of dissociation of $Ca(NO_3)_2$ in a dilute aqueous solution containing 14 g of the salt per 200 g of water at 100°C is 70% If the vapour pressure of water is 760 mm Hg, calculate the vapour pressure of the solutions.

384) A solution contains 25% water, 25% ethanol, 50% acetic acid by mass. Calculate mole fraction of each component.

385) When fruits and vegetables are dried and placed in water, they slowly swell and return to original form, why? Does an increase in temperature accelerate the process? Explain.

386) What is the molar concentration of solute particles in a human blood if the osmotic pressure is 7.2 atm at the body temperature of 37 °C? (R = 0.0821 L atm K^{-1} mol^{-1})

387) (a) The molecular masses of polymers are determined by osmotic pressure method and not by measuring other colligative properties. Give two reasons.
(b) At 300 K, 36 g of glucose, $C_6H_{12}O_6$ present per litre in its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of another glucose solution is 1.52 bar at the same temperature, calculate the concentration of the other solution.

388) In terms of osmotic pressure (π) and volume of the solution (V) containing n moles of the solute, van't Hoff factor (i) at temperature T = _____

389) When and why is molality preferred over molarity in handing solutions in chemistry ?

390) What is the effect of temperature on molarity of a solution ?

391) Which solution has higher concentration, 1 molar or 1 molal solution of the same solute ? Give reason.

392) V_1 cc of solution having molarity M_1 is diluted to have molarity M_2. Derive expression (in terms of M_1,M_2 and V_1) for the volume of water required to be added.

393) How is the solubility of gases in water related with their Henry's constants at the same pressure and temperature ?

394) How does Henry's constant (K_H) of a gas in a particular solvent vary with temperature ?

395) At the same temperature, hydrogen is more soluble in water than helium. Which of them will have a higher value of K_H and why ?

396) Why is the vapour pressure of a liquid constant at constant temperature ?

397) Why does vapour pressure of liquid decrease when a non - volatile solute is added into it ?

398) Why is liquid ammonia bottle first cooled in ice before opening it ?

399) 10 cc of a liquid A were mixed with 10 cc of liquid B. The volume of the resulting solution was found to be 19.9cc. What do you conclude ?

400) Two liquids A and B on mixing produce a warm solution. Which type of deviation from Raoult's law does it show ?

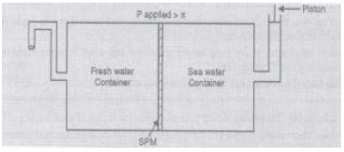
401) Why does a solution of ethanol and cyclohexane show positive deviation from Raoult's law ?

402) 2g each of the solutes A and B (Mol mass of A > B) are dissolved separately in 20g each of the same solvent C. Which will show greater lowering of vapour pressure and why ?

403) After removing the outer shell of two eggs in dill. HCl, one is placed in distilled water and the other is placed in a saturated solution of NaCl. What will you observe and why ?

404) What do you expect to happen when Red Blood Corpuscles (RBC's) are placed in
(i) 1% NaCl solution
(ii) 0.5% NaCl solution ?

405) Given below is the sketch of a plant carrying out a process.



(i) Name the process occurring in the above plant.
(ii) To which container does the net flow of solvent take place ?
(iii) Name one SPM which can be used in this plant.
(iv) Give one practical use of the plant.

406) Why does the use of pressure cooker reduce cooking time ?

407) What will happen to the boiling point of a solution if the weight of the solute dissolved is doubled but the weight of solvent taken is halved ?

408) Why os camphor preferred as a solvent in finding the molecular mass of naphthalene by Rast method ?

409) Why boiling point of water is increased on addition of sodium chloride into it ?

410) Two liquids A and B boil at 145^oC and 190^oC respectively. Which of them has higher vapour pressure at 80^oC ?

411) Why NaCl solution freezes at lower temperature than water but boils at higher temperature than water ?

412) What freezes out first when a solution of common salt is cooled ?

413) What is de - icing agent ? How does it work ?

414) Equimolal solutions of NaCl and $BaCl_2$ are prepared in water. Freezing point of NaCl is found to be -2^oC. What freezing point do you expect for $BaCl_2$ solution ?

415) Calculate the molarity and normality of a solution containing 9.8g of H_2SO_4 in 2590 cm^3

416) Why is freezing point depression of 0.1 M sodium chloride solution nearly twice that of 0.1 M glucose solution ?

417) Explain why equimolar aqueous solutions of sodium chloride and sodium sulphate are not isotonic ?

418) Why melting point of a substance is used as a criterion for testing the purity of the substance.

419) Air contains O_2 and N_2 in the ratio of 1:4, Calculate the ratio of solubilities in terms of mole fractions of O_2 and N_2 dissolved in water at atmospheric pressure and room temperature at which Henry's constant for O_2 and N_2 are 3.30 $\times 10^7$ torr and 6.60$\times 10^7$ torr respectively.

420) The mole fraction of helium in a saturated solution at 20^0C is 1.2$\times 10^{-6}$. Given Henry's constant at 20^0C is 71.18kbar.

421) Calculate the solubility of H_2 in water at 25^0C if its partial pressure above the solution is 1 bar. Given that Henry's constant for H_2 in water at 25^0C is 71.18k bar.

422) Calculate the mass percentage of benzenc (C_6H_6) and carbon tetrachloride (CCl_4) if 22 g of benzene is dissolved in 122g of carbon tetrachloride.

423) What concentration of nitrogen should be present in a glass of water at room temperature?Assume temperature of 25^0C, a total pressure of 1 atmosphere and mole fraction of nitrogen in air as 0.78 [K_H for nitrogen = 8.42$\times 10^{-7}$ M/mm Hg].

424) The vapour pressures of pure liquids A and B are 450 and 700 mm Hg at 350 K respectively. Find out the composition of the liquid mixture if total vapour pressure is 600 mm Hg. Also find the composition of the vapour phase.

425) Two liquid X and Y on mixing from an ideal solution. At 30^0C, the vapour pressure of the solution containing 3 moles of X and 1 mole of Y is 55omm Hg. But when 4 moles of X and 1 mole of Y are mixed,the vapour pressure of the solution thus formed is 560mm Hg. What would be the vapour pressure of pure X and pure Y at this temperature?

426) Ethylene dibromide ($C_2H_4Br_2$) and 1, 2-dibromo propane form a series of ideal solutions over the whole range of composition.At 85^0C, the vapour pressure of these two liquids are 173 and 127 torr respectively. What would be the mole fraction of ethylene dibromide in a solution at 85^0 C equilibrated with 1:1 molar mixture in the vapour?

427) At a given temperature,the vapour pressure in mm of Hg of a solution of two volatile liquids A and B is given by the equation
p = 120-80 X_B (X_B = mole fraction of b)
Calculate the vapour pressures of pure A and B at the same temperature.

428) The mole fraction of ethyl alcohol in its solution with methyl alcohol is 0.80. The vapour pressure of ethyl alcohol at the temperature of the solution is 40mm of Hg. What is its vapour pressure in solution if the solution is ideal?

429) Suppose a solid solution is formed between two substances, one whose particles are very large and the other whose particles are very small. What type of this solid solution is likely to be ?

430) The vapour pressure of a pure A is 40mm Hg at 310K. The vapour pressure of this liquid solution with liquid B is 32mm of Hg. Calculate the mole fraction of A in the solution if the mixture obeys Raoult's law

431) Methanol and ethanol form nearly an ideal solution at300K. A solution is made by mixing 32g methanol and 22g ethanol at 300k. Calculate the partial pressures of its constituents and the total pressure of the solution.[At 300k: p_{CH3OH} = 90mm Hg, p_{C2H5OH} = 51mm Hg]

432) The vapour pressure of benzene and toluene at 293K are 75mm Hg respectively. 23.4g of benzene and 64.4g of toluene are mixed. If the two form an ideal solution, calculate the mole fraction of benzene in the vapour phase assuming that the vapours are in equilibrium with the liquid mixture at this temperature.

433) Two liquid A and B on mixing from an ideal solution. Their vapour pressure in the pure state are 200 and 100mm respectively. What will be mole fraction of B in the vapour phase in equilibrium with an equimolar solution of the two.

434) The vapour pressure of ethyl acetate and ethyl propionate are 72.8 and 27.7mm of Hg respectively.A solution is prepared by mixing 25g ethyl acetate and 50g ethyl propionate.Assuming to the solution to be ideal,calculate the vapour pressure of the solution

435) (a) Calculate the osmotic pressure of 0.01 M solution of cane-sugar at 300 K (R = 0.0821 litre atm/degree/mole).
(b) If this solution were placed in a tube of uniform cross-sectional area of 1 cm^2 with a semi permeable membrane at the lower end and this end is dipped in pure water, what will be height of the vertical column developed ? Assume density of the solution as 1g m L^{-1} .

436) Calculate the osmotic pressure at 273 K of a 5% solution of urea (Mol. mass = 60). (R = 0.0821 litre atm/degree/mole).

437) Benzene and toluene form nearly ideal solution. At a certain temperature,the vapour pressure of the pure benzene is 150mm Hg and of pure toluene is 50mm Hg. For this temperature,calculate the vapour pressure of solution containing equal weights of two substances. Also calculate their composition in the vapour phase

438) A solution containing 10 g/litre of surose has an osmotic pressure of 0.66 atm at 273 K. Calculate the value of the constant R.

439) Calculate the concentration of that solution of sugar which has osmotic pressure of 2.46 atmosphere at 300 K.

440) 0.75mol of ethylene bromide were mixed with 0.25mol of propylene bromide at 358K to form nearly ideal solution.Vapour pressure of pure ethylene bromide and propylene bromide at 358K are 2.77 $\times$ $10^4 Nm^{-2}$ and 1.73$\times$ $10^4 Nm^{-2}$ respectively.Calculate the vapour pressure of the solution.

441) A 4 per cent solution of surose C_{12} H_{22} O_{11} is isotonic with 3 per cent solution of an unknown organic substance. Calculate the molar mass of the unknown substance.

442) Calculate the osmotic pressure of a solution obtained by mixing 100 cm^3 of 1.5 % solution of urea (mol.mass = 60) and 100 cm^3 of 3.42 % solution of cane-sugar (mol.mass = 342) at 20 °**C** (R = 0.082 litre atm/degree/mole)

443) 10 g of a substance were dissolved in water and the solution was made up to 250 cm^3 . The osmotic pressure of the solution was found to be 8 x 10^5 N m^{-2} (pascals) at 288 K. Find the molar mass of the solute.

444) Vapour pressure of water at 293K is 17.51mm. Lowering of vapour of a sugar solution is 0.0164mm. Calculate
(i) Relative lowering of vapour pressure
(ii) Vapour pressure of the solution and
(iii) Mole fraction of water.

445) The vapour pressure of a 5% aqueous solution of a non-volatile organic substance at 373K is 745mm. Calculate the molar mass of the solute.

446) At 298K, the vapour pressure of water is 23.75mm Hg. Calculate the vapour pressure at the same temperature over 5% aqueous solution of urea [$CO(NH_2)_2$]

447) An aqueous solution of glucose C_6 H_{12} O_6 has an osmotic pressure of 2.72 atmospheres at 298 K. How many moles of glucose were dissolved per litre of the solution ? (R = 0.082 lit.atm.mol^{-1} deg^{-1})

448) A solution of surose (molecular mass 342/mol) is prepared by dissolving 68.4 g of it per litre of solution. What is its osmotic pressure at 300 K ? (R = 0.082 lit.atm.mol^{-1} deg^{-1})

449) Calculate the osmotic pressure of a solution containing 17.1 g of cane-sugar (molecular mass 342) in 500 g of water at 300 K ((R = 0.082 lit.atm.mol^{-1} deg^{-1}). Density of the solution is 1.034 g cm^{-3} .

450) A 5% solution of cane-sugar (m.wt. = 342) is isotonic with 0.877% solution of urea. Find the molecular weight of urea.

451) At 298 K, 100 cm^3 of a solution containing 3.002 g of an unidentified solute exhibits an osmotic pressure of 2.55 atmospheres. What is the molar mass of solute ? (R = 0.0821 L atm. mol^{-1} K^{-1})

452) A current of dry air was passed through a solution of a 2.5g a non-volatile substance 'X' in 100g of water and then through water alone. The loss of the weight of the former was 1.25g and that of the later was 0.05g. Calculate
(i) mole fraction of the solution
(ii) molecular weight of the solute.

453) The vapour pressure of 2.1% of an aqueous of a non-electrolyte at 373K is 755mm. Calculate the molar mass of solute.

454) A solution containing 6g of benzene acid in 50g of ether ($C_2H_5OC_2H_5$) has a vapour pressure of 410mm of mercury at 293K. Given that the vapour pressure of ether at the same temperature is 422mm of mercury, calculate the molecular mass of benzoic acid. (Assume that the solution is dilute)

455) The vapour pressure of water is 92mm at 323Kg of urea are dissolved in 100g of water. The vapour pressure is reduced by 5mm. Calculate the molar mass of urea.

456) The vapour pressure of water is 92mm at 323Kg of urea are dissolved in 100g of water. The vapour pressure is reduced by 5mm. Calculate the molar mass of urea.

457) Calculate the vapour pressure at 295K of a 0.1M solution of urea.The density of the solution may be taken as 1 g/cm^3. The vapour pressure of pure water at 295K is 20mm

458) One litre aqueous solution of surose (molar mass = 342 g mol^{-1}) weighing 1015 g is found to record an osmotic pressure of 4.82 atm at 293 K. What is the molality of the surose solution ? (R = 0.0821 atm mol^{-1} K^{-1}).

459) The osmotic pressure of blood is 8.21 atm at 37 °**C**. How much glucose would be used for an injection that is at the same osmotic pressure as blood ?

460) A solution containing 10.2 g glycerine per litre of a solution is found to be isotonic with 2.0% solution of glucose (Molar mass 180). Calculate the molecular mass of glycerine.

461) The osmotic pressure of 0.200 g of haemoglobin in 20.0 ml of solution is 2.88 torr at 25 °**C**. Calculate the molecular weight of haemoglobin.

462) The vapour pressure of an aqueous solution of cane sugar(mol mass 342) is 756mm at 373K. How many grams of sugar are pressure in 1000g of water?

463) A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 ML of water has an osmotic pressure of 0.335 torr at 25 °**C** . Assuming gene fragment is non-electrolyte, determine its molar mass.

464) At 25^0C, the vapour pressure of pure water is 23.76mm of Hg and that of an aqueous dilute solution of urea is 22.98mm of Hg. Calculate the molality of this solution?

