# RAVI MATHS TUITION CENTRE , WHATSAPP - 8056206308

**Time : 1 Mins** **SOLUTIONS 1** **Marks : 944**

1. The volume strength of 1.5 N $H_2O_2$ solution is:
   a) 4.8 b) 5.2 c) 8.4 d) 8.8
2. 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 pressure 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
3. At high altitudes the partial pressure of oxygen is less than that at the ground level. This leads to
   a) low concentrations of oxygen in the blood and tissues
   b) high concentrations of oxygen in the blood and tissues
   c) release of dissolved gases and formation of bubbles of nitrogen in the blood
   d) thickening of blood and tissues.
4. According to Henry's law 'the partial pressure of the gas in vapour phase (p) is proportional to the mole fraction of the gas (x) in the solution'. For different gases the correct statement about Henry's constant is
   a) higher the value of $K_H$ at a given pressure, higher is the solubility of the gas
   b) higher the value of $K_H$ at a given pressure, lower is the solubility of the gas
   c) $K_H$ is not a function of nature of gas
   d) $K_H$ value for all gases is same at a given pressure.

5. The law which indicates the relationship between solubility of a gas in liquid and pressure is _____ .
   a) Raoult's law  b) Henry's law  c) Lowering of vapour pressure
   d) van't Hoff law
6. What is the mole fraction of glucose in 10% w/W glucose solution?
   a) 0.01  b) 0.02  c) 0.03  d) 0.04
7. Which of the following solutions shows positive deviation from Raoult's law?
   a) Acetone + Aniline  b) Acetone + Ethanol  c) Water + Nitric acid
   d) Chloroform + Benzene
8. 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
9. How many grams of NaOH are present in 250 mL of 0.5 M NaOH solution?
   a) 7.32 g  b) 3.8 g  c) 5 g  d) 0.5 g
10. Which of the following aqueous solutions has minimum freezing point?
    a) 0.01 m NaCl  b) 0.005 m $MgI_2$  c) 0.005 m $C_2H_5OH$  d) 0.005 m $MgSO_4$
11. The value of Henry's law constant for some gases at 293 K is given below. Arrange the gases in the increasing order of their solubility.
    He: 144.97 kbar, H2: 69.16 kbar,
    $N_2$ : 76.48 kbar, 02 : 34.86 kbar
    a) He < $N_2$ < $H_2$ < $O_2$  b) $O_2$ < $H_2$ < $N_2$ < He  c) $H_2$ < $N_2$ < $O_2$ < He
    d) He < $O_2$ < $N_2$ < $H_2$
12. The osmotic pressure of a solution can be increased by
    a) increasing the volume  b) increasing the number of solute molecules
    c) decreasing the temperature  d) removing semipermeable membrane.
13. An aqueous solution is 1.00 molal in KI. Which change will cause the vapour pressure of the solution to increase?
    a) Addition of NaCl  b) Addition of $Na_2SO_4$  c) Addition of 1.00 molal KI
    d) Addition of water
14. The beans are cooked earlier in pressure cooker because
    a) Boiling point increases with increasing pressure
    b) Boiling point decreases with increasing pressure

c) Internal energy is not lost while cooking in pressure cooker
d) Extra pressure of pressure cooker, softens the beans

15. The vapour pressure, at a given temperature, of an ideal solution containing 0.2 mole of a non-volatile solute and 0.8 mole of solvent is 60 mm of Hg. The vapour pressure of the pure solvent at the same temperature is:
a) 150 mm of Hg b) 120 mm of Hg c) 75 mm of Hg d) 60 mm of Hg
16. We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1 M, 0.01 M and 0.001 M, respectively. The value of van't Hoff factor for these solutions will be in the order.
a) $i_A$BC b) $i_A > i_B > i_C$ c) $i_A = i_B = i_C$ d) $i_A < i_B > i_C$
17. When a gas is bubbled through water at 298 K, a very dilute solution of gas is obtained. Henry's law constant for the gas is 100 k bar. If gas exerts a pressure of 1 bar, the number of moles of gas dissolved in 1 litre of water is:
a) 0.555 b) $55.55 \times 10^{-5}$ c) $55.55 \times 10^{-3}$ d) $5.55 \times 10^{-5}$
18. A solution containing 10 g per $dm^3$ of urea (molecular mass: 60 g $mol^{-1}$) is isotonic with a 5% solution of a non-volatile solute. The molecular mass of this non volatilec solute is:
a) 300 g $mol^{-1}$ b) 350 g $mol^{-1}$ c) 200 g $mol^{-1}$ d) 250 g $mol^{-1}$
19. A 5% solution (w/W) of cane sugar (molar mass = 342 g $mol^{-1}$) has freezing point 271 K. What will be the freezing point of 5% glucose (molar mass = 18 g $mol^{-1}$) in water if freezing point of pure water is 273.15 K?
a) 273.07 K b) 269.07 K c) 273.15 K d) 260.09 K
20. Formation of a solution from two components can be considered as
(i) Puresolvent -> Separated solute molecules, $\Delta H_1$
(ii) Puresolvent -> Separated solute molecules, $\Delta H_2$
(iii) Separated solvent and solute molecules -l solution $\Delta H_3$ , solution so formed will be ideal if
a) $\Delta H_{sol} = \Delta H_3 - \Delta H_1 - \Delta H_2$
b) $\Delta H_{sol} = \Delta H_1 + \Delta H_2 - \Delta H_3$
c) $\Delta H_{sol} = \Delta H_3 + \Delta H_2 - \Delta H_1$
d) $\Delta H_{sol} = \Delta H_1 - \Delta H_2 - \Delta H_3$

