Total Mark : 75

Multiple Choice

46 × 1 = 46

1) 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

2) 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

3) 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

4) 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

5) 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

6) 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

7) 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

8) 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

9) 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)

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

11) 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

12) In which mode of expression, the concentration of solution remains independent of temperature ?
(a) Molarity (b) Normality (c) Formality (d) Molality

13) 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

14) 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

15) 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

16) 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

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

(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.

19) 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

20) 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

21) 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

22) 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

23) 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

24) 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) $\Delta H_{soln} = \Delta H_3 - \Delta H_1 - \Delta H_2$

25) 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

26) 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

27) 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) $i_A < B > i_C$

28) 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

29) The system that forms maximum boiling azeotrope is

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

30) 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

31) 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

32) 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

(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.

36) 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

37) 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

38) 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

39) K_H value for Ar(g), CO_2(g), HCHO (g) and CH_4 (g) are 4.39,1.67,1.83 × 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) $\mathrm{Ar} < \mathrm{CH_4} < \mathrm{CO_2} < \mathrm{HCHO}$

40) 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

41) 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

42) 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

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

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

44) 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.

45) 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

46) 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) $8.0 \times 10^{-4} M$

Fill up / 1 Marks

10 × 1 = 10

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

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

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

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

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

57) 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.

58) 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.

59) 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.

60) 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.

61) 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.

62) 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.

63) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.

64) **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

65) **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

66) **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) $P_A < P_A^{\circ} x_A$ and $P_B < P_B^{\circ} x_B$

(c) Carbon tetrachloride and chloroform mixture is an example of positive deviations.

(d) All 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**

Multiple Choice Question