465) 100 mg of a protein is dissolved in just enough water to make 10.0 mL of a solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25ºC, what is the molar mass of protein?

466) Vapour pressure of an aqueous solution of glucose is 750mm of Hg at 373K. Calculate the molality and mole fraction of solution.

467) Calculate the molal elevation constant of water, it being given that its 0.1 molal aqueous solution of a substance boiled at 100-052 °**C**

468) At 50^0C,the vapour pressure of pure CS_2 is 854 torr.A solution of 2.0g of sulphur in 100g of CS_2 has vapour pressure of 848.9 torr.Determine the formula of sulphur molecule

469) Urea forms an ideal solution in water. Determine the vapour pressure of an aqueous solution containing 10% by mass of urea at 40^0C (vapour pressure of water at 40^0C = 55.3 mm Hg)

470) A 0.2 percent aqueous solution of a non-volatile solute exerts a vapour pressure of 1.004 bar at 100^0 C.What is the molar mass if the solute?(Given: vapour pressure of pure water at 100^0C is 1.013 bar and molar mass of water is 18g mol^{-1})

471) 20g of solute was added to 100g of water at 25^0C.The vapour pressure of water and that of solution were 23.76mm Hg and 22.41mm Hg respectively at that temperature.Calculate the relative molecular mass of the solute

472) Calculate the boiling point of a solution containing 0.456 g of camphor (mol.mass = 152) dissolved in 31.4 g of acetone (b.p = 56.30°**C**), if the molecular elevation constant per 100 g of acetone is 17.2°**C.**

473) A solution containing 0.5126 g napthalene (mol.mass = 128) in 50.0 g of carbon tetrachloride yields a boiling point elevation of 0.402°**C** while a solution of 0.6216 g of an unknown solute in the same weight of the same solvent gives a boiling point elevation of 0.647°**C** . Find the molecular mass of the unknown solute.

474) A solution containing 6 g of a solute dissolved in 250 cm^3 of water gave an osmotic pressure of 4.5 atmosphere at 27°**C** . Calculate the boiling point of the solution. The molal elevation constant for water is 0.52°**C** per 1000 g.

475) Calculate the boiling point of a solution containing 25 g urea (NH_2 $CONH_2$) and 25 g thiourea (NH_2 $CSNH_2$) in 500 g chloroform, $CHCl_3$. The boiling point of pure chloroform is 61.2°**C** and K_b = 3.63 K m^{-1} .

476) An aqueous solution of glucose boils at 100.01°**C** . The molal elevation constant for water is 0.5 K kg mol^{-1} . What is the number of glucose molecules in the solution containing 100 g of water ?

477) Calculate the molal boiling point constant for chloroform from the fact that its boiling point is 61.2°**C** and 0.1 molal solution of an organic substance in chloroform boiled at 61.579°**C.**

478) When 1.80 g of non-volatile compound is dissolved in 25.0 g of acetone, the solution boils at 56.86°**C** while pure acetone boils at 56.38°**C** under the same atmospheric pressure. Calculate the molar mass of the compound. The molal elevation constant for acetone is 1.72°.

479) A solution containing 36 g of solute dissolved in one litre of water gave an osmotic pressure of 6.75 atmosphere at 27°**C** . The molal elevation constant of water is 0.52°**C**. Calculate the boiling point of the solution.

480) The vapour pressure of an aqueous solution of cane sugar (mol.mass = 342) is 732 mm at 100°**C.** Calculate the boiling point of the solution (K_b for water = 0.52°**C)**.

481) Calculate the molar mass of a substance 1.3 g of which when dissolved in 169 g of water gave a solution boiling at 100.025°**C** at a pressure of one atmosphere (K_b for water=0.52K m^{-1})

482) On dissolving 3.24 g of sulphur in 40 g of benzene, boiling point of solution was higher than that of benzene by 0.81 K. K_b value for benzene is 2.53 K kg mol^{-1} . What is the molecular formula of sulphur ? (Atomic mass of sulphur = 32 g mol^{-1})

483) 0.90 g of a non-electrolyte was dissolved in 87.90 g of benzene. This raised the boiling point of benzene by 0.25°**C**. If the molar mass of non-electrolyte is 103.0 g mol^{-1} . calculate the molal elevation constant for benzene.

484) A solution of an organic compound is prepared by dissolving 68.4 g in 1000 g of water. Calculate the molecular mass of the compound and osmotic pressure of the solution at 293 K when elevation of b.pt. is 0.104 and K_b for water is 0.52 K mol^{-1} .

485) A solution containing 34.2 g of cane-sugar (C_{12} H_{22} O_{11}) dissolved in 500 cm^3 of water froze at - 0.374°**C**. Calculate the freezing point depression constant of water.

486) A solution of urea in water has a boiling point of 100.128°**C**. Calculate the freezing point of the same solution. Molal constants for water K_f and K_b are 1.86°**C** and 0.512°**C** respectively.

487) The average osmotic pressure of human blood is 7.7 atm at 40°**C**. (a) What would be the total concentration of the various solutes in the blood ? (b) Assuming the concentration to be essentially the same as the molality, find the freezing point of blood (K_f for water = 1.86°**C**).

488) A solution containing 2.56 g of sulphur dissolved in 100 g of naphthalene whose melting point is 80.1°**C** gave a freezing point lowering of 0.680°**C.** Calculate the formula of sulphur (K_f for naphthalene = 6.8 K/m)

489) How many grams of sucrose (M.wt. = 342) should be dissolved in 100g water in order to produce a solution with 105.0°**C** difference between the freezing point and the boiling point ?(K_f = 1.86°**C**/m, K_b = 0.51°**C**/m)

490) The freezing point of a solution containing 50 cm^3 of ethylene glycol in 50 g water is found to be - 34°**C**. Assuming ideal behaviour, calculate the density of ethylene glycol. (K_f for water = 1.86 K kg mol^{-1})

491) Normal freezing point of a solvent is 15°**C**. A 0.5 molal solution of urea in the above solvent causes a freezing point depression of two degrees. Calculate the molal depression constant.

492) Water is used in car radiators. In winter season, ethylene glycol is added to water so that water may not freeze. Assuming ethylene glycol to be non-volatile, calculate the minimum amount of ethylene glycol that must be added to 6.0 kg of water to prevent it from freezing at - 0.30°**C**. The molal depression constant of water is 1.86 K/m.

493) Two aqueous solutions, containing respectively 7.5 g of urea (mol.wt. = 60) and 42.75 g substance X in 100 g of water freeze at the same temperature. Calculate the molar mass of X.

494) Pure solvent A has freezing point 16.5°**C**. On dissolving 0.4 g of B in 200 g of A, the solution freezes at 16.4°**C** and on dissolving 2.24 g of C in 100 g of A, the solution has freezing point of 16.0°**C**. If the molar mass of B is 74 g mol^{-1}, what is the molar mass of C ?

495) An aqueous solution freezes at - 0.2°**C.** What is the molality of the solution ? Determine also (i) elevation in the boiling point (ii) lowering of vapour pressure at 298 K, given that K_f = 1.86° kg mol^{-1} , K_b = 0.512° kg mol^{-1} and vapour pressure of water at 298 K is 23.756 mm.

496) 68.4 g of sugar (molecular weight = 342) is dissolved in 1000 g of water. What is (a) freezing point (b) boiling point (c) vapour pressure at 20°**C** (d) osmotic pressure of the solution at 20°C ? The density of the solution at 20°C is 1.024 g cm^{-3} . The vapour pressure of water at 20°C is 17.633 mm. The K_f and K_b values for water are 1.873° and 0.516° respectively.

497) An aqueous solution contains 5% by weight of urea and 10% by weight of glucose. What will be its freezing point? [Molal depression constant of water is 1.86°**C**].

498) Addition of 0.643 g of a compound to 50 ml of benzene (density : 0.879 g/ml) lowers the freezing point from 5.51°**C** to 5.03°**C** . If K_f for benzene is 5.12, calculate the molecular weight of the compound.

499) The temperature at a hill station is - 10°C. Will it be suitable to add ethylene glycol (mol mass = 62) to water in the radiator so that the solution is 30% by mass ? (K_f for water = 1.86 K m^{-1})

500) The molal freezing point depression constant of benzene (C_6H_6) is 4.90 K kg mol^{-1} . Selenium exists as a polymer of the type Se_x . When 3.26 g of selenium is dissolved in 226 g of benzene, the observed freezing point is 0.112°C lower than for pure benzene. Deduce the molecular formula of selenium (At. mass of Se = 78.8 g mol^{-1}).

501) A solution of an organic compound is prepared by dissolving 34.2 kg in 500 g of water. Calculate the molar mass of the compound and freezing point of the solution. Given that K_b for water = 0.52 K mol^{-1} B.pt of solution = 100.104°C. K_f for water = 1.87 K mol^{-1} .

502) Explain why on addition of 0 mol of NaCl to 1 litre of water, the boiling point of water increases, while addition of 1 mol of methyl alcohol to one litre of water decreases its boiling point.

503) Concentration terms such as mass percentage, ppm, mole fraction and molality are independent of temperature, however molarity is a function of temperature. Explain.

504) What is the significance of Henry's Law constant K_H?

505) The freezing point depression of 0.1 molal solution of acetic acid in benzene is 0.256 K. K_f for benzene is 5.12 K kg mol^{-1} . What conclusion can you draw about the molecular state of acetic acid in benzene ?

506) 0.5 g KCl was dissolved in 100 g water and the solution originally at 20°C, froze at - 0.24°C. Calculate the percentage ionisation of salt. K_f per 1000 g of water = 1.86°C.

507) 2 g of benzoic acid dissolved in 25.0 g of benzene shows a depression in freezing point equal to 1.62 K. Molal depression constant (K_f) of benzene is 4.9 K kg mol^{-1} . What is the percentage association of the acid if it forms dimer in the solution?

508) Calculate the boiling point of a one molar aqueous solution (density 1.04 g mL^{-1}) of potassium chloride (K_b for water = 0.52 K kg mol^{-1} , Atomic masses : K = 39, Cl = 35.5)

509) KI and sucrose solution with 0.1 M concentration have osmotic pressure of 0.465 atm and 0.245 atm respectively. Find the van't Hoff of KI and its degree of dissociation.

510) Why are aquatic species more comfortable in cold water in comparison to warm water ?

511) (a) Explain the following phenomena with the help of Henry's law.
(i) Painful condition known as bends.
(ii) Feeling of weakness and discomfort in breathing at high altitude.
(iii) Why soda water bottle kept at room temperature fizzes on opening ?

512) Why is the vapour pressure of an aqueous solution of glucose lower than that of water?

513) How does sprinkling of salt help in clearing the show covered roads in hilly areas ? Explain the phenomenon involved in the process.

514) What is "semi-permeable" membrane?

515) Give an example of a material used for making semipermeable membrane for carrying out reverse osmosis.

516) Assuming complete dissociation of the salts, calculate the molality of sodium chloride solution whose elevation in boiling point is numerically equal to the depression in freezing point of 0.2 m aluminium sulphate solution in water (K_b and K_f for water are 0.52 and 1.86 K kg mol^{-1} respectively).

517) Arrange the following solutions in the increasing order of their osmotic pressure
(a) 34.2 g/lit sucrose
(b) 60 g/lit urea (NH_2 $CONH_2$)
(c) 90 g/lit glucose
(d) 58.5 g/lit sodium chloride
Give reason in support of your answer

518) Calculate the amount of NaCl which must be added to 100 g of water so that the freezing point is depressed by 2 K. For water K_f = 1.86 K/m.

519) Decinormal solution of NaCl developed an osmotic pressure of 4.6 atmosphere at 300 K. Calculate its degree of dissociation (R = 0.082 L atm K^{-1} mol^{-1})

520) Calculate the van't Hoff factor of $CdSO_4$ (molecular mass 208.4) if the dissolution of 5.21 g of $CdSO_4$ in half litre water gives a depression in freezing point of 0.168°C (K_f of water is 1.86 K kg mol^{-1})

521) Determine the osmotic pressure of a solution prepared by dissolving 2.5 x 10^{-2} g of K_2 SO_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_2 SO_4 = 174 g mol^{-1})

522) 0.01 m aqueous solution of K_3 $[Fe(CN)_6]$ freezes at - 0.062°C. What is the apparent percentage of dissociation ? (K_f for water = 1.86 K kg mol^{-1})

523) Out of the following three solutions, which has the highest freezing point and why ?
(i) 0.1 M Urea
(ii) 0.1 M Barium phosphate
(iii) 0.1 M Sodium sulphate

524) How is it that alcohol (ethoxyethane) and water are miscible in all proportions ?

525) Give an example of a solution containing a liquid solute in a solid solvent.

526) Give one example each of solid in gas and liquid in gas solutions.

527) What do you mean by saying that the molality of a solution is 0.1 ?

528) What is the relation between normality and molarity of a given solution of H_2SO_4 ?

529) Out of the following three solutions, which has the highest boiling point and why?
(i) 1 M Glucose
(ii) 1 M Potassium chloride
(iii) Aluminium nitrate

530) An aqueous solution containing 1.248 g of barium chloride (molar mass = 208.34 g mol^{-1}) in 100 g of water boils at 100.0832°C. Calculate the degree of dissociation of $BaCl_2$ (K_b for water = 0.52 K kg mol^{-1}).

531) A decimolar solution of potassium ferrocyanide is 50% dissociated at 300K. Calculate the osmotic pressure of the solution. (R = 8.314 J K^{-1} mol^{-1})

532) What is the sum of mole fractions of all the components in a three component system ?

533) Why does the molality of a solution remain unchanged with temperature?

534) Calculate the molality of H_2SO_4 if the density of 10% (w/w) aqueous solution of H_2SO_4 is 1.84 g cm^{-3} (Molar mass of H_2SO_4 = 98g mol^{-1}).

535) What is the effect of temperature on the solubility of sodium sulphate decahyrate ?

536) Define transition temperature in solubility of a solid in a liquid.

537) On a certain hill station, pure water is found to boil at 95°C. How many grams of NaCl must be added to 2 kg of water so that it boils at 100°C ?

538) Depression in freezing point of 0.10 molal solution of HF is - 0.201°C. Calculate the percentage degree of dissociation of HF. (K_f = 1.86 K kg mol^{-1})

539) Calculate the boiling point of a solution containing 0.61 g of benzoic acid in 50 g of carbon disulphide assuming 84% dimersation of the acid. The boiling point and K_b of CS_2 are 46.2°C and 2.3 K kg mol^{-1} respectively.