21. Which of the following statements about the composition of the vapour over an ideal 1: 1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25°C. (Given, vapour pressure data at 25°C, benzene = 12.8 kPa, toluene = 3.85 kPa)
    a) The vapour will contain equal amounts of benzene and toluene
    b) Not enough information is given to make a prediction
    c) The vapour will contain a higher percentage of benzene.
    d) The vapour will contain a higher percentage of toluene
22. Mole fraction of the solute in a 1.00 molar aqueous solution is
    a) 1.7700 b) 0.1770 c) 0.0177 d) 0.0344
23. The van't Hoff factor of 0.005 M aqueous solution of KCl is 1.95. The degree of ionisation of KCl is
    a) 0.95 b) 0.97 c) 0.94 d) 0.96
24. Arrange the following aqueous solutions in the order of their increasing boiling points
    (i) $10^{-4}$ M NaCl
    (ii) $10^{-4}$ M Urea
    (iii) $10^{-3}$ M $MgCl_2$
    (iv) $10^{-2}$ M NaCl
    a) (i) < (ii) < (iv) < (iii) b) (ii) < (i) = (iii) < (iv) c) (ii) < (i) < (iii) < (iv)
    d) (iv) < (iii) < (i) = (ii)
25. A solute X when dissolved in a solvent associates to form a pentamer. The value of van't Hoff factor (i) for the solute will be
    a) 0.5 b) 5 c) 0.2 d) 0.1
26. Pure water can be obtained from sea water by:
    a) centrifugation b) plasmolysis c) reverse osmosis d) sedimentation
27. Which one is a colligative property?
    a) Boiling point b) Vapour pressure c) Osmotic pressure d) Freezing point
28. Match the column I with column II and mark the appropriate choice.

| Column I | | Column II | |
|---|---|---|---|
| (A) | Ethyl alcohol + Water | (i) | $p = p^o x$ |
| (B) | Benzene + Toluene | (ii) | Effect of pressure on gas solutions |
| (C) | Henry's law | (iii) | Ideal solution |

| | | | |
|---|---|---|---|
| (D) | Raoult's law | (iv) | Azeotropic mixture |

a) (A) → (i), (B)→(ii), (C)→(iii), (D)→(iv)
b) (A) → (i), (B) → (iii), (C) → (ii), (D) → (iv)
c) (A)→ (iv), (B)→ (iii), (C)→ (ii), (D)→ (i)
d) (A)→ (iii), (B)→ (ii), (C)→ (i), (D)→ (iv)

29. What is the mole fraction of the solute in a 1.00 m aqu solution?
    a) 0.177 b) 1.770 c) 0.0354 d) 0.0177
30. The vapour pressure of two liquids P and Q are 80 and 60 torr, respectively. The total vapour pressure of solution obtained by mixing 3 moles of P and 2 moles of Q would be :
    a) 140 torr b) 20 torr c) 68 torr d) 72 torr
31. 4 L 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
32. Which of the following aqueous solutions has minimum freezing point?
    a) $0.01\ \mathrm{m\ NaCl}$ b) $0.005\ \mathrm{m\ MgI_2}$
    c) $0.005\ \mathrm{m\ C_2H_5OH}$ d) $0.005\ \mathrm{m\ MgSO_4}$
33. The mole fraction of the solute in one molal aqueous solution is:
    a) 0.009 b) 0.018 c) 0.027 d) 0.036
34. Which one is not equal to zero for an ideal solution:
    a) $\Delta S_{\mathrm{mix}}$ b) $\Delta \mathrm{V_{mix}}$ c) $\Delta \mathrm{P} = \mathrm{P_{observed}} - \mathrm{P_{Raoult}}$
    d) $\Delta \mathrm{H_{mix}}$
35. Vapour pressure of benzene at 30°C is 121.8 mm. When 15 g of a non-volatile solute is dissolved in 250 g of benzene its vapour pressure decreased to 120.2mm. The molecular weight of the solute is (Molecular weight of solvent = 78)
    a) 356.2 b) 456.8 c) 530.1 d) 656.1
36. $H_2S$ is a toxic gas used in qualitative analysis. If solubility of $H_2S$ in water at STP is 0.195 m, what is the value of $K_H$?
    a) 0.0263 bar b) 69.16 bar c) 192 bar d) 282 bar
37. 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 semipermeable 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.

38. Which of the following colligative property can provide molar mass of proteins (or polymers or colloids) with greatest precision?

    a) Osmotic pressure  b) Elevation in boiling point

    c) Depression in freezing point  d) Relative lowering of vapour pressure

39. For which of the following solutes the van't Hoff factor is not greater than one?

    a) $NaNO_3$  b) $BaCl_2$  c) $K_4[Fe(CN)_6]$  d) $NH_2CONH_2$

40. At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is_____.

    a) less than the rate of crystallisation

    b) greater than the rate of crystallisation  c) equal to the rate of crystallisation

    d) Zero

41. 2 g of sugar is added to one litre of water to give sugar solution. What is the effect of addition of sugar on the boiling point and freezing point of water?

    a) Both boiling point and freezing point increase.

    b) Both boiling point and freezing point decrease.

    c) Boiling point increases and freezing point decreases.

    d) Boiling point decreases and freezing point increases

42. The relative lowering of vapour pressure is equal to the ratio between the number of

    a) solute molecules to the solvent molecules

    b) solute molecules to the total molecules in solution

    c) solvent molecules to the total molecules in the solution

    d) solvent molecules to the total number of ions of the solute

43. **Assertion:** At equilibrium, vapour phase will be always rich in component which is more volatile.