540) What mass of NaCl (molar mass = 58.5 g mol^{-1}) must be dissolved in 65 g of water to lower the freezing point by 7.5 °C? The freezing point depression constant, K_f for water is 1.86 K kg mol^{-1} . Assume van't Hoff factor for NaCl is 1.87.

541) State the formula relating pressure of a gas with its mole fraction in a liquid solution in contact with it.

542) What type of liquids form ideal solutions ?

543) What is the boiling point of an azeotrope of non - ideal solution showing positive deviations as compared to the boiling points of its components ?

544) Under what condition do non - ideal solutions show negative deviations?

545) What is the difference between lowering of vapour pressure and relative lowering of vapour pressure ?

546) Write the mathematical form of Raoult's law of relative lowering of vapour pressure

547) What are isotonic solutions ? Give one example.

548) What is van't Hoff equation for dilute solution ?

549) Why does water from the soil rise to the top of a tall tree ?

550) What happens when blood cells are placed in pure water ?

551) Define reverse osmosis. Give one use of it.

552) Define molal elevation constant, K_b or ebullioscopic constant.

553) Define molal depression constant/cryoscopic constant.

554) Give one most important application of the phenomenon of depression in freezing point in everyday life.

555) Between 2 M glucose solution and 1 M glucose solution, which one has a lower freezing point ?

556) What is anti-freeze?

557) How is the molecular mass of NaCl is odtained experimentally using colligative properties?

558) How is the colligative property of solution changed when a solute in a solution undergoes
(i) association
(ii) dissociation.

559) What would be the value of van't Hoff factor for dillute aqueous solution of K_2SO_4?

560) Arrange the following solutions in increasing order of their van't Hoff factor :
0.1 M $CaCl_2$, 0.1 M KCl , 0.1 M $Al_2(SO_4)$, 0.1 M $C_{12}H_{22}O_{11}$

561) Give an example of a compound in which hydrogen bonding results in the formation of a dimer.

562) When is the value of van't Hoff factor more than one ?

563) What is the van't Hoff factor for a compound which undergoes tetramerisation in an organic solvent ?

564) State Henry's law correlating the pressure of a gas and its solubility in a solvent and mension two applications for the law. What helps in existence of aquatic life ?

565) (a) Define Azeotropes and explain broefly minimum boiling azeotrope by taking suitable example.
(b) The vapour pressures of pure liquids A and B are 450 mm 700 mm of Hg respectively at 350 K. Calculate the composition of the liquid mixture if total vapour pressure is 600 mm of Hg. Also find the composition of the mixture in the vapour phase.

566) Match the following if the molecular weights of X,Y and Z are the same :

SOLVENT	BOILING POINT	K_B
X	100°C	0.68
Y	27°C	0.53
Z	253°C	0.98

567) (a) Derive the relationship between relative lowering of vapour pressure and mole fraction of the volatile liquid.
(b) Derive a relationship between mole fraction and vapour pressure of a component of an ideal solution in the liquid phase and vapour phase.

568) Why dissolution of some solid compounds is exithermic while that of some others is endothermic ?

569) Benzene and toluene have equal mole fractions in their mutual solution. What do you expect about their mole fractions in the vapour phase at the same temperature ? Explain.
(Given : $p^o_{Benzene} = 3 \times p^o_{Toluene}$)

570) Why a person suffering from high blood pressure is advised to take minimum quantity of common salt ?

571) The boiling point of carbon tetrachloride is 77°C and its heat of vaporisation is 31 kJ mol^{-1}. Calculate the vapour pressure of carbon tetrachloride in atmospheres at 25°C.

572) A 0.001 molal solution of a complex with molecular formula $[Pt(NH_3)_4Cl_4]$ in water showed a freezing point depression of 0.0054°C. If K_f for water is 1.80, what is the correct formulation of the molecule with a proper coordination sphere ?

573) To 500 cm^3 of water, 3.0×10^{-3} kg of acetic acid is added. If 23% of acetic acid is dissociated, what will be the depression in freezing point ? K_f and density of water are 1.86 K kg mol^{-1} and 0.997 g cm^{-3}respectively.

574) Calculate the density of H_2SO_4 solution if its molality and molarity are 94.5 and 11.5 respectively.

575) 17.4% K_2SO_4 solution at 27°C is isotonic with 4% NaOH solution at the same temperature. If NaOH is 100% ionized, what is the degree of ionization of K_2SO_4 in aqueous solution ?

576) Calculate the osmotic pressure of a 0.1 M monobasic acid if its pH is 2.0 at 25°C.

577) The boiling point of benzene rises from 80.1°C to 82.4°C when 13.76 g of biphenyl (C_6H_5 - C_6H_5) is dissolved into 100 g of benzene. Calculate latent heat of vaporisation of benzene.

578) A storage battery contains a solution of H_2SO_4 38% by weight. At this concentration, van't Hoff factor is 2.50. At what temperature will the battery contents freeze ? (K_f for water = 1.86 K kg mol^{-1})

579) Calculate the resulting molarity of the solution that is obtained by adding 5 g of NaOH to 250 ml of $\frac{M}{4}$ NaOH solution (density = 1.05 g/cm^3). The density of the resulting solution is 1.08 g/cm^3.

580) Calculate the molarity of a solution of $CaCl_2$ if on chemical analysis it is found that 200 ml of $CaCl_2$ solution contains 3.01×10^{22} chloride ions.

581) A solution of A and B with 30 mole percent of A is in equilibrium with its vapour which contain 60 mole percent of A. Assuming that the solution and the vapour behave ideally, calculate the ratio of the vapour pressures of pure A and pure B .

582) Vapour pressures of benzene and toluene in a mixture at 50°C are given in mm by P = 179 X_B + 92 where X_B is the mole fraction of benzene. Calculate
(a) Vapour pressures of pure benzene and toluene at 50°C.
(b) Vapour pressure of a liquid mixture obtained by mixing 224 g benzene and 184 g of toluene.
(c) If the vapours are removed and condensed into liquid and again brought to the temperature of 50°C, what would be the mole fraction of benzene in the vapour phase ?

583) Components of a binary mixture of two liquids A and B were being separated by distillation. After some time separation of components stopped and composition of vapour phase became same as that of liquid phase. Both the components started coming in the distillate. Explain why this happened.

584) Explain why on addition of 1 mol of NaCl to 1 litre of water, the boiling point of water in -creases, while addition of 1 mole of methyl alcohol to one litre of water decreases its boiling point.

585) Why is molality considered better for expressing concentration of solution than molarity?

586) Define Raoult's law for binary solutions.

587) What will be the mole fraction of water in methanol solution containing equal number of moles of water and methanol?

588) State Henry's law about the solubility of a gas in a liquid.

589) Which will have higher boiling point: 0.1MNaCl or 0.1M, $BaCl_2$ in water? Explain.

590) Why is cooking temperature in pressure cooker higher than in the open pan?

591) Define osmosis and osmotic pressure.

592) Write Vant's Hoff equation. Name the method commonly used measuring osmotic pressure.

593) Define azeotropic mixture.

594) Why water from the soil rises to the top of a tall free?

595) Why is Van't Hoff factor introduced in the equation for colligative properties of solutions?

596) Which substances is usually added into water in the car radiator to act as antifreeze?

597) Why do doctors advice gargles by saline water in case of sore throat?

598) Why is an increase in temperature observed on mixing chloroform with acetone?

599) What will happen to blood cells if placed in pure water?

600) What is the value of Van't Hoff factor $'i'$ for $K_4\left[Fe\left(CN_6\right)\right]$ aqueous solution assuming complete ionisation.

601) Mention the enthalpy of mixing $\left(\Delta_{mix}H\right)$ value to form an ideal solution

602) What is Raoult's law? Give its two limitations.

603) What is osmosis? How does it differ from diffusion?

604) Sodium chloride solution freezes at lower temperature than water but boils at higher temperature than water. Explain.

605) What is osmotic pressure of 1 M solution of NaCl approximately double than 1M solution of sugar?

606) Why do we get abnormal molecular mass if a solute undergoes association in a solvent?

607) What will happen to the vapour pressure of a liquid if a small amount of non-volatile solute is added to it?

608) Why is a molar solution of solute in water more concentrated than a molal solution?

609) Explain the relevance of elevation of boiling point in determining the molecular mass of a non-volatile solute.

610) What type of deviations (positive or negative) from an ideal solution will be shown by the solution of cyclohexane and ethanol?

611) How will you determine the molecular mass of a substance from osmotic pressure?

612) What are antifreeze solutions? Which substance is commonly used as antifreeze?

613) Explain depression in freezing point of a solution on the addition of a solute. Show that depression in freezing point is a colligative property.

614) State Raoult's law for a solution containing a non-volatile solute. Show that relative lowering in vapour pressure is a colligative property.

615) Which colligative property is preferred for the molar mass determination of macromolecules?

616) State Henry's law correlating the pressure of a gas and its solubility in solvent and mention two applications for the law.

617) State Raoult's law for solutions of volatile liquids. Taking suitable examples explain the meaning of positive and negative deviations from Raoult's law.

618) Define the term osmotic pressure. Describe how the molecular mass of substance can be determined by a method based on measurement of osmotic pressure?

619) State the following:
(i) Raoult's law in its general from in reference to solutions.
(ii) Henry's law about partial pressure of a gas in a mixture.

620) Define an ideal solution and write one of its characteristics.

621) State Raoult's law for the solution containing volatile components. Write two differences between an ideal solution and a non-ideal solution.

622) State Henry's law. Why do gases always tend to be less soluble in liquids as the temperature is raised?

623) What is meant by positive deviations from Raoult's law? Give an example. What is the sign of $\Delta_{mix}H$ for positive deviation?

624) Define azeotropes. What type of azeotrope is formed by negative deviation from Raoult's law? Give an example.

625) (i) Write the colligative property which is used to find the molecular mass of macromolecules.
(ii) In non-ideal solution, what type of deviation shows the formation of minimum boiling azeotropes?

626) What is relative lowering of vapour pressure? Does it depend upon temperature or not?

627) Define mole fraction.

628) State Henry's law about partial pressure of a gas in a mixture.

629) Define the following terms :
(i) Mole fraction (x)
(ii) Molality of a solution (m)

630) Define an ideal solution.

631) Some liquids on mixing form 'azeotropes'. What are 'azeotropes'?

632) What type of intermolecular attractive interaction exists in the pair of methanol and acetone ?

633) What is the similarity between Raoult's law and Henry's law?

634) State Raoult's law. How is it formulated for solutions of non-volatile solutes?

635) (i) Gas (A) is more soluble in water than Gas (B) at the same temperature. Which one of the two gases will have the higher value of K_H (Henry's constant) and why?
(ii) In non-ideal solution, what type of deviation shows the formation of maximum boiling azeotropes ?

636) what are isotonic solution ?

637) Define the term osmotic pressure.

638) Define the following terms :
(i) Isotonic solutions
(ii) Van't Hoff factor

639) What is meant by term reverse osmosis?

640) Explain boiling point elevation constant for a solvent or ebullioscopic constant.

641) Define osmotic pressure. How is the osmotic 'pressure related to the concentration of a solute in a solution.

642) Will the elevation in boiling point be same if 0.1mol of sodium chloride or 0.1 mol of sugar is dissolved in 1L of water? Explain.

643) State Henry's law and mention two of its important applications.

644) Cutting onions taken form the fridge is more comfortable than cutting onions laying at room temperature. Explain, why?

645) What is meant by molality of the solution?

646) Calculate the molarity of 9.8% (w/w) solution of H_2SO_4 if the density of the solution is 1.02 gmL^{-1}. [Molar mass of H_2SO_4 = 98 $gmol^{-1}$]

647) Differentiate between molarity and molality of a solution. How can we change molality value of a solution into molarity value?

648) If the density of water of a lake is 1.25 g mL^{-1} and 1 kg of lake water contains 92 g of Na^+ ions, calculate the molarity of Na^+ ions in this lake water. (Atomic mass of Na= 23 g mol^{-1})

649) The solubility of pure nitrogen gas at 25°C and 1 atm is 6.8 x 10^{-4} mol L^{-1}. What is the concentration of nitrogen dissolved in water under atmospheric conditions? The partial pressure of nitrogen gas in the atmosphere is 0.78 atm.

650) Define ideal solution

651) State Raoult's law for a solution of volatile liquids.

652) Define the following
(i) Ideal solution
(ii) Molarity (M)

653) What is meant by colligative properties?

654) Define the following terms:
(i) Colligative properties
(ii) Molality (m)

655) Define the following terms:
(i) Abnormal molar mass
(ii) van't Hoff factor

656) (i) On mixing liquid X and liquid Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y?
(ii) What happens when we place the blood cell in water (hypertonic solution)? Give reason.

657) Why does a solution containing non-volatile solute have higher boiling point than the pure solvent? Why is elevation of boiling point a colligative property?

658) 18 g glucose, $C_6H_{12}0_6$ (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).

659) Find the freezing point of a solution containing 0.520 g glucose ($C_6H_{12}O_6$) dissolved in 80.2 g of water [Given, K_f for water = 1.86 Km^{-1}]

660) Outer hard shells oftwo eggs are removed one of the egg is placed in pure water and the other is placed in saturated solution of sodium chloride. What will be observed and why?

661) Calculate the number of moles of methanol in 5 L in its 2m solution, if the density of the solution is 0.981 kgL^{-1}.

662) 75.2 g of phenol is dissolved in solvent of K_f = 14. If the depression in freezing point is 7K, find the % of phenol that dimerises ?

663) An aqueous solution of 1.248 g of Barium chloride (molar mass = 208.34 g mol^{-1}) in 100 g of water is found to boil at 100.0832^{0}C. Calculate the degree of dissociation of $BaCl_2$. K_b of water = 0.52 K kg mol^{-1}.

664) The storage battery contains a solution of sulphuric acid 38 % by mass. At this concentration vant Hoff factor is 2.50. At what temperature will the battery condense freeze ? K_f for water = 1.86 K kg mol^{-1}.

665) Give an example of a liquid solution in which the solute is a gas.

666) Define the term mass percentage.

667) How does a change of temperature influence the values of molarity and molality of a solution?

668) Will the molarity of a solution at 50°C be same, less or more than at 25°C?

669) A sugar syrup of weight 214.2g contains 34.2 g of sugar ($C_{12}H_{22}o_{11}$). Calculate
(i) mole fraction of sugar
(ii) molality of sugar syrup

670) What volume of 95% sulphuric acid (density = 1.85g / cm^3) and what mass of water must be taken to prepare 100cm^3 of 15%solution of sulphuric acid (density = 1.10g /cm^3)?

671) Name the four important factors on which solubility depends.