    **Reason:** The composition of vapour phase in equilibrium with the solution is determined by the partial pressures of the components.

a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

44. Which of the following 0.10 M aqueous solution will have the lowest freezing point?
a) $Al_2(SO_4)_3$ b) $C_5H_{10}O_5$ c) KI d) $C_{12}H_{22}O_{11}$

45. **Assertion:** Molecular mass of KCl calculated on the basis of colligative properties will be lower than the normal molecular mass.
**Reason:** Experimentally determined molar mass is always lower than the true value.
a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

46. The mixture that forms maximum boiling azeotrope is:
a) Ethanol + Water b) Acetone + Carbon disulphicle c) Heptane + Octane
d) Water + Nitric acid

47. 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

48. If 0.15 g of solute, dissolved in 15 g of solvent, is boiled at a temperature higher by 0.216°C, than that of the pure solvent, the molecular weight of the substance is (molal elevation constant for the solvent $\text{is } 2.16^\circ C$ )
a) 1.01 b) 10 c) 10.1 d) 100

49. Which of the following 0.10 M aqueous solution will have the lowest freezing point?
    a) $Al_2(SO_4)_3$ b) $C_5H_{10}O_5$ c) KI d) $C_{12}H_{22}O_{11}$
50. The vapour pressure of benzene at a certain temperature is 640 mm Hg. A non-volatile and non-electrolyte solid, weighing 2.175 g is added to 39.08 g of benzene. If the vapour pressure of the solution is 600mm Hg, what is the molecular weight of solid substance?
    a) 49.50 b) 59.60 c) 69.40 d) 79.82
51. 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
52. How many grams of concentrated nitric acid solution should be used to prepare 250 ml of 2.0 M $HNO_2$? The concentrated acidic is 70% $HNO_3$
    a) 90.0 gconc. $HNO_3$ b) 70.0 gconc. $HNO_3$ c) 54.0 gconc. $HNO_3$
    d) 45.0 gconc $HNO_3$
53. How much oxygen is dissolved in 100 mL water at 298 K if partial pressure of oxygen is 0.5 atm and $K_H = 1.4 \times 10^{-3}$ mol/L/atm?
    a) 22.4 mg b) 22.4 g c) 2.24 g d) 2.24 mg
54. Express the terms representing the following formulae.
    (i) $\frac{No.\ of\ moles\ of\ solute}{Volume\ of\ solution\ in\ litres}$ =(W)
    (ii) $\frac{No.\ of\ moles\ of\ solute}{Mass\ of\ solvent\ in\ kg}$ =(X)
    (iii) $\frac{No.\ moles\ of\ component}{Moles\ in\ the\ solution}$ =(Y)
    (iv) $\frac{Mass\ of\ component}{Mass\ of\ solution}$ =(Z)
    a)

| W | X | Y | Z |
|---|---|---|---|
| Molality | Molarity | Mass fraction | Mole fraction |

    b)

| W | X | Y | Z |
|---|---|---|---|
| Molality | Molarity | Mass fraction | Mole fraction |

c)

| W | X | Y | Z |
|---|---|---|---|
| Molarity | Molality | Mole fraction | Mass fraction |

d)

| W | X | Y | Z |
|---|---|---|---|
| Molarity | Molality | Mole fraction | Mass fraction |

55. Concentration terms like mass percentage, ppm, mole fraction and molality do not depend on temperature. However, molarity is a function of temperature because

    a) volume depends on temperature and molarity involves volume

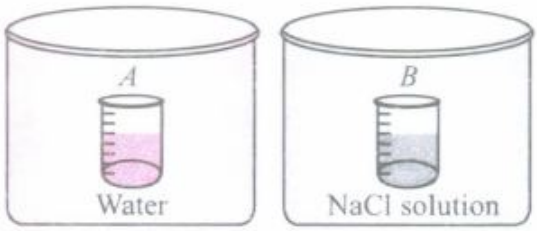
    b)

    molarity involves non -volatile solute while all other terms involve volatile solute

    c) number of moles of solute change with change in temperature

    d) molarity is used for polar solvents only.

56. Two beakers of capacity 500 mL were taken. One of these beakers, labelled as "A", was filled with 400 mL water whereas the beaker labelled "B" was filled with 400 mL of 2 M solution of NaCl. At the same temperature both the beakers were placed in closed containers of same material and same capacity as shown in figure.




    At a given temperature, which of the following statements is correct about the vapour pressure of pure water and that ofNaCl solution.

    a) Vapour pressure in container (A) is more than that in container (B).

    b) Vapour pressure in container (A) is less than that in container (B).

    c) Vapour pressure is equal in both the containers.

    d)

    Vapour pressure in container (B) is twice the vapour pressure in container (A).

57. When acetone and chloroform are mixed together, hydrogen bonds are formed between them. Which of the following statements is correct about the solution made by mixing acetone and chloroform?
    a) On mixing acetone and chloroform will form an ideal solution.
    b)
    On mixing acetone and chloroform positive deviation is shown since the vapour pressure increases.
    c)
    On mixing acetone and chloroform negative deviation is shown since there is decrease in vapour pressure.
    d) At a specific composition acetone and chloroform
58. Which of the aqueous equimolal solution will have its vapour pressure near to solvent?
    a) Urea  b) $Ba(NO_3)_2$  c) $NaNO_3$  d) $Al(NO_3)_3$
59. Which of the following statements is not correct?
    a) 5% aqueous solutions of NaCl and KCl are said to be isomolar.
    b) 1M sucrose solution and 1M glucose solution are isotonic.
    c)
    Molecular mass of acetic acid and benzoic acid is higher than normal mass in cryoscopic methods.
    d) For the same solution, $\frac{\triangle T_b}{\triangle T_f} = \frac{K_b}{K_f}$
60. Which one of the following is incorrect for ideal solution?
    a) $\Delta H_{mix} = 0$  b) $\Delta Umix = 0$  c) $\Delta P = P_{obs} - P_{calculate\ by\ Raoult's\ law} = 0$  d) $\Delta G_{mix} = 0$
61. Fill in the blanks with appropriate words.
    Azeotropic mixtures boil without change in their _____. Azeotropic mixtures exist in solutions showing _____ or _____ deviations. _____ solutions do not form azeotropes. van't Hoff factor for an electrolyte is _____ than 1.
    a) colour, positive, negative, non-ideal, greater
    b) properties, positive, negative, ideal, smaller
    c) boiling point, positive, negative, non-ideal, lesser
    d) composition, positive, negative, ideal, greater
62. Equimolal solutions in the same solvent have

a) same elevation in boiling point and same depression in freezing point
b) different elevation in boiling point and different depression in freezing point
c) same elevation in boiling point but different depression in freezing point
d) same depression in freezing point but different elevation in boiling point.

63. According to Raoult's law, Relative lowering of vapour pressure of a solution is equal to
a) moles of solute b) moles of solvent c) mole fraction of solute
d) mole fraction of solvent

64. Osmotic pressure of a solution containing 2 g dissolved protein per 300 $cm^3$ of solution is 20 mm of Hg at 27°C. The molecular mass of protein is
a) 6239.6 g $mol^{-1}$ b) 12315.5 g $mol^{-1}$ c) 3692.1 g $mol^{-1}$ d) 7368.4 g $mol^{-1}$

65. Vapour pressure of pure water at 298 K is 23.8 mm Hg. 50 g of urea is dissolved in 850 g of water. The vapour pressure of water for this solution and its relative lowering are respectively.
a) 23.8 mm Hg and 0.16 b) 25.4 mm Hg and 0.02 c) 30.2 mm Hg and 0.020
d) 23.4 mm Hg and 0.017

66. Match the column I with column II and mark the appropriate choice

| Column I | | Column II | |
|---|---|---|---|
| (A) | $K_b$ | (i) | $\frac{K_b \times W_2 \times 1000}{\triangle T_b \times W_1}$ |
| (B) | $M_2$ | (ii) | $\frac{W_2 \times 1000}{M_2 \times W_1}$ |
| (C) | $\pi$ | (iii) | $\frac{RT_b^2}{1000 \times L_V}$ |
| (D) | m | (iv) | $\frac{\triangle T_b \times dRT}{1000 \times k_b}$ |

a) (A) →(i), (B) → (iii), (C) → (ii), (D) → (iv)
b) (A) → (iv), (B) → (ii), (C) → (i), (D) → (iii)
c) (A)→ (ii), (B)→ (iv), (C)→ (iii), (D)→ (i)
d) (A) → (iii), (B) → (i), (C) → (iv), (D) → (ii)

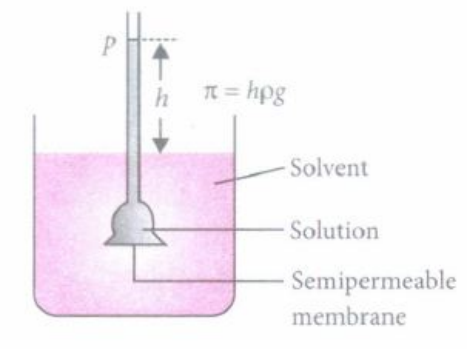
67. The system that forms maximum boiling azeotrope is
a) acetone - chloroform b) ethanol - acetone c) n-hexane - n-heptane
d) carbon disulphide - acetone.

68. Which one of the following electrolytes has the same value of van't Hoff factor (i) as that of $Al_2(SO_4)_3$ if all are 100% ionized?
a) $K_2SO_4$ b) $K_3[Fe(CN)_6]$ c) $Al(NO_3)$ d) $K_4[Fe(CN)_6]$

69. Vapour pressure of chloroform ($CHCl_3$) and dichloromethane ($CH_2Cl_2$) at 25°C are 100 mm Hg and 41.5 mm Hg respectively. Vapour pressure of the solution obtained by mixing 25 .5 g of $CHCl_3$, and 40 g of $CH_2Cl_2$ at the same temperature wil1 be: (Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of $CH_2Cl_2$ = 85 u)
    a) 173.9 mm Hg  b) 615.0 mm Hg  c) 347.9 mm Hg  d) 285.5 mm Hg
70. **Assertion:** The solutions which show large positive deviations from Raoult's law form maximum boiling azeotropes.
    **Reason:** 95% aqueous solution of ethanol is maximum boiling azeotrope.
    a)
    If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false.
    d) If both assertion and reason are false
71. Which of the following statements is correct?
    a) A saturated solution will remain saturated at all temperatures.
    b) A plant cell swells when placed in hypertonic solution.
    c)
    The depression in freezing point is directly proportional to molality of the solution.
    d) Lowering in vapour pressure is a colligative property.
72. Which one of the following modes of expressing concentration is independent of temperature?
    a) Molarity  b) Molality  c) Formality  d) Normality
73. Which of the following azeotropes is not correctly matched?
    a)
    $HNO_3$ (68%) + $H_2O$ (32%) : Maximum boiling azeotrope, boiling point = 393.5 K
    b) $H_2O$ (43%) + HI (57%) : Minimum boiling azeotrope, boiling point = 290 K

c)
$C_2H_5OH$ (95.5%) + Hp (4.5%) : Minimum boiling azeotrope, boiling point = 351.15 K
d)
Chloroform (93.2%) + $C_2H_5OH$ (6.8%) : Minimum boiling azeotrope, boiling point = 332.3 K