672) Why do smaller particles dissolve faster than larger ones?

673) $\triangle_{sol}$ of NH_4Cl is > 0 . What is the effect of temperature on its solubility?

674) The K_H value for H_2 in water is 71.18 k bar but its value changes to 3. 67 k bar when the solvent is benzene. Why?

675) Explain the solubility rule 'like dissolves like' in terms of intermolecular forces that exist in solutions.

676) How is the vapour pressure of a solvent affected when a non-volatile solute is dissolved in it?

677) If the vapour pressure of C_2H_5OH at 298K is 40 mm of Hg. Its mole fraction in a solution with CH_3OH is 0.8. What will be its vapour pressure in solution, if it obeys Raoult's law?

678) When water and nitric acid are mixed together, a rise in temperature is observed. What type of azeotropic mixture is obtained?

679) Why is the vapour pressure of a solution of glucose in water lower than that of water?

680) If a table spoon of sugar is added to water, then what happens to vapour pressure of water?

681) On mixing liquid X and liquid Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y?

682) Will the depression in freezing point be same or different, if 0.1mole of sugar or 0.1mole of glucose is dissolved in 1L of water?

683) It is advised to add ethylene glycol to water in car radiator while driving in hill station. Why?

684) What happens when we place the blood cell in water (hypertonic solution)? Give reason.

685) State the condition for reverse osmosis.

686) What will be the value of van't Hoff factor for a dilute solution of K_2SO_4 in water?

687) List any four factors on which the colligative properties of a solution depend.

688) Explain why on addition of 1mole of glucose to 1litre of water, the boiling point of water increases?

689) Explain, why on addition of mole of NaCl to 1L of water, the boiling point of water increases, while addition of 1mole of methyl alcohol to 1L of water decreases its boiling point?

690) An aqueous solution of sodium chloride freezes below 273 K.Explain the lowering in freezing point of water with the help of a suitable diagram.

691) Calculate the freezing point of a solution containing 60 g of glucose (Molar mass =180 g mol^{-1}) in 250 g of water. (K_f of water =1.86 Kkg mol^{-1})

692) 18g of glucose, $C_6H_{12}O_6$ (molar mass =180 g mol^{-1}) is dissolved in 1kg of water in a sauce pan. At what temperature will this solution boil? (Kb for water =0.52 K kg mol^{-1}, boiling point of pure water =373.15 K).

693) The molecular masses of polymers are determined by osmotic pressure method and not by measuring other colligative properties. Give two reasons.

694) When kept in water, raisin swells in size. Name and explain the phenomenon involved with the help of a diagram. Give three applications of the phenomenon.

695) How many grams of KCl should be added to 1kg of water to lower its freezing point to -8.0°C (K_f for water = 1.86°C kg mol^{-1}).

696) A solution is prepared by dissolving 10 g of non-volatile solute in 200 g of water. It has a vapour pressure of 31.84mm Hg at 308 K. Calculate the molar mass of the solute. (Vapour pressure of pure water at 308 K= 32mm of Hg)

697) What type of deviation is shown by a mixture of ethanol and acetone ? Give reason.

698) A person suffering from high blood pressure should consume less common salt. Give reason.

699) What would be the value of van't Hoff factor for a dilute solution of Na_2SO_4 in water?

700) Why cannot we separate an azeotropic mixture by distillation?

701) A and B liquids on mixing produced a warm solution. Which type of deviation is this and why?

702) What do you mean by parts per million?

703) Express the quantity $\chi_i = \frac{n_i}{\Sigma n_i}$ in words.

704) What is the density of 3.60 M sulphuric acid, which is 29% H_2SO_4 by mass?

705) Define vapour pressure.

706) What happens to vapour pressure of water if a table spoon of sugar is added to it?

707) Why the vapour pressure of the solution is found to be less than that of the solvent?

708) Give two basic differences between ideal and non-ideal solution.

709) Are equimolar solutions of sodium chloride and urea isotonic? Give reason.

710) What type of liquids form non-ideal solutions?

711) An electrolyte AB is 50% ionised in aqueous solution. Calculate the freezing point of 1 molality aqueous solution.

712) Which out of molality, molarity and mole fraction of a solution will remain unchanged and why?

713) Why constant boiling mixtures behave like a single component when subjected to distillation?

714) Write four differences between solutions having positive deviation and solutions having negative deviations from Raoult's law.

715) Explain why the boiling point of a solvent is increased on dissolving a non-volatile solute into it?

716) What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solutions?

717) A solution prepared by dissolving 1.25g of oil of winter green (methyl salicylate) in 99 g of benzene has a boiling point of 80.31°Cand K_b for benzene is 2.53K kg mol^{-1}. Find molar mass of the solute. Boiling point of benzene = 80°C.

718) Calculate the molality of K_2CO_3 solution which is formed by dissolving 2.5 g of it in 1L of solution. Density of solution is 0.85 g mL^{-1}

719) Distinguish between the terms molality and molarity. Under what conditions are the molarity and molality of a solution nearly the same?

720) Consider the solute-solvent interactions and arrange the following compounds in the order of increasing solubility in ethanol with suitable explanations. NaCl, cycloheptane, H_2O, CH_3COCH_3

721) K_H value for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 40.39, 1.67,1.83 x 10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility and giving suitable reason.

722) Why the solubility of Glauber's salt ($Na_2SO_4 .10H_2O$) first increases upto 32.4°C and then decreases?

723) A solution obtained by mixing 300 g of 25% and 400 g of 40% solution by mass. Calculate the mass % of the resulting solution.

724) At 80^0C, the vapour pressure of a pure liquid A is 520 mm of Hg and that of pure liquid B is 1000 mm of Hg. If a mixture of A and B boils at 80^0C and 1atm pressure, then what is the amount of A in the mixture?

725) A solution of chloroform and acetone is an example of maximum boiling azeotropes. Name and discuss the type of azeotrope.

726) How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3? The concentrated acid is 70% HNO_3

727) Define the following terms:
(i) Isotonic solutions
(ii) Hypertonic solutions
(iii) Hypotonic solutions

728) A storage battery contains a solution of H_2SO_4, 38% by weight. At this concentration, van't Hoff factor is 2.50. At what temperature, will the battery contents freeze?

729) Four solutions of K_2SO_4 with the concentration 0.1M, 0.01M, 0.001M and 0.0001M are available. For which concentration, there is maximum value of van't Hoff factor?

730) What is the value of van't Hoff factor for 0.1M ideal solution?

731) Name the type of solution having equal osmotic pressure.

732) Name the type of intermolecular attractive interaction in n-hexane and n-octane.

733) Name the entity which do not change with temperature.

734) Name an antifreezing agent.

735) Give an example of a compound in which hydrogen bonding occurs.

736) What are constant boiling mixtures called?

737) Which type of deviation is shown by a mixture of ethanol and acetone?

738) Name the term which is defined as the ratio of normal molecular mass to observed molecular mass.

739) Predict whether van't Hoff factor, (i) is less than one or greater than one in the following:
(i) CH_3 COOH dissolved in water.
(ii) CH_3 COOH dissolved in benzene.

740) What type of azeotropic mixture will be formed by a solution of acetone and chloroform? Justify on the basis of strength of intermolecular interactions that develop in the solution.

741) 1.0 g of a non-electrolyte solute dissolved in 50.0 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is 5.12 K kg mol^{-1}. Find the molar mass of the solute.

742) What is the cause of anoxia?

743) Why are cold drinks bottles filled at high pressure?

744) Give an example each of solid in gas and liquid in gas solution.

745) What are the values of ΔH and ΔV for positive deviation from ideality? Give one example.

746) Can we separate an azeotropic mixture by distillation? Why do we call it a mixture?

747) What are the values of P_{total} ΔH and ΔV for negative deviation from ideality? Give one example.

748) What is expected van't Hoff factor for K_4 $[Fe(CN)_6]$?

749) What is the value of i for $Na_2SO_4.10\ H_2O$ assuming complete ionisation?

750) Why is osmotic pressure of 1 M KCl is higher than that of IM urea solution?

751) State how does osmotic pressure vary with temperature.

752) Define the following terms:
(i) Mole fraction.
(ii) Cryoscopic constant.

753) Find out the molar mass of X when 100 g of 'X' is dissolved in 500 mL of solution if molarity of solution is 0.5.

754) What is meant by positive deviations from Raoult's law? Give an example. What is the sign of $\Delta_{\text{mix}}H$ for positive deviation?

755) Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law? Give an example.

756) (i) On mixing liquid X and liquid Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y?
(ii) What happens when we place the blood cell in water (hypotonic solution)? Give reason.

757) What is meant by negative deviation from Raoult's law? Give an example. What is the sign of $\Delta_{\text{mix}}H$ for negative deviation?

758) Derive the relationship between relative lowering of vapour pressure and molar mass of solute.

759) What is van't Hoff factor? What types of values can it have if in forming the solution the solute molecules undergo
(i) Dissociation
(ii) Association?

3 Marks 139 x 3 = 417

760) Henry's law constant for the molality of methane in benzene at 298 K is 4.27×10^5 mm Hg. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg.

761) If N_2 gas is bubbled through water at 293 K, how many millimoles of N_2 gas would dissolve in 1 liter of water? Assume that N_2 exerts a partial pressure of 0.987 bar. Given Henry's law constant for N_2 at 293 K is 76.48 kbar.

762) Calculate the mole fraction of benzene in solution containing 30% by mass in carbon tetrachloride.

763) $_{H_2}S$, a toxic gas with rotten egg like smell, is used for the qualitative analysis. If the solubility of H_2S in a water at STP is 0.195 mol/kg, calculate Henry's law constant.

764) Boiling point of water at 750 mm Hg is 99.63 ^oC. How much sucrose is to be added to 500 g of water such that it boils at 100^oC?

765) If the solubility product of Cus is $6\times\ 10^{-16}$, calculate the maximum molarity of CuS in aqueous solution.

766) Nalorphene($C_{19}H_{21}NO_3$), similar to morphine, is used to combat withdrawal symptoms in narcotic users. The dose of nalorphene generally given is 1.5 mg. Calculate the mass of 1.5×10^{-3} m aqueous solution required for the above dose.

767) Calculate the amount of benzoic acid (C_6H_5COOH) required for preparing 250 ml of 0.15 M solution in methanol.

768) Determine the amount of $CaCl_2$ (i = 2.47) dissolved in 2.5 litre of water such that its osmotic pressure is 0.75 atm at 27^oC.

769) Vapour pressure of water at 293 K is 17.535 mm Hg. Calculate the bvapour pressure of water at 293 when 25 g of glucose is dissolved in 450 g of water.

770) The vapour pressure of water is 12.3 kPa at 300 K. Calculate vapour pressure of 1 molal solution of a non-volatile solute in it.

771) A sample of drinking water was found to be severely contaminated with chloroform, ($CHCl_3$), supposed to be a carcinogen. The level of contamination was 15 ppm (by mass):
(i) express this in percent by mass,
(ii) determine the molality of chloroform in the water sample.

772) An aqueous solution of 2% non-volatile solute exerts a pressure of 1.004 bar at the normal boiling point of the solvent. What is the molecular mass of the solute?

773) Calculate the mass of a non-volatile solute (molecular mass 40 g mol^{-1}) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.

774) Suggest the most important type of intermolecular attractive interaction in the given pairs.
(i) n - hexane and n-octane,
(ii) I_2 and CCl_4,
(iii) $NaClO_4$ and water,
(iv) methanol and acetone,
(v) acetonitrile (CH_3CN) and (C_3H_6O).

775) Calculate the mass of urea (NH_2CONH_2) required in making 2.5 kg of 0.25 molal aqueous solution.

776) An antifreeze solution is prepared from 222.6 g of ethylene glycol ($C_2H_6O_2$) and 200 g of water. Calculate the molality of the solution. If the density of the solution is 1.072 g mL^{-1}, then what shall be the molarity of the solution?

777) 18 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a saucepan. At what temperature will water boil at 1.013 bar? K_b for water is 0.52 K kg mol^{-1}.

778) 200 cm^3 of an aqueous solution of a protein contains 1.26 g of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57 x 10^{-3} bar. Calculate the molar mass of the protein.

779) 2g of benzoic acid (C_6H_5COOH) dissolved in 25 g of benzene shows a depression in freezing point equal to 1.62 K. Molar depression constant for benzene is 4.9K kg mol^{-1}. What is the percentage association of acid if it forms double molecules (dimer) in solution?

780) 45 g of ethylene glycol ($C_2H_4O_2$) is mixed with 600 g of water. Calculate
(i) the freezing point depression and
(ii) the freezing point of the solution.

781) The depression in freezing point of water observed for the same molar concentrations of acetic acid, trichloroacetic acid and trifluoroacetic acid increases in the order as stated above. Explain briefly.

782) Based on solute-solvent interactions, arrange the following in the increasing order of solubility in n-octane and explain. Cyclohexane, KCl, CH_3OH, CH_3CN.

783) Amongst the following compounds, identify which are insoluble, partially soluble and highly soluble in water?
(i) Phenol
(ii) Toluene
(iii) Formic acid
(iv) Ethylene glycol
(v) Chloroform
(vi) Pentanol

784) What is meant by positive and negative deviations from Raoult's law and how is the sign of $\triangle_{mix}$ H related to positive and negative deviations from Raoult's law?

785) At 300 K, 36 g of glucose present in a litre of its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of the solution is 1.52 bar at the same temperature, what would be its concentration?

786) Calculate the normal boiling point of a sample of sea water containing 3.5% of NaCl and 0.13% of $MgCl_2$ by mass. Given Kb (water) = 0.52 K kg mol^{-1} (Mol. Wt. of NaCl = 58.5 g mol^{-1}. $MgCl_2$ = 95g mpl^{-1})

787) At 25°C the saturated vapour pressure of water is 3.165 kPa (23.75 mm Hg). Find the saturated vapour pressure of a 5% aqueous solution of urea (carbamide) at the same temperature. (molar mass of urea = 60.05 g mol^{-1})

788) What would be the molar mass of a compound if 6.21 g of it dissolved in 24.0 g of chloroforms a solution that has a boiling point of 68.04°C. The boiling point of pure chloroform is 61.7 °C and the boiling point elevation constant, k_b for chloroform is 3.63 °C/m.