74. If semipermeable membrane is placed between the solvent and solution as shown in the given figure then




a)
the flow of the solvent from its side to solution side across a semipermeable membrane can be stopped if some extra pressure (called osmotic pressure) is applied on the solution.
b) both (b) and (c).
c)
the solvent molecules will flow through the membrane from solution to pure solvent
d) the solvent molecules will flow continuously till the equilibrium is attained

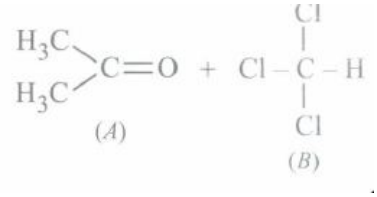
75. Which of the following aqueous solutions should have the highest boiling point?
a) 1.0 M NaOH b) 1.0 M $Na_2SO_4$ c) 1.0 M $NH_4NO_3$ d) 1.0 M $KNO_3$

76. Molarity of liquid HCl, if density of solution is 1.17g/cc is :
a) 36.5 b) 18.25 c) 32.05 d) 42.10

77. Given below are few mixtures formed by mixing two components. Which of the following binary mixtures will have same composition in liquid and vapour phase?
(i) Ethanol + Chloroform

(ii) Nitric acid + Water
(iii) Benzene + Toluene
(iv) Ethyl chloride + Ethyl bromide
a) (i) and (iii) b) (i) and (ii) c) (i), (ii) and (iii) d) (iii) and (iv)

78. When acetone and chloroform are mixed together, which of the following observations is correct?




a) A - A and B - B interactions are stronger than A - B interactions.
b) A - A and B - B interactions are weaker than A - B interactions.
c) A - A, B - B and A - B interactions are equal.
d) The liquids form separate layers and are immiscible.

79. Among the following substances the lowest vapour pressure is exerted by
a) water b) alcohol c) ether d) mercury.

80. Partial pressure of a solution component is directly proportional to its mole fraction. This is known as
a) Henry's law b) Raoult's law c) Distribution law d) Ostwald's dilution law

81. A solution is made by dissolving 20 g of a substance in 500 mL of water. Its osmotic pressure was found to be 600 mm of Hg at 15°C. Find the molecular weight of the substance
a) 1198 b) 500 c) 1200 d) 1000

82. Which of the following will have the highest f.pt. at one atmosphere?
a) 0.1 M NaCl solution b) 0.1 M sugar solution c) 0.1 M $BaCl_2$ solution
d) 0.1 M $FeCl_3$ solution

83. 1 M, 2.5 litre NaOH solution is mixed with another 0.5 M, 3 litre NaOH solution. Then find out the molarity of resultant solution
a) 0.80 M b) 1.0 M c) 0.73 M d) 0.50 M

84. What will be the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0g of polymer of molar mass 150,000 in 500 mL of water at 37°C?
a) 30.96 Pa b) 34.36 Pa c) 68.72 Pa d) 48.25 Pa

85. An organic compound containing C, H and N gave the following results on analysis C = 40%, H = 13.33%, N = 46.67%. Its empirical formula would be

a) $C_2H_7N_2$ b) $CH_5N$ c) $CH_4N$ d) $C_2H_7N$

86. What are the conditions for an ideal solution which obeys Raoult's law over the entire range of concentration?
    a) $\triangle_{mix}H = 0, \triangle_{mix}V = 0, P_{Total} = P_A^o x_A + P_B^o x_B$
    b) $\triangle_{mix}H$ = +ve, $\triangle_{mix}V = 0, P_{Total} = P_A^o x_A + P_B^o x_B$
    c) $\triangle_{mix}H = 0, \triangle_{mix}V$ = +ve, $P_{Total} = P_A^o x_A + P_B^o x_B$
    d) $\triangle_{mix}H = 0, \triangle_{mix}V = 0, P_{Total} = P_B^o x_B$
87. A solution of sucrose (molar mass = 342 g $mol^{-1}$) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of the solution obtained will be : ($k_f$ for water = 1.86K kg $mol^{-1}$)
    a) - 0.372°C b) - 0.520°C c) + 0.372°C d) - 0.570°C
88. Which one of the following electrolytes has the same value of Van't Hoffs factor (i) as that of the $Al_2(SO_4)_3$ (if all are l00% ionised)?
    a) $K_3[Fe(CN)_6]$ b) $Al(NO_3)_3$ c) $K_4[Fe(CN)_6]$
    d) $K_2SO_4$
89. The van't Hoff factor, i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively.
    a) less than one and less than one b) greater than one and less than one
    c) greater than one and greater than one
    d) less than one and greater than one
90. The molality of 648 g of pure water is
    a) 36 m b) 55.5 m c) 3.6 m d) 5.55 m
91. 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
92. A 5% solution of cane sugar (molecular weight = 342) is isotonic with 1% solution of a substance X. The molecular weight of X is :
    a) 34.2 b) 171.2 c) 68.4 d) 136.8
93. If 1g of solute (molar mass = 50 g $mol^{-1}$) is dissolved in 50 g of solvent and the elevation in boiling point is 1K. The molar boiling constant of the solvent is
    a) 2 b) 3 c) 2.5 d) 5