789) What mass of ethylene glycol (molar mass = 62.0 g mol^{-1}) must be added to 5.50 kg of water to lower the freezing point of water from 0°C to -10°C? (K_f for water = 1.86 K kg mol^{-1})

790) Calculate the amount of sodium of chloride which must be added to one kilogram of water so that the freezing point of water is depressed by 3 K. [Given: K_f = 1.86 K kg mol^{-1}, Atomic mass: Na = 23.0 , Cl = 35.5]

791) A solution of urea in water has a boiling point of 373.128 K. Calculate the freezing point of the same solution. [Given: For water, K_f = 1.86 Km^{-1}, K_b = 0.52 Km^{-1}]

792) 0.1 mole of acetic acid was dissolved in 1 kg of benzene. Depression in freezing point of benzene was determined to be 0.256 K. what conclusion can you draw about the state of the solute in solution? [Given: K_f for benzene = 5.12 K/m]

793) Calculate the freezing point depression expected for 0.0711 m aqueous solution of Na_2SO_4. If this solution actually freezes at -0.320 °C, what would be the value of van't Hoff factor? (K_f for water is 1.86 °C mol^{-1}).

794) Calculate the temperature at which a solution containing 54 g of glucose, ($C_6H_{12}O_6$), in 250 g of water will freeze. (K_f for water =1.86 K kg mol^{-1})

795) A solution containing 8 g of a substance in 100 g of diethyl ether boils at 36.60 °C. whereas pure ether boils at 35.60 °C. Determine the molecular mass of the solute. (For ether , Kb = 2.02 K kg mol^{-1})

796) A 0.1539 molal aqueous solution of cane sugar (mol. mass = 342 g mol^{-1}) has a freezing point of 271 K while the freezing point of pure water is 273.15 K. what will be the freezing point of an aqueous solution containing 5 g of glucose (mol. mass = 180 g mol^{-1}) per 100 g of solution?

797) An anti-freeze solution is prepares from 222.6 g of ethylene glycol ($C_2H_6O_2$), and 200 g of water. Calculate the molality of the solution. If the density of the solution is 1.072 g mL^{-1} then what shall be the molarity of the solution?

798) A mongst the following compounds, identify which are insoluble, partially soluble in water?
(i) phenol , (ii) toluene,
(iii) formic acid, (iv) ethylene glycol,
(v) chloroform, (vi) pentanol.

799) Calculate the freezing point of a 1 molar aqueous solution of KCl.
(Density of solution = 1.04 g cm^{-3},
K_f = 1.86 K kg mol^{-1}, At wt. of K = 39 and Cl = 35.5)

800) Benzene (C_6H_6) and Toluene (C_7H_8) form a nearly ideal solution. At 313 K, the vapour pressure of pure benzene is 150 mm Hg and of pure benzene is 150 mm Hg and pure toluene is 50 mm Hg. Calculate the vapour pressure of a mixture of these containing equal masses at 313 K.

801) Conc. H_2SO_4 has a density of 1.9 gmL^{-1} and is 99 % by weight. calculate the molarity of is 99% by weight. Calculate the molarity of H_2SO_4 (Mol . Wt pf H_2SO_4 = 98 g mol^{-1}).

802) An aqueous solution freezes at 272.4, while pure water at 273 K, determine the
(i) molality of the solution,
(ii) boiling point of solution,
(iii) lowering of vapour pressure of water at 298 K.
Given K_f = 1.86 K kg mol^{-1}, K_b = 0.512 K kg mol^{-1} and vapour pressure of pure water is 23.757 mm Hg)

803) A solution of sucrose (Mol. Wt. 342) is prepared by dissolving 68.4 g of it per litre of solution. What is osmotic pressure at 300 K? (R = 0.0821 L atm K^{-1} mol^{-1})

804) An aqueous solution of 3.12 g of $BaCl_2$ in 250 g of water is found to boil at 100.0832°C. Calculate the degree of dissociation of $BaCl_2$. [K_b (H_2O) = 0.52 K/m.]

805) How can you remove the hard calcium carbonate layer of the egg without damaging its semi-permeable membrane? Can this egg be inserted into a bottle with a narrow neck without distorting its shape? Explain the process involved.

806) (a) Assuming complete ionization, calculate the expected freezing point of solution prepared by dissolving 6.00 g of Glauber's salt, Na_2SO_4. $10H_2O$ in 0.1 kg of H_2O. (K_f for H_2O = 1.86 K kg mol^{-1}) [At. mass of Na = 23, S = 32, O= 16, H = 1 u].
(b) Two liquids X and Y boil at 110 °C and 130 °C respectively. Which of them has higher vapor pressure at 50°C ?

807) The Henry's law constant for oxygen dissolved in water is 4.34×10^4atm at 25°C. If the partial pressure of oxygen in air is 0.2atm under atmospheric conditions, calculate the concentration (in moles per litre) of dissolved oxygen in water in equilibrium with air at 25°C.

808) Calculate of solubility of a gas at a particular pressure from the known solubility at some other pressure (at the same temperature).

809) Quantitative effect of temperature on the solubility of a gas in lIquid

810) Alternative definition of Henry's law

811) Solution of Solids in Solids(Solid Solution)

812) Konowaloff's rule.

813) Relationship between mole fraction of the components of an ideal solution in the liquid phase and vapour phase.

814) Benzene (C_6H_6) and (C_7H_8) form a nearly ideal solution at 313k. The vapour pressure of pure alcohol and toluene are 160mm of Hg and 60mm of Hg respectively. Calculate the partial pressure of benzene and toluene and the total pressure over the following:
(i) containing equal weight of benzene and toluene
(ii) containing 1 mole of benzene and 4 moles of toluene
(iii) containing equal molecules of benzene and toluene.

815) 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 ^oC. Determine the molar mass of this compound. (Boiling point of pure benzene = 80.10 ^oC and K_b for benzene = 2.53 ^oC kg mol^{-1})

816) Calculate the mass of 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})

817) 0.1 mol of sugar was dissolved in 1 kg of water. The freezing point of the solution was found to be 272.814 K. What conclusion would you draw about the molecular state of sugar ? K_f for water is 1.86 K kg mol^{-1}

818) The freezing point depression of 0.1 m NaCl solution is 0.372°C. What conclusion would you draw about its molecular state ? K_f for water is 1.86 K kg mol^{-1}

819) Which of the following solution will have the highest and which will have the lowest freezing point and why ?
(i) 0.1 M NaCl solution
(ii) 0.1 M glucose solution
(iii) 0.1 M $BaCl_2$ solution

820) 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})

821) 6.90 M solution of KOH in water contains 30% by mass of KOH. Calculate density and molality of KOH solution. [K = 39, °= 16, H = 1]

822) Commercially available sample of H_2SO_4 is 15% by weight. Its density is.$1.10g \quad mL^{-1}$ Calculate its molarity.

823) A sugar syrup of weight 214.2 g contains 34.2 g of sugar $(C_{12}H_{22}O_{11})$. Calculate (i) molal concentration and (ii) mole fraction of sugar syrup.

824) Calculate the molarity of pure water (density of water $= 1 \quad g \quad mL^{-1}$).

825) Two liquids X and Y on mixing form an ideal solution. The vapour pressure of the solution containing 3 mol of X and 1 mol of Y is 550 mm of Hg. But when 4 mol of X and 1 mol of Y are mixed, the vapour pressure of the solution thus formed is 560 mm of Hg. What will be the vapour pressure of the pure X and pure Y at this temperature?

826) The vapour pressure of water at $25^\circ C$ IS 23.755 torr and the vapour pressure of a solution containing 5 g of solute X in 100 g of water is 23.402 torr. Calculate the molar mass of X.

827) At 298 K, the vapour pressure of water is 23.75 mm Hg. Calculate the vapour pressure at the same temperature over 5% aqueous solution of urea.

828) A solution containing 8 g of a substance in 100 g of diethyl ether boils at $36.86^{\circ} C$, whereas pure ether boils at $35.60^{\circ} C$. Determine the molecular mass of the solute. (For ether $K_b = 2.02 K\ kg\ mol^{-1}$).

829) A solution containing 0.5 g of KCl dissolved in 100 g of water freezes at $-0.24^{\circ} C$. Calculate the degree of dissociation of the salt $(K_f \quad for \quad water = 1.86^{\circ} C)$.

830) Calculate the freezing point depression expected for 0.711 m aqueous solution of Na_2So_4 . If this solution actually freezes at $-0.320^{\circ} \quad C$, what would be the value of Van't Hoff factor?
$(K_f\ for\ water = 1.86^{\circ}\ C\ m^{-1})$

831) Calculate the amount of $CaCl_2$ (molar mass 111 g mol^{-1}) which must be added to 500 g of water to lower the freezing point by 2K, assuming $CaCl_2$ is completely dissociated. (Kj = 1.86 K kg mol^{-1})

832) Calculate the boiling point of solution when 2 g of $Na_2So_4\ (M = 142\ g\ mol^{-1})$ was dissolved in 50 g of water, assuming Na_2So_4 undergoes complete ionization.
$(K_b\ for\ water = 0.52\ K\ kg\ mol^{-1})$

833) If vapour pressure of liquid A is greater than the vapour pressure of liquid B, then boiling point of A is lower than that of liquid B. Do you agree with the statement? Explain.

834) Why is melting point of a substance used as criterion for testing the purity of a substance?

835) Why water cannot be separated completely from ethanol by fractional distillation?

836) 0.052 g of glucose $(C_6H_{12}O_6)$ has been dissolved in 80.2 g of water. Calculate
(i) the boiling point and
(ii) freezing point of the solution $(K_f = 1.86\ K\ m^{-1},\ K_b = 5.2\ K\ m^{-1})$.

837) A motor vehicle radiator was filled with 8 L of water to which 2 L of methyl alcohol (density 0.8 g/mL) were added. What is the lowest temperature at which the vehicle can be parked outdoors without a danger that water in the radiator will freeze? $K_f \quad of \quad water = 1.86 \quad K \quad m^{-1})$

838) Deep sea divers have been using the compressed air containing N_2 in addition to O_2 for breathing. When the sea diver breathes in compressed air at a depth, more N_2 dissolves in the blood and other body fluids than would dissolve at the surface because the pressure at the depth is far greater than surface atmospheric pressure. When the diver comes towards the surface, the pressure decreases and N_2 comes out of the body quickly forming bubbles in the blood stream which restrict blood flow and affect the transmission of nerve impulses. This results into a condition called 'the bends' which is dangerous and painful. To avoid this condition, professionals now use air diluted with helium. As a student of chemistry, can you analyse as to why helium is used?

839) Common salt $(NaCI)$ and calcium chloride $(CaCI_2)$ are used to clear snow on the roads. The cost of sodium chloride and calcium chloride is almost the same. As a student of chemistry which salt would you prefer to purchase and why?

840) Jagan went to Srinagar with his friend. He noticed that the taxi drivers always add ethylene glycol as a coolant in the radiator of the taxi and not water. He asked his driver, how much ethylene glycol he generally adds to the radiator. The taxi driver told him that he generally adds 30% ethylene glycol solution. On that day, the temperature of the valley was $-10^{\circ} C$.
Answer the following questions:
(i) What is the role ethylene glycol when added to water?
(ii) Is the amount of ethylene glycol sufficient to avoid the freezing of water in car radiator when the temperature of the valley was $-10^{\circ} C$?

841) Rekha observed that her mother placed shrinked or dried vegetables in water before cutting these for cooking. After sometime, these vegetables looked fresh.
Answer the following questions:
(i) Why did Rekha's mother place the shrinked or dried vegetables in water?
(ii) What is the name of the process used and define it.
(iii) Would the temperature increase accelerate the process or not?

842) State Henry's law. What is the effect of temperature on the solubility of a gas in a liquid?

843) Calculate the boiling point of solution when 4 g of $MgSO_4$ (M = 120 g mol^{-1}) was dissolved in 100 g of water, assuming $MgSO_4$ undergoes complete ionization. (K_b for water = 0.52 K kg mol^{-1})

844) A 5 percent solution (by mass) of cane-sugar (M.W. 342) is isotonic with 0.877% solution of substance X. Find the molecular weight of X.

845) Calculate the boiling point of a 1M aqueous solution (density 1.04 g mL^{-1}) of potassium chloride (K_b for water = 0.52 K kg mol^{-1}, Atomic masses : K = 39 u, Cl = 35.5 u). Assume, potassium chloride is completely dissociated in solution.

846) At 10 $^\circ$ C, the average osmotic pressure of blood is 8.8 atm. Find the total concentration of the various constituents in the blood. Assuming that the concentration is the same as the molarity, find the freezing point of the solution (K_f for water = 1.86 K kg mol^{-1})

847) What mass of NaCl must be dissolved in 65.0 g of water to lower the freezing point of water by 7.50°C? The freezing point . depression constant (Kf) for water is 1.86°C/mol. Assume van't Hoff factor for NaCl is 1.87. (molar mass of NaCl = 58.5 g mol^{-1}).

848) Calculate the boiling point elevation for a solution prepared by adding 10 g of $CaCl_2$ to 200 g of water. (Kb for water = 0.52 K kg mol^{-1}, molar mass of $CaCl_2$ = 111 g mol^{-1}).

849) Some ethylene glycol, $HOCH_2CH_2OH$, is added to your car's cooling system along with 5 kg of water. If the freezing point of water-glycol solution is -15.0^0 C, what is the boiling point of the solution? (Kb = 0.52 K kg mor $^{-1}$and K f = 1.86 K kg mol^{-1} for water)

850) At 25°C, the saturated vapour pressure of water is 3.165 k Pa (23.75 mm Hg). Find the saturated vapour pressure of a 5% aqueous solution of urea (carbamide) at the same temperature. (molar mass of urea = 60.05 g mol^{-1}).

851) Calculate the freezing point of a solution containing 18 g glucose, $C_6H_{12}O_6$ and 68.4 g sucrose, ($C_6H_{12}O_6$) in 200 g of water. The freezing point of pure water is 273 K and K f for water is 1.86 K mol^{-1} .

852) The boiling point elevation of 0.30 g acetic acid in 100 g benzene is 0.0633 K. Calculate the molar mass of acetic acid from this data. What conclusion can you draw about the molecular state of the solute in the solution? (Given, K_b for benzene = 2.53 K kg mol^{-1}).

853) Calculate the depression in freezing point of water when 20.0 g of $CH_3CH_2CHClCOOH$ is added to 500 g of water. (Given, Ka = 1.4 x 10-3, K_f = 1.86 K kg mol^{-1}).

854) A 5% solution by mass of cane sugar, $C_{12}H_{22}O_{11}$ (molecular weight 342) is isotonic with 0.877% solution of substance 'X'. Find the molecular weight of substance X.