94. Two liquids A and B form ideal solutions. At 300 K, the vapour pressure of a solution containing 1 mole of A and 3 moles of B is 550 mm Hg. At the same temperature, if one more mole of B is added to this solution, the vapour pressure of the solution increases by 10 mm Hg. The vapour pressures of A and B in their pure states are respectively
    a) $P_A^o$ = 600 mm Hg and $P_B^o$ = 400 mm Hg
    b) $P_A^o$ = 550 mm Hg and $P_B^o$= 560 mm Hg
    c) $P_A^o$= 450 mm Hg and $P_B^o$ = 650 mm Hg
    d) $P_A^o$= 400 mm Hg and $P_B^o$ = 600 mm Hg
95. What is the mass percentage of carbon tetrachloride if 22 g of benzene is dissolved in 122 g of carbon tetrachloride?
    a) 84.72%  b) 15.28%  c) 50%  d) 44%
96. The Henry's law constant for the solubility of N, gas in water at 298 K is 1.0 x $10^5$ atm. The mole fraction of $N_2$ in air is 0.8. The number of moles of $N_2$ from air dissolved in 10 moles of water at 298 K and 5 atm pressure is:
    a) 4.0 x $10^{-4}$  b) 4.0 x $10^{-5}$  c) 5.0 x $10^{-4}$  d) 4.0 x $10^{-6}$
97. Which of the following relations is not correctly matched with the formula?
    a) In case of association, $\propto = \frac{i-1}{\frac{1}{n}-1}$  b) In case of association, $\propto = \frac{i-1}{n+1}$
    c) Relative lowering of vapour pressure= $\frac{P_A^o - P_A}{P_A^o} = i\frac{n_B}{n_A+n_B}$
    d) Elevation in boiling point, $\triangle T_b = k_b \times \frac{W_B \times 1000}{M_B \times W_A}$
98. Homogeneous mixture of two or more than two components is called
    a) solute  b) solvent  c) both (a) and (b)  d) solution
99. **Assertion:** Decrease in the vapour pressure of water by adding 1 mol of sucrose to one kg of water is higher to that produced by adding 1 mol of urea to the same quantity of water at the same temperature.
    **Reason:** Molecular mass of sugar is less than that of urea.
    a)
    If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.

d) If both assertion and reason are false

100. What will be the freezing point of a 0.5 m KCl solution? The molal freezing point constant of water is 1.86 °C $m^{-1}$.

a) -1.86°C b) - 0.372 °C c) - 3.2 °C d) O°C

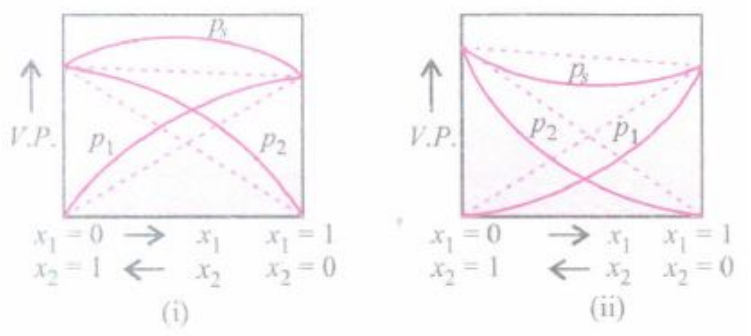
101. Which of the following is dependent on temperature?

a) Molarity b) Mole fraction c) 'Weight percentage d) Molality

102. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionized. If $k_f$ for water is 1.86 K-kg-$mol^{-1}$, the lowering in freezing point of the solution is :

a) -1.12 K b) 0.56 K c) 1.12 K d) - 0.56 K

103. Study the figures given below and mark the correct statement.




(i) Nitric acid + Water, (i) Water + Ethyl alcohol,

a) (ii) Acetone + Ethyl alcohol b) (ii) Acetone + Benzene

(i) Acetone + Ethyl alcohol, (i) Benzene + Chloroform,

c) (ii) Acetone + Chloroform d) (ii) Acetone + Chloroform

104. The density of a solution prepared by dissolving 120 g of urea (mol. mass = 60 u) in 1000 g of water is 1.15 g/mL. The molarity of this solution is:

a) 1.78 M b) 1.02 M c) 2.05 M d) 0.50 M

105. Ihe relative lowering in vapour pressure is proportional to the ratio of number of

a) solute molecules to solvent molecules

b) solvent molecules to solute molecules

c) solute molecules to the total number of molecules in solution

d) solvent molecules to the total number of molecules in solution.

106. Arrange the following solutions in increasing order of their osmotic pressures.

(i) 34.2 g/litre sucrose

(ii) 60 g/litre of urea

(iii) 90 g/litre of glucose

(iv) 58.5 g/litre of sodium chloride

a) (i) < (iii) < (ii) < (iv)  b) (iii) < (i) < (iv) < (ii)  c) (i) < (iii) < (iv) < (ii)

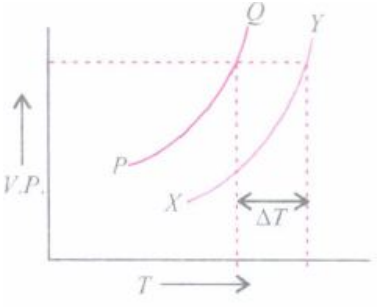
d) (ii) < (iv) < (i) < (iii)

107. 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

108. In the graph plotted between vapour pressure (V.P.) and temperature(T),




a)

PQ is the curve for solvent, XY is the curve of solution and $\Delta$ T is depression in freezing point

b)

PQ is the curve for solution, XY is the curve for solvent and $\Delta$ T is elevation in boiling point

c)

PQ is the curve for solvent, XY is the curve for solution and $\Delta$ T is molal elevation in boiling point

d)

PQ is the curve for solvent, XY is the curve for solution and $\Delta$ T is elevation in boiling point.

109. When 1.04 g of $BaCl_2$ is present in $10^5$ g of solution the concentration of solution is

a) 0.104 ppm  b) 10.4 ppm  c) 0.0104 ppm  d) 104 ppm

10. Grapes placed in three beakers X, Y and Z containing different type of solutions are shown in figures.


If beaker X contains water, Yand Z contain

a) Y - hypotonic solution, Z - hypertonic solution

b) Y - hypertonic solution, Z - hypotonic solution c) Y and Z- isotonic solutions

d) Y and Z- hypotonic solutions

11. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is:

a) 0 b) 1 c) 2 d) 3

12. 75.2 g of phenol is dissolved in a solvent of $K_f$= 14. If the depression in freezing point is 7 K then find the % of phenol that dimerises.

a) 75% b) 80% c) 70% d) 100%

13. 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) $K_2SO_4$

14. The preservation of meat by salting and of fruits by adding sugar protects them from bacterial action because

a) bacteria die of eating sugar or salt

b) due to osmosis bacteria lose water on salted meat or candid fruit and die

c) due to osmosis bacteria gain water on salted meat or candid fruit and die

d) bacteria get stuck to the salt and sugar layers and die.

15. At 100°C the vapour pressure of a solution of 6.59 of solute in 100 g water is 732 mm. If $K_b$ = 0.52, the boiling print of this solution will be:

a) 101°C b) 100°C c) 102°C d) 103°C

16. Value of Henry's constant $K_H$_____.

a) increases with increase in temperature

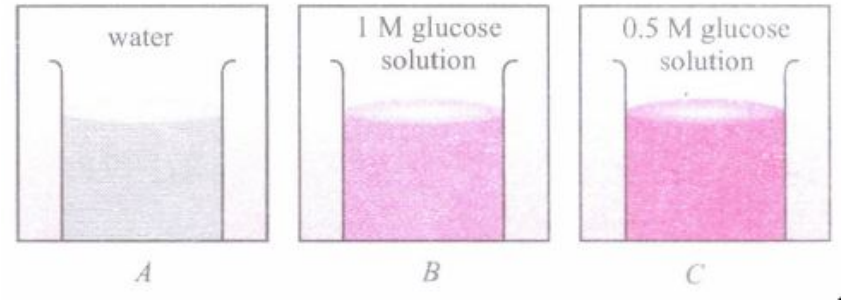
b) decreases with increase in temperature c) remains constant

d) first increases then decreases

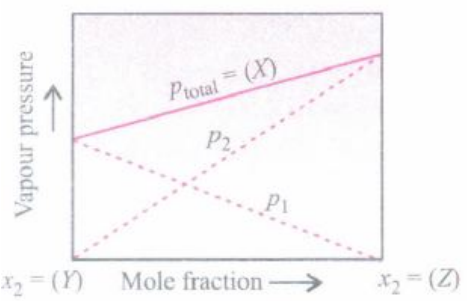
17. Solubility of a substance is its maximum amount that can be dissolved in a specified amount of solvent. It depends upon
(i) nature of solute
(ii) nature of solvent
(iii) temperature
(iv) pressure
a) Only (i), (ii) and (iii) b) Only (i), (iii) and (iv) c) Only (i) and (iv)
d) (i), (ii), (iii) and (iv)

18. Blood cells retain their normal shape in solutions which are
a) hypotonic to blood b) isotonic to blood c) hypertonic to blood
d) equinormal to blood

19. In three beakers labelled as (A), (B) and (C), 100 mL of water, 100 mL of 1 M solution of glucose in water and 100 mL of 0.5 M solution of glucose in water are taken respectively and kept at same temperature.




Which of the following statements is correct?
a) Vapour pressure in all the three beakers is same.
b) Vapour pressure of beaker B is highest.
c) Vapour pressure of beaker C is highest.
d)
Vapour pressure of beaker B is lower than that of C and vapour pressure of beaker C is lower than that of A.

20. 


X, Y and Z in the above graph are

a) $X = P_1 + P_2$, $Y = 1$, $Z = 0$ b) $X = P_1 + P_2$, $Y = 0$, $Z = 1$
c) $X = P_1 * P_2$, $Y = 0$, $Z = 1$ d) $X = P_1 - P_2$, $Y = 1$, $Z = 0$

21. The van't Hoff factor I for a compond which undergoes dissociation in one solvent and associaion in other solvent is respectively
a) less than one and greater than one. b) less than one and less than one.
c) greater than one and less than one.
d) greater than one and greater than one

22. A solution containing 10.2 g glycerine per litre is isotonic with a 2% solution of glucose. What is the molecular mass of glycerine?
a) 91.8 g b) 91.8 g c) 83.9 g d) 890.3 g

23. 250 mL of sodium carbonate solution contains 2.65 g of $Na_2CO_3$. If 10 mL of this solution is diluted to 500 ml., the concentration of the diluted acid will be:
a) 0.01 M b) 0.001 M c) 0.05 M d) 0.002 M

24. **Assertion:** Amalgam of mercury with sodium is an example of solid solutions.
**Reason:** Mercury is solvent and sodium is solute in the solution.
a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

25. $K_H$ values for $Ar_{(g)}$, $CO2_{(g)}$, $HCHO_{(g)}$ and $CH4_{(g)}$ are 40.39, 1.67, $1.83 \times 10^{-5}$ 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) $Ar < CH_4 < CO_2 < HCHO$