855) Calculate (i) molality (ii) molarity and (iii) mole fraction of KI if the density of 20% (mass/mass) aqueous KI is 1.202 g mL^{-1}
(i) As density and mass % is given, so find the mass of solute and solvent (as x% solution contains xg solute in (100 - x)g solvent).
(ii) Find the volume of the solution, using the relation Volume = $\frac{Mass}{Density}$
(iii) Recall the formulae of molality, molarity and mole fraction to calculate them.

856) (i) Calculate the molarity of a solution containing 4.9 g of H_2SO_4 in 500 cm^3 of the solution.
(ii) A solution contains 25% water, 25% ethanol and 50% acetic acid by mass. Calculate the mole fraction of each component.

857) (i) Define the following terms: (a) molarity (b) molality,
(ii) What is the molality of a urea solution in which 0.0100 g of urea [$(NH_2)_2CO$] is added to 0.3000 dm^3 of water at STP?

858) Suggest the most important type of intermolecular interaction in the following pairs.
(i) n-hexane and n-octane
(ii) I_2 and CCl_4
(iii) $NaClO_4$ and water
(iv) Methanol and acetone
(v) Acetonitrile (CH_3CN)and acetone (C_3H_6O)
(vi) Water and alcohol

859) At 25°C the vapour pressures of benzene (C_6H_6) and toluene (C_7H_8) are 93.4 torr and 26.9 torr, respectively. A solution is made by mixing 35.0 g of benzene and 65.0 g of toluene. At what applied pressure, in torr, will this solution boil at 25°C?

860) At some temperature, the vapour pressure of pure C_6H_6 is 0.256 bar and that of pure $C_6H_8CH_3$(toluene) is 0.0925 bar. If the mole fraction of toluene in solution is 0.6. Then,
(i) what will be the total pressure of the solution?
(ii) what will be the mole fraction of each component in vapour phase?

861) Give reasons for the following:
(a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macro molecules such as proteins and polymers.
(b) Aquatic animals are more comfortable in cold 1 water than in warm water.
(c) Elevation of boiling point of 1M KCl solution is nearly double than that of 1M sugar solution.

862) 6.8 g of a compound is dissolved in 100 g water. Calculate osmotic pressure of this solution at 298 K, when boiling point of solution is 100.11°C, Kb for water is 0.52 K kg mol^{-1} and R = 0.082 L atm K^{-1} mol^{-1}

863) A solution containing 15g urea (molar mass = 60 g mol^{-1}) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol^{-1}) in water. Calculate the mass of glucose present in one litre of its solution.

864) Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is depressed by 2 K. (K_f for water = 1.86 K kg mol^{-1})

865) The freezing point of benzene decreases by 0.45°C when 0.2 g of acetic acid is added to 20 g of benzene. If acetic acid associates to form a dimer in benzene, percentage association of acetic acid in benzene will be (K_f for benzene = 5.12K kg mol^{-1})

866) 15.0 g of an unknown molecular material is dissolved in 450 g of water. The resulting solution freezes at - 0.34 ° C. What is the molar mass of the material? [K_f for water = 1.86 K Kg mol^{-1}]

867) Calculate the freezing point of an aqueous solution 10.5 g of $MgBr_2$ in 200 g of water, assuming complete ionisation of $MgBr_2$. [Molar mass of $MgBr_2$ = 184 g mol^{-1}, KI of H2 0 = 1.86 K/m]

868) Discuss biological and industrial importance of osmosis.

869) Explain with example the concept of minimum boiling azeotropes and maximum boiling azeotropes.

870) (i) Why does the use of pressure cooker reduce cooking time?
(ii) How does van't Hoff factor helps in the determination of degree of association or dissociation of a solute in solution?

871) (i) Define molality in terms of elevation in boiling point.
(ii) Derive the relation between elevation in boiling point and the molecular mass of a non-volatile solute.

872) (i) If the membrane used for the determination of osmotic pressure is slightly torn, how will it influence the measured value of osmotic pressure?
(ii) The boiling point of benzene is 353.23K. When 1.80g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point is raised to be 354.11K. Calculate the molar mass of the solute. (K_b for benzene is 2.53K kg mol^{-1})

873) At what partial pressure, oxygen will have a solubility of 0.05 g L^{-1} in water at 293 K? [Henry's constant (K_H) for O_2 in water at 293 K is 34.86 k bar. Assume the density of the solution to be same as that of the solvent.]

874) State the law correlating the pressure of a gas and its solubility in a liquid. State an application of this law.

875) When dehydrated fruits and vegetables are placed in water, they slowly swell and return to original shape. Why? What is the effect of temperature on this process? Explain.

876) What amount of water is required to make 10% ethanol in water solution using 10 mL of pure ethanol?

877) If 1 L of a solution contains 5 mL of a certain disinfectant then express this concentration in ppm.

878) At same temperature, H_2 is more soluble in water than He. Which of them has higher value of K_H and why?

879) The vapour pressure of ethyl alcohol at 298 Kis 20 mm of Hg. Its mole fraction in a solution with methyl alcohol is 0.40. What is its vapour pressure in solution if the mixture obeys Raoult's law?

880) A 0.5% aqueous solution of KCl was found to be freeze at -0.24°C. Calculate the van't Hoff factor and degree of dissociation of the solute at this concentration. (K_f for water = 1.86 Kkg mol^{-1}).

881) A solution of glucose (Molar mass = 180 g mort) in water has a boiling point of 100.20 °C. Calculate the freezing point of the same solution. Molal constants for water K_f and K_b are 1.86 K kg molt and 0.512 K kg mol^{-1} respectively.

882) The freezing point of benzene decreases by 2.12 K when 2.5 g of benzoic acid (C_6H_5COOH) is dissoled in 25 g of benzene. If benzoic acid forms a dimer in benzene, calculate the van't Hoff factor and the percentage association of benzoic acid. (K_f for benzene = 5.12 K kg mol^{-1})

883) A solution 0.1 M of Na_2SO_4 is dissolved to the extent of 95%. What would be its osmotic pressure at 27°C? (R = 0.0821 L atm K^{-1} mol-1)

884) Calculate the mass of NaCl (molar mass = 58.5 g mol^{-1}) to be dissolved in 37.2 g of water to lower the freezing point by 2°C, assuming that NaCl undergoes complete dissociation.
[K_f for water = 1.86 K kg mol^{-1}]

885) What is the molality of ammonia in a solution containing 0.85 g of NH_3 in 100 mL of a liquid of density 0.85 g cm^3?

886) What is the mass of precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 5.8% solution of NaCl?
[Ag = 108.0, N = 14, O = 16, Na = 23, Cl = 35.5]

887) How does mole fraction of HCl gas in its solution in cyclohexane varies with partial pressure of HCl(g)? Show with the help of graph? How can we calculate K_H with the help of graph? Name two factors which affect the value of K_H?

888) Vapour pressure of water at 20°C is 17.5 mm Hg, Calculate the vapour pressure of water at 20°C when 15 g glucose (molecular weight 180 g mol^{-1}) is dissolved in 150 g of water.

889) A solution is prepared by dissolving 5 g non-voltale solute in 95 g of water. It has vapour pressure of 23.375 mm ofHg at 25°C. Calculate the molar mass of solute. (Vapour pressure of pure water at 25 °C = 23.75 mm of Hg).

890) Give reasons for the following
(i) Aquatic species are more comfortable in cold water than warm water.
(ii) At higher altitudes people suffer from anoxia resulting in inability to think.

891) The vapour pressure of pure liquid X and pure liquid Y at 25°C are 120 mm Hg and 160 mm Hg respectively. If equal moles of X and Y are mixed to form an ideal solution, calculate the vapour pressure of the solution.

892) A glucose solution which boils at 101.04°C at 1 atm. What will be relative lowering of vapour pressure of an aqueous solution of urea which is equimolal to given glucose solution? (Given: K for water is 0.52 K kg mol^{-1})

893) 0.3 g acetic acid (M= 60 g mol^{-1}) dissolved in 30 g of benzene shows a depression in freezing point equal to 0.45°K. Calculate the percentage association of acid if it forms a dimer in the solution.
(Given: K, for benzene = 512 K kg mol^{-1})

894) When 195 g of F-CH_2-COOH (Molar mass =78 g mol^{-1}), is dissolved in 500 g of water, the depression in freezing point is observed to be 1°C. Calculate the degree of dissociation of F-CH_2-COOH. (Given: K_f for water = 1.86 K kg mol^{-1}) =

895) If benzoic acid (M=122 g mol^{-1}) is associated into a dimer when dissolved in benzene and the osmotic pressure of a solution of 61 g of benzoic acid in 100 mL benzene is 65 atm at 27°C, then what is the percentage association of benzoic acid ? (Given: R=0.0821 L atm K^{-1} mol^{-1})

896) The freezing point of a solution containing 5g of benzoic acid (M=122 g mol^{-1}) in 35g of benzene is depressed by 2.94 K. What is the percentage of association? (K, for benzene =4.9 K kg mol^{-1})

897) (i) Why is boiling of 1 M NaCl solution more than that of 1 M glucose solution?
(ii) A non-volatile solute ' X ' (molar mass =50 $gmol^{-1}$) when dissolved in 78 g of benzene reduced its vapour pressure to 90%.
Calculate the mass of X dissolved in the solution.
(iii) Calculate the boiling point elevation for a solution prepared by adding 10 g of $MgCl_2$ to 200 g of water assuming $MgCl_2$ is completely dissociated.
(K_b for water =0.512 $Kkgmol^{-1}$, molar mass of $MgCl_2$=95 g mol^{-1}).

898) (i) Why is the value of van't Hoff factor ethanoic acid in benzene close to 0.5 ?
(ii) Determine the osmotic pressure of a solution prepared by dissolving $2.32 \times 10^{-2}\ \mathrm{g}$ of $\mathrm{K_2SO_4}$ in 2 L of solution at $25^{\circ}\mathrm{C}$, assuming that $\mathrm{K_2SO_4}$ is completely dissociated. ($R = 0.082\ \mathrm{L\ atm\ K^{-1}\ mol^{-1}}$, Molar mass $\mathrm{K_2SO_4} = 174\ \mathrm{g\ mol^{-1}}$).
(iii) When 25.6 g of sulphur was dissolved in 1000 g of benzene, the freezing point lowered by 0.512 K . Calculate the formula of Sulphur (S_x) .
(Kf for benzene $= 5.12\ \mathrm{K\ kg\ mol^{-1}}$ Atomic mass of sulphur $= 32\ \mathrm{g\ mol^{-1}}$) .

Case Study Questions 14 x 4 = 56

899) **Read the passage given below and answer the following questions:**
The concentration of a solute is very important in studying chemical reactions because it determines how often molecules collide in solution and thus indirectly determine the rate of reactions and the conditions at equilibrium. There are several ways to express the amount of solute present in a solution. The concentration of a solution is a measure of the amount of solute that has been dissolved in a given amount of solvent or solution. Concentration can be expressed in terms of molarity, molality, parts per million, mass percentage, volume percentage, etc.
The following questions are multiple choice questions. Choose the most appropriate answer:
(i) The molarity (in mol L^{-1}) of the given solution will be
(a) 1.56 (b) 1.89 (c) 0.263 (d) 1.44
(ii) Which of the following is correct relationship between mole fraction and molality?
(a) $x_2 = \frac{mM_1}{1+mM_1}$ (b) $x_2 = \frac{mM_1}{1-mM_1}$
(c) $x_2 = \frac{1+mM_1}{mM_1}$ (d) $x_2 = \frac{1-mM_1}{mM_1}$
(iii) Which of the following is temperature dependent?
(a) Molarity (b) Molality
(c) Mole fraction (d) Mass percentage
(iv) Which of the following is true for an aqueous solution of the solute in terms of concentration?
(a) 1 M = 1 m (b) 1M > 1m
(c) 1M < 1 m (d) Cannot be predicted

900) **Read the passage given below and answer the following questions:**
At 298 K, the vapour pressure of pure benzene, C_6H_6 is 0.256 bar and the vapour pressure of pure toluene $C_6H_5CH_3$ is 0.0925 bar. Two mixtures were prepared as follows:
(i) 7.8 g of C_6H_6 + 9.2 g of toluene
(ii) 3.9 g of C_6H_6 + 13.8 g of toluene
The following questions are multiple choice questions. Choose the most appropriate answer:
(i) The total vapour pressure (bar) of solution 1 is
(a) 0.128 (b) 0.174 (c) 0.198 (d) 0.258
(ii) Which of the given solutions have higher vapour pressure?
(a) I (b) II
(c) Both have equal vapour pressure (d) Cannot be predicted
(iii) Mole fraction of benzene in vapour phase in solution 1 is
(a) 0.128 (b) 0.174 (c) 0.734 (d) 0.266
(iv) Solution I is an example of a/an
(a) ideal solution
(b) non-ideal solution with positive deviation
(c) non-ideal solution with negative deviation
(d) can't be predicted

901) **Read the passage given below and answer the following questions:**

An ideal solution may be defined as the solution which obeys Raoult's law exactly over the entire range of concentration. The solutions for which vapour pressure is either higher or lower than that predicted by Raoult's law are called non-ideal solutions.

Non-ideal solutions can show either positive or negative deviations from Raoult's law depending on whether the A-B interactions in solution are stronger or weaker than A - A and B - B interactions.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Which of the following solutions is/are ideal solution(s)?

(i) Bromoethane and iodoethane (ii) Acetone and chloroform

(iii) Benzene and acetone (iv)n-heptane and n-hexane

(a) only 1 (b) I and II (c) II and III (d) I and IV

(ii) Which of the following is not true for positive deviations?

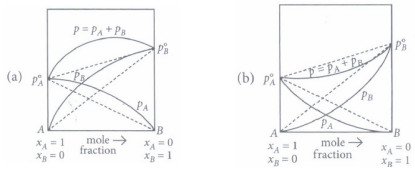
(a) The A-B interactions in solution are weaker than the A -A and B -B interactions.

(b) $P_A < P_A^\circ x_A \text{ and } P_B < P_B^\circ x_B$

(c) Carbon tetrachloride and chloroform mixture is an example of positive deviations.

(d) All of these

(iii) For water and nitric acid mixture which of the given graph is correct?



(C) Both of these (d) None of these

(iv) Water- HCl mixture

I. shows positive deviations II. forms minimum boiling azeotrope

III. shows negative deviations IV. forms maximum boiling azeotrope

(a) I and II (b) II and III

(c) I and IV (d) III and IV

902) **Read the passage given below and answer the following questions:**

The properties of the solutions which depend only on the number of solute particles but not on the nature of the solute are called colligative properties. Relative lowering in vapour pressure is also an example of colligative properties.

For an experiment, sugar solution is prepared for which lowering in vapour pressure was found to be 0.061 mm of Hg. (Vapour pressure of water at 20°C is 17.5 mm of Hg.)

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Relative lowering of vapour pressure for the given solution is

(a) 0.00348 (b) 0.061 (c) 0.122 (d) 1.75

(ii) The vapour pressure (mm of Hg) of solution will be

(a) 17.5 (b) 0.61 (c) 17.439 (d) 0.00348

(iii) Mole fraction of sugar in the solution is

(a) 0.00348 (b) 0.9965 (c) 0.061 (d) 1.75

(iv) The vapour pressure (mm of Hg) of water at 293 K when 25 g of glucose is dissolved in 450 g of water is

(a) 17.2 (b) 17.4 (c) 17.120 (d) 17.02

903) **Read the passage given below and answer the following questions:**

Few colligative properties are:

(a) relative lowering of vapour pressure: depends only on molar concentration of solute (mole fraction) and independent of its nature.

(b) depression in freezing point: it is proportional to the molal concentration of solution.

(c) elevation of boiling point: it is proportional to the molal concentration of solute.

(d) osmotic pressure: it is proportional to the molar concentration of solute.

A solution of glucose is prepared with 0.052 g at glucose in 80.2 g of water. (K_f = 1.86 K kg mol^{-1} and K_b = 5.2 K kg mol^{-1})

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Molality of the given solution is

(a) 0.0052 m **(b) 0.0036 m** **(c) 0.0006 m** **(d) 1.29 m**

(ii) Boiling point for the solution will be

(a) 373.05 K **(b) 373.15 K** **(c) 373.02 K** **(d) 372.98 K**

(iii) The depression in freezing point of solution will be

(a) 0.0187 K **(b) 0.035 K** **(c) 0.082 K** **(d) 0.067 K**

(iv) Mole fraction of glucose in the given solution is

(a) 6.28 x 10^{-5} **(b) 1.23 x 10^{-4}** **(c) 0.00625** **(b) 0.00028**

904) **Read the passage given below and answer the following questions:**

The solubility of gases increases with increase of pressure. William Henry made a systematic investigation of the solubility of a gas in a liquid. According to Henry's law "the mass of a gas dissolved per unit volume of the solvent at constant temperature is directly proportional to the pressure of the gas in equilibrium with the solution".

Dalton during the same period also concluded independently that the solubility of a gas in a liquid solution depends upon the partial pressure of the gas. If we use the mole fraction of gas in the solution as a measure of its solubility, then Henry's law can be modified as "the partial pressure of the gas in the vapour phase is directly proportional to the mole fraction of the gas in the solution":

(i) Henry's law constant for the solubility of methane in benzene at 298 K is 4.27 X 10^5 mm Hg. The solubility of methane in benzene at 298 K under 760 mm Hg is

(a) 4.27 x 10^{-5} **(b) 1.78 x 10^{-3}**

(c) 4.27 X 10^{-3} **(d) 1.78 x 10^{-5}**

(ii) The partial pressure of ethane over a saturated solution containing 6.56 x 10^{-2} g of ethane is 1 bar. If the solution contains 5.00 x 10^{-2} g of ethane then what will be the partial pressure (in bar) of the gas?

(a) 0.762 **(b) 1.312** **(c) 3.81** **(d) 5.0**

(iii) K_H (K bar) values for $Ar_{(g)}$, $CO_{2(g)}$, $HCHO_{(g)}$ and $CH_{4(g)}$ are 40.39, l.67, 1.83 x 10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility.

(a) $HCHO < CH_4 < CO_2 < Ar$ (b) $HCHO < CO_2 < CH_4 < Ar$

(c) $Ar < CO_2 < CH_4 < HCHO$ (d) $Ar < CH_4 < CO_2 < HCHO$

(iv) Which of the following statements is correct

(a) K_H increases with increase of temperature

(b) K_H decreases with increase of temperature

(c) K_H remains constant with increase oftemperature

(d) K_H first increases then decreases, with increase of temperature.

905) **Read the passage given below and answer the following questions:**

At the freezing point of a solvent, the solid and the liquid are in equilibrium. Therefore, a solution will freeze when its vapour pressure becomes equal to the vapour pressure of the pure solid solvent.

It has been observed that when a non-volatile solute is added to a solvent, the freezing point of the solution is always lower than that of the pure solvent. Depression in freezing point can be given as, $\Delta T_f = K_f m$

Where, K_f = Molal freezing point depression constant

or we can write, $\Delta T_f = \frac{K_f \times W_B \times 1000}{W_A^1 \times M_B}$

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: 0.1 M solution of glucose has same depression in the freezing point as 0.1 M solution of urea.

Reason: K_f for both has same value.

(ii) Assertion: Larger the value of cryoscopic constant of the solvent, lesser will be the freezing point of the solution.

Reason: Extent of depression in the freezing point depends on the nature of the solvent.

(iii) Assertion: The water pouch of instant cold pack for treating athletic injuries breaks when squeezed and NH_4NO_3 dissolves thus lowering the temperature.

Reason: Addition of non-volatile solute into solvent results into depression of freezing point of solvent.

(iv) Assertion: If a non-volatile solute is mixed in a solution then elevation in boiling point and depression in freezing point both will be same.

Reason: Elevation in boiling point and depression in freezing point both depend on number of particles of solute.

906) **Read the passage given below and answer the following questions:**

According to Raoult's law, the partial pressure of two components of the solution may be given as:

$p_A = p_A^\circ x_A \text{ and } p_B = p_B^\circ x_B$

For an ideal solution (obeys Raoult's law always)

$\Delta H_{\text{mix}} = 0, \Delta V_{\text{mix}} = 0$

All solutions do not obey Raoult's law over entire range of concentration. These are known as non-ideal solutions.

For non-ideal solutions, $p_A \neq p_A^\circ x_A \text{ or } p_B \neq p_B^\circ x_B$

Positive deviation $\Rightarrow p_A > p_A^\circ x_A \text{ and } p_B > p_A^\circ x_B$

Negative deviation $\Rightarrow p_A < p_A^\circ x_A \text{ and } p_B < p_B^\circ x_B$

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statemeht but reason is correct statement.

(i) Assertion: An ideal solution obeys Raoults law.

Regson : In an ideal solution, solute-solute as well as solvent-solvent interactions are similar to solutesolvent interactions.

(ii) Assertion: Acetone and aniline show negative deviations.

Reason: H-bonding between acetone and aniline is stronger than that between acetone-acetone and aniline-aniline.

(iii) Assertion: The solutions which show negative deviations from Raoult's law are called maximum boiling azeotropes.

Reason: 68% nitric acid and 32% water by mass form maximum boiling azeotrope.

(iv) Assertion: ΔH_{mix} and ΔV_{mix} are positive for an ideal solution.

Reason: The interactions between the particles of the components of an ideal solution are almost identical as between particles in the liquids.

907) **Read the passage given below and answer the following questions:**

The phenomenon of the flow of solvent through a semipermeable membrane from pure solvent to the solution is called osmosis.

Sometimes a pressure is applied to stop the process of osmosis, this is known as osmotic pressure. It is denoted by π . Osmotic pressure is expressed as: π = CRT

Since, osmotic pressure depends upon the molar concentration of solution, therefore it is a colligative property.

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: If red blood cells were removed from the body and placed in pure water, pressure inside the cells increases.

Reason: The concentration of salt content in the cells increases.

(ii) Assertion: When a solution is separated from the pure solvent by a semipermeable membrane, the solvent molecules pass through it from pure solvent side to the solution side.

Reason: Diffusion of solvent occurs from a region of high concentration to a region of low concentration solution.

(iii) Assertion: Two solutions having same osmotic pressure at a given temperature are called isotonic solutions.

Reason: Osmotic pressure is not a colligative property.

(iv) Assertion: The preservation of meat by salting and fruits by adding sugar protects against bacterial action.

Reason: A bacterium on salted meat or candid fruit loses water due to osmosis shrivels and ultimately dies.

908) **Read the, passage given below and answer the following questions:**

If some solute is added to a solvent, the boiling point of solution increases. This is known as elevation in boiling point.

$\Delta T_b = K_b m$,where, K_b = Molal elevation constant

$\Delta T_b \propto m$

Hence, it is a colligative property.

Also, $K_b = \frac{MRT_b^2}{\Delta_{vap} H \times 1000}$

where, M= Molar mass of solvent

$\Delta_{vap} H$ = Enthalpy of vaporisation

Molar mass can also be calculated using elevation in boiling point.

$M_B = \frac{K_b \times W_B \times 1000}{\Delta T_b \times W_A}$

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: In a pressure cooker, the water is brought to boil. The cooker is then removed from the stove. Now on removing the lid of pressure cooker, the water starts boiling again.

Reason: The impurities in water bring down its boiling point.

(ii) Assertion: On dissolving 3.24 g of sulphur in 40 g of benzene, boiling point of solution get higher than that of benzene by 0.081 K, then the formula of sulphur is S_8. (K_b for benzene = 2.53 K kg mol

Reason: Molecular mass of sulphur comes out to be 253.

(iii) Assertion: When sugar is added to water, boiling point of water increases.

Reason: When a non-volatile solute is added to a solvent, elevation in boiling point is observed.

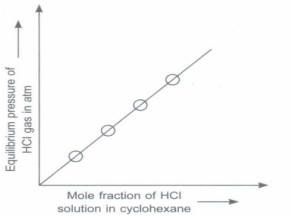
(iv) Assertion: Cooking time in pressure cookers is reduced.

Reason: Boiling point inside the pressure cooker in raised.

909) Solutions are homogeneous mixture of two or more substances. Ideal solution follow Raoult's law. The vapour pressure of each component is directly proportional to their mole fraction if both solute and solvent are volatile. The relative lowering of vapour pressure is equal to mole fraction of solute if only solvent is volatile.
Non-ideal solution form azeotropes which cannot be separated by 'tractional distillation. Henry's law is special case of Raoult's law applicable to gases dissolved in liquids.
Colligative properties depend upon number of particles of solute. Relative lowering of vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure are colligative properties which depend upon mole fraction of solute, molality and molarity of solutions. When solute undergoes either association or dissociation, molecular mass determined by colligative property will be abnormal.
van't Hofffactor is used in such cases which is ratio of normal molecular mass over observed molar mass.
(a) 50 ml of an aqueous solution of glucose (Molar mass 180 g/mol) contains 6.02×10^{22} molecules. What is molarity?
(b) Identify which liquid has lower vapour pressure at 90°C if boiling point of liquid 'A' and 'B' are 140°C and 180° respectively.
(c) What type of azeotropes are formed by nonideal solution showing negative deviation from Raoult's law?
(d) For a 5% solution of area (molar mass 60 g mol^{-1}), calculate the osmotic pressure at 300 K (R = 0.0821 L atm k^{-1})
(e) Predict the van't Hoff factor
(i) CH3 COOH dissolved in water,
(ii) dissolved in benzene.
(f) Why meat is preserved for longer time by salting?
(g) Why 0.1 M KCI has higher boiling point than 0.1 M glucose solution?

910) Solution playa very important role in our daily life. Alloys, homogeneous mixture of metal are solution of solid in solid. 1 ppm (parts per million) of fluoride ions prevent tooth decay. All intravenous injections must be isotonic with our body fluids, i.e. should have same concentration as blood plasma. Diabetic patients are more likely to have heart attack and high blood pressure due to higher glucose level in blood. Common salt increase blood pressure because Na^+ mixes up with blood. Aquatic species are more comfortable in cold water than warm water.
(a) 0.1 M glucose is not isotonic with 0.1 M KCI solutions. Why?
(b) A solution contains 5.85 g of NaCI (molar mass 58.5 g mol^{-1} per litre of the solution, has osmotic pressure 4.75 atm of 27°c Calculate the degree of dissociation of NaCI in this solution. [R = 0.0821 L atm K^{-1} mol^{-1}]
(c) What will happen if blood cells are placed in saline water (hypertonic solution)?
(d) Calculate the molality of ethanol solution in which mole fraction of water is 0.88.
(e) What will happen if pressure applied on solution side is more than osmotic pressure, when solvent and solution are separated by semipermeable membrane?

911) Observe the graph between mole fraction of HCI gas dissolved in cyclohexane Vs equilibrium pressure of HCI(g) and answer the questions based on graph.



(a) Which law is depicted by this graph?
(b) What is mathematical expression for Henry's law?
(c) What does slope represent?
(d) What is effect of temperature and pressure on solubility of gas in liquid?
(e) Name two factors which affect the value of K_H?

912) Observe the table in which azeotropic mixtures are given along with their boiling points of pure components and azeotropes and answer the questions that follow.

Some Azeotropic Mixtures					
A	B	Minimum Boiling Azeotropes	Boiling Points		
			A	B	Mixture Azeotropes
H_2O	C_2H_5OH	95.37%	373K	35 13K	351.15
H_2O	C_3H_7OH	71.69%	373K	370.19K	350.72
CH_3CQCH_3	CS_2	67%	329.25K	319.25K	312.30
A	B	Maximum Boiling Azeotropes	A	B	Mixture Azeotropes
H_2O	HCl	20.3%	373K	188K	383K
H_2O	HNO_3	68.0%	373K	359K	393.5K
H_2O	$HClO_4$	71.6%	373K	383K	476K

(a) What type of deviation is shown by minimum boiling azeotropes?
(b) Why does H_2O and HCl mixture form maximum boiling azeotropes?
(c) How can be separate azeotropic mixture?
(d) Give one example of ideal solution. What type of liquids form ideal solutions?
(e) What are azeotropes?
(f) What will be vapour pressure of maximum boiling azeotrops?
(g) At what mole fraction of A', vapour pressure of A (P^o_A = 450 mm) and vapour pressure of B (P^o_B = 200 mm) in solution will be equal if both A and B form ideal solution.

5 Marks 68 x 5 = 340

913) Calculate the mole fraction of ethylene glycol ($C_2H_6O_2$) in a solution containing 20% of $C_2H_6O_2$ by mass.

914) Calculate the depression in the freezing point of water when 10 g of $CH_3CH_2ChClCOOH$ is added to 250 g of water. $K_a = 1.4 \times 10\text{-}3$ $K_f = 1.86$ K kg mol^{-1}.

915) Heptane and octane form an ideal solution. At 373 K, the vapour pressures of the two liquid components are 105.2 kPa and 46.8 kPa respectively. What will be the vapour pressure of a mixture of 26.0 g of heptane and 35 g of octane?

916) A 5% solution (by mass) of cane sugar in water has freezing point of 271K. Calculate the freezing point of 5% glucose in water if freezing point of pure water is 273.15 K.

917) How many mL of 0.1 M HCl are required to react completely with 1 g mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar amounts of both?

918) A solution of glucose in water is labelled as 10% w/w, what would be the molality and mole fraction of each component in the solution? If the density of solution is 1.2 g mL^{-1}, then what shall be the molarity of the solution?

919) What role does the molecular interaction play in solution of alcohol and water?

920) Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 298 K are 200 mm Hg and 415 mm Hg respectively.
(i) Calculate the vapour pressure of the solution prepared by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at 298 K and (ii) mole fractions of each component in vapour phase.

921) 0.6 mL of acetic acid (CH_3COOH), having density 1.06 g mL^{-1}, is dissolved in 1 litre of water. The depression in freezing point observed for this strength of acid was 0.0205°C. Calculate the van't Hoff factor and the dissociation constant of acid.

922) 100 g of liquid A (molar mass 140 g mol^{-1}) was dissolved in 1000 g of liquid B (molar mass 180 g mol^{-1}). The vapour pressure of pure liquid B was found to be 500 torr. Calculate the vapour pressure of pure liquid A and its vapour pressure in the solution if the total vapour pressure of the solution is 475 torr.

923) Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 in 2 litres of water at 25°C, assuming that it is completely disassociated.

924) Define the following terms: (i) Mole fraction (ii) Molality (iii) Molarity (iv) Mass percentage.

925) Two elements A and B form compounds having molecular formula AB_2 and AB_4 . When dissolved in 20 g of benzene (C_6H_6), 1 g of AB_2 lowers the freezing point by 2.3 K whereas 1.0 g of AB_4 lowers it by 1.3 K. The molal depression constant for benzene is 5.1 K kg mol^{-1} . Calculate atomic masses of A and B.

926) Vapour pressure of pure acetene and chloroform at 328 K are 741.8 mm Hg and 632.8 mm Hg respectively. Assuming that they form ideal solution over the entire range of composition, plot p_{total}, $p_{chloroform}$, and $p_{acetone}$ as a function of $x_{acetone}$. The experimental data observed for different compositions of mixtures is :

$100 \times x_{acetone}$	0	11.8	23.4	36.0	50.8	58.2	64.5	72.1
$p_{acetone}$/mm Hg	0	54.9	110.1	202.4	322.7	405.9	454.1	521.1
$p_{chloroform}$/mm Hg	632.8	548.1	469.4	359.7	257.7	193.6	161.2	120.7

Plot this data also on the same graph paper. Indicate whether it has positive deviation or negative deviation from the ideal solution.

927) Define the term solution. How many types of solutions are formed? Write briefly about each type with an example.

928) A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapour pressure of 2.8 kPa at 298 K. Further, 18 g of water is then added to the solution, the new vapour pressure becomes 2.9 kPa at 298K. Calculate
(i) molar mass of the solute,
(ii) vapour pressure of water at 298K.

929) The air is a mixture of a number of gases. The major components are oxygen and nitrogen with approximate proportion of 20% is to 79% by volume at 298 K, respectively. The water is in equilibrium with air at a pressure of 10 atm. At 298 K, if the Henry's law constant for oxygen and nitrogen are 3.30 x 10^7 mm and 6.51 x 10^7 mm respectively, calculate the composition of these gases in water.

930) The vapour pressure of pure liquids A and B are 450 and 700 mm Hg respectively, at 350 K . Find out the composition of the liquid mixture if total vapour pressure is 600 mm Hg. Also find the composition of the vapour phase.

931) Benzene and toluene form ideal solution over the entire range of composition. The vapour pressures of pure benzene and toluene at 300 K are 50.71mm of Hg and 32.06 mm of Hg, respectively. Calculate the mole fraction of benzene in the vapour phase, if 80 g of benzene is mixed with 100 g of toluene.

932) Vapour pressure of pure water at 298 K is 23.8mm of Hg. 50 g of urea (NH_2CONH_2) is dissolved in 850 g of water. Calculate the vapour pressure of water for this solution and its relative lowering.

933) Calculate the mass of ascorbic acid (vitamin C, $C_6H_{80_6}$) to be dissolved in 75 g of acetic acid to lower its melting point by 1.5^0 C. (K_f for acetic acid = 3.9K kg mol^{-1})

934) (a) Explain the following:
(i) Henry's law about dissolution of a gas in a liquid.
(ii) Boiling point elevation constant for a solvent.
(b) A solution of glycerol ($C_3H_8O_3$) in water was prepared by dissolving some glycerol in 500 g of water. This solution as a boiling point of 100.42 ^oC. What mass of glycerol was dissolved to make this solution?
(K_b for water = 0.512 K kg mol^{-1})

935) (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 $MgBr_2$ = 184 g) (K_f for water 1.86 K kg mol^{-1})

936) (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)

937) (a) State the following:
(i) Henry's law about partial pressure of gas in a mixture.
(ii) Raoult's law in its general form in reference to solutions.
(b) A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 ML of water has an osmotic pressure of 0.335 torr at 25^oC. Assuming gene fragment is non-electrolyte, determine its molar mass.

938) (a)List any four factors on which the colligative properties of a solution depend.
(b)Calculate the boiling point of one molar aqueous solution (density 1.06 gmL^{-1}) of KBr.
[Given K b for H_2O = 0.52 K kg mol^{-1}, Atomic mass: K = 39, Br = 80]

939) (a) Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and how are they caused?
(b) What mass op NACl (molar mass = 58.5 g mol^{-1}) must be dissolved in 65 g of water to lower the freezing point by 7.50 ^oC? The freezing point depression constant, K_f for water is 1.86 K kg mol^{-1}. Assume van't Hoff factor for NaCl is 1.87.

940) (a) Explain why a solution of chloroform and acetone shows negative deviation from Raoult's law.
(b) Phenol associates in benzene to certain extent6 to form a dimer. A solution containing 20 g of phenol in 1.0 kg of benzene has its freezing point lowered by 0.69 K. Calculate the fraction of phenol that has dimerised.
[Given K_f for benzene = 5.1 Km^{-1}]

941) (a) Define the terms osmosis and osmotic pressure. What is the advantage of using osmotic pressure as compared to other colligative properties for the solutes in solutions?
(b) A solution prepared from 1.25 g of oil of wintergreen ?(methyl salicylate) in 90.0 g of benzene has a boiling point of 80.31 ^oC. Determine the molar mass of this compound. (Boiling point of pure benzene = 80.10 ^oC and K_b for benzene = 2.53 ^oC kg mol^{-1})

942) (a) What is van't Hoff factor?what possible values can it have if the solute molecules undergo dissociation?
(b) An aqueous solution containing 12.48 g of barium chloride in 1.0 kg of water boils at 373.0.0832 K. Calculate the degree of dissociation of barium chloride.
[Given K_b for H_2O = 0.52 K m^{-1}; Molar mass of BaCl2 = 208.34 g mol^{-1}]

943) (a) Define the following terms:
(i) mole fraction
(ii) van't Hoff factor
(b) 100 mg of a protein is dissolved in enough water to make 10.0 mL of a solution. If this solution has an osmotic pressure of 13.3 mm Hg at 15^oC, what is the molar mass of protein?
(R = 0.0821 L atm mol^{-1} K^{-1} and 760 mm Hg = 1 atm).

944) (a) What is meant by:
(i) Colligativge properties,
(ii) Molality of a solution?
(b) What concentration of nitrogen should be present in a glass of water at room temperature? Assume a temperature of 25^oC, a total pressure of 1 atmosphere and mole fraction of nitrogen in air of 0.78. [K_H for nitrogen = 8.42×10^7 M/mm Hg]

945) (a) State how the vapour pressure of a solvent is affected when a non-volatile solute is dissolved in it.
(b) A 5A% solution (by mass) of cane sugar in water has a freezing point of 271 K. Calculate the freezing point of 5% (by mass) solution of glucose in water. The freezing point of pure water is 273.15 K.
(Molar mass of cane sugar = 342 g mol^{-1} and molar mass of glucose = 180 g mol^{-1})

946) (a) Define the following terms:
(i) Molarity
(ii) Molal elevation constant (K_b)
(b) A solution containing 15 g urea (molar mass = 60 g mol^{-1}) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol^{-1}) in water. Calculate the mass glucose present in one litre of its solution.

947) (i) What type of deviation is shown by a mixture of ethanol and acetone? Give reason.
(ii) A solution of glucose (molar mass = 180 g mol^{-1}) in water is labelled as 10 % (by mass). What would be the molality and molarity of the solution?
(Density of solution = 1.2 g mL^{-1})

948) (a) Define the following terms:
(i) Ideal solution
(ii) Azeotrope
(iii) Osmotic pressure
(b) A solution of glucose ($C_6H_{12}O_6$) in water is labelled as 10% by weight. What would be the molality of the solution?
(Molar mass of glugose = 180 g mol^{-1})

949) (a) Define the following terms:
(i) Mole fraction,
(ii) Ideal solution.
(b) 15.0 g of an unknown molecular material is dissolved in 450 g of water. The resulting solution freezes at - 0.34 $^{\circ}$ C. What is the molar mass of the material? [K_f for water=1.86 K Kg mol^{-1}]

950) A doctor has advised a patient suffering from high blood pressure to take less quantity of the salt. On the basis of above para, give answer of following questions-
(i) What is the role of salt in increasing blood pressue?
(ii) How does less intake of salt help in reducing blood .pressure?
(iii) What is the value associated with this?

951) Savitri Devi is a poor tribal woman. Her daughter Mala is a student of science. Savitri Devi can not afford pressure cooker whenever she cooks dal (lentils), she generally adds salt to it after fully cooked. One day, Mala suggested her to add salt to the dal before cooking. Savitri Devi found that dal cooked faster when salt is added to it before cooking. Read above passage and answer the following questions :
(i) Why adding of salt to dal before cooking helped in faster cooking?
(ii) What values are associated with Mala's suggestions?

952) In a winter morning, Ramesh woke up to see that there is lot of snow in front of his house at Srinagar. His father suggested him to spread common salt to clear snow. Ramesh added common salt to clear snow.
(i) How does salt melts ice and clear the path?
(ii) Mention the values exhibited by Ramesh.

953) Abhay went to hills with family during winter break. After driving for more than six hours he filled the radiator of their car with water. Then his uncle suggested him to add some antifreeze. Abhay was surprised and asked for the reason. After reading the above passage answer the following questions.
(i) Define antifreeze with example.
(ii) State the reason given by uncle.
(iii) Name some solvents with lower freezing point than water.
(iv) Mention the values shown by Abhay.

954) (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 becames more than the osmotic pressure of solution?

955) (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?

956) (a) What is Van't Hoff factor? Under what conditions Van't Hoff factor is
(i) > 1
(ii) = 1
(iii) < 1. Explain.
(b) What will happen to the boiling point of a solution if mass of the solute dissolved is doubled and that of the solvent taken is halved?

957) A 10% solution (by mass) of sucrose in water has a freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water if the freezing point of pure water is 273.15 K.
(Given, molar mass of sucrose = 342 g mol^{-1} and molar mass of glucose = 180 g mol^{-1})

958) Bharat went to his grandfather's house during winter. As usual he went for fishing to a nearby lake. He noticed that it was more difficult to find fishes in winter than in summer. The fishes were deep inside the river, whereas during summer, they were near the surface and hence, he was able to catch fishes.
Answer the following questions.
(i) Why are fishes near the surface in summer than in the depth in winter?
(ii) Give any two examples where same reason (or law) is applicable.
(iii) What values can be derived about Bharat?

959) Neeru observed that her mother kept shrinked or dried vegetables in water before cutting these for cooking. After some time, these dried vegetables looked fresh and their shrinkness has been reduced. Answer the following questions.
(i) Why did Neeru's mother kept the dried vegetables in water?
(ii) Name this process and define it.
(iii) Would an increase in temperature accelerate the process?
(iv) Write the values associated with Neeru's mother.

960) What is the solubility of a solid in liquid? Describe the various factors on which the solubility of a solid in a liquid depends?

961) (i) Two liquids A and B boil at 155°Cand 190°C, respectively. Which of them has a higher vapour pressure at 80°C?
(ii) Heptane and octane form ideal solution. At 373 K, the vapour pressures of the two liquid components are 105.2kPa and 46.8 kPa, respectively. What will be the vapour pressure of a mixture of 26.0 g of heptane and 35.0 g of octane?
(iii) The vapour pressure of water is 12.3 kPa at 300 K. Calculate the vapour pressure of one molal solution of non - volatile, non - ionic solute in water.

962) (i) Explain why on addition of 1mol glucose to 1 litre water the boiling point of water increases.
(ii) Henry's law constant for CO_2 in water is 1.67×10^8 Pa at 298 K. calculate the quality of CO_2 in 500 ml of soda water when packed under 2.5 atm CO_2 pressure at 298 K.

963) (i) Define the following terms:
(a) Ideal solution
(b) Osmotic pressure
(ii) Calculate the boiling point elevation for a solution prepared by adding 10 g $CaCl_2$ to 200 g of water, assuming that $CaCl_2$ is completely dissociated. (K_b for water = 0.512K kg mol^{-1}, Molar mass of $CaCl_2$ = 111g mol^{-1}

964) (i) Why does a solution of chloroform and acetone show negative deviation from Raoult's law?
(ii) State how the vapour pressure of a solvent is affected, when a non-volatile solute is dissolved in it?
(iii) A solution of glucose ($C_6H_{12}O_6$) in water is labelled as 10%by weight. What would be the molality of the solution? (Molar mass of glucose = 180g mol^{-1})

965) (i) Two liquids X and Y boil at 100°C and 120°C respectively. Which of them has higher vapour pressure at 50°C and why?
(ii) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250 g water. (K_b for water = 0.512 K kg mol^{-1}; molar mass of NaCl = 58.44g)
(iii) Calculate the lowering of vapour pressure for 0.1 m aqueous solution of non -electrolyte at 75°C. ($\triangle$ H = 9.720 K cal mol^{-1}, P_2 = 742.96 torr)

966) (i) Give the differences (any three) between ideal and non-ideal solutions.
(ii) Which of the following solutions will have the highest and lowest osmotic pressure? and why?
(a) Sugar in water (b) Salt in water

967) (i) What is van't Hoff factor?
(ii) What possible values can it have if the solute molecules undergo dissociation?
(iii) An aqueous solution containing 12.48 g of barium chloride in 1.0 kg of water boils at 373.0832 K. Calculate the degree of dissociation of barium chloride. (Given, K_b for H_2O = 0.52 K m^{-1}; molar mass of $BaCl_2$ = 208.34 g mol^{-1}).