26. A solution containing components A and B follow Raoult's law when
a) A - B attraction force is greater than A - Aand B - B
b) A-B attraction force is less than A - A and B - B
c) A- B attraction force remains same as A.-A and B- B
d) Volume of solution is different from sum of volume of solute and solvent

27. 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) X is undergoing dissociation in water
    b) Molecular mass of X is greater than the molecular mass of Y
    c) Molecular mass of X is less than the molecular mass of Y
    d) Y is undergoing dissociation in water while X undergoes no change.
28. The freezing point depression constant for water is $-1.86^{o}Cm^{-l}$. If 5.00 g $Na_2SO_4$ is dissolved in 45.0 g $H_2O$, the freezing point is charged by $-3.82^{o}C$. Calculate the van't Hoff factor for $Na^2SO^4$
    a) 2.05  b) 2.63  c) 3.11  d) 0.381
29. If a is the degree of dissociation of $Na_2SO_4$, the vant Hoff's factor (i) used for calculating the molecular mass is
    a) $1+\alpha$  b) $1-\alpha$  c) $1+2\alpha$  d) $1-2\alpha$
30. In a pair of immiscible liquids, a common solute dissolve in both and the equilibrium is reached. Then, the concentration of the solute in upper layer is:
    a) in fixed ratio with that in the lower layer  b) same as the lower layer
    c) lower than the lower layer  d) higher than the lower layer
31. **Assertion:** 1M solution of KCl has greater osmotic pressure than 1 M solution of glucose at the same temperature.
    **Reason:** In solution KCl dissociates to produce more number of particles.
    a)
    If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false.
    d) If both assertion and reason are false
32. On the basis of 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 Raoults law.

d)

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

33. Sea water is 3.5% by mass of common salt and has a density 1.04 g $cm^{-3}$ at 293 K. Assuming the salt to be sodium chloride, then osmotic pressure of sea water will be (assume complete ionisation of the salt)

a) 25.45 atm b) 11.56 atm c) 29.98 atm d) 30.20 atm

34. During osmosis, flow of water through a semipermeable membrane is

a) from both sides of semipermeable membrane with equal flow rates

b) from both sides of semipermeable membrane with unequal flow rates

c) form solution having lower concentration only

d) from solution having higher concentration only

35. **Assertion**: In an ideal solution, $\triangle_{mix}H$ is zero.

**Reason:** In an ideal solution, A - B interactions are lower than A - A and B - B interactions.

a)

If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.

d) If both assertion and reason are false

36. The vapour pressure of a solvent decreased by 10 mm in two columns 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 decrease in the vapour pressure is 20 mm of mercury:
    a) 0.8  b) 0.6  c) 0.4  d) 0.2

37. All form ideal solution except
    a) $\mathrm{C_6H_6}$ and $\mathrm{C_6H_5CH_3}$  b) $\mathrm{C_2H_5Cl}$ *and* $\mathrm{C_2H_5I}$
    c) $\mathrm{C_6H_5Cl}$ *and* $\mathrm{C_6H_5Br}$  d) $\mathrm{C_2H_5I}$ *and* $\mathrm{C_2H_5OH}$

38. **Assertion:** Lowering of vapour pressure is not dependent on the number of species present in the solution.
    **Reason:** Lowering of vapour pressure and relative lowering of vapour pressure are colligative properties.
    a)
    If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false.
    d) If both assertion and reason are false

39. A solution contains non-volatile solute of molecular mass $M_2$. Which of the following can be used to calculate the molecular mass of solute in terms of osmotic pressure?
    a) $\mathrm{M_2} = \left(\frac{m_2}{\pi}\right) \mathrm{VRT}$  b) $\mathrm{M_2} = \left(\frac{m_2}{V}\right) \frac{\mathrm{RT}}{\pi}$
    c) $\mathrm{M_2} = \left(\frac{m_2}{V}\right) \pi\mathrm{RT}$  d) $\mathrm{M_2} = \left(\frac{m_2}{V}\right) \frac{\pi}{\mathrm{RT}}$

40. What weight of glycerol should be added to 600 g of water in order to lower its freezing point by 10 °C? ($K_f$= 1.860 C $m^{-1}$)
    a) 496 g  b) 297 g  c) 310 g  d) 426 g

41. 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 1t = 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.

42. If molality of the dilute solution is doubled, the value of molal depression constant ($K_f$) will be :

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

43. **Assertion:** A solution of phenol and aniline will show negative deviations from Raoult's law.

**Reason:** In case of negative deviations from Raoult's law, A - B forces are stronger than A - A and B - B forces.

a)

If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.

d) If both assertion and reason are false

44. 1.4275 g sample of $[Cr(NH_3)6]SO_4Cl$ (mol. wt. = 285.5) is dissolved to prepare 250 mL solution showing an osmotic pressure of 1.478 atm at 27°C. Which of the following statements are correct about this solution?

(I) Each molecule furnishes three ions in solution.

(II) The van't Hoff factor is 3.
(III) Equilibrium molarity of $[Cr(NH_3)_6]$ $SO_4CI=0$
(IV) Equilibrium molarity of $[Cr(NH_3)6]^{3+}$ = 0.02 M
a) I and III only b) II and IV only c) I, II and IV only d) All of these

145. Vapour pressure of a pure liquid X is 2 atm at 300 K. It is lowered to 1 atm on dissolving 1 g of Y in 20 g of liquid X. If molar mass of X is 200, what is the molar mass of Y?
a) 20 b) 50 c) 100 d) 200

146. What will be the mole fraction of ethanol in a sample of spirit containing 85% ethanol by mass?
a) 0.69 b) 0.82 c) 0.85 d) 0.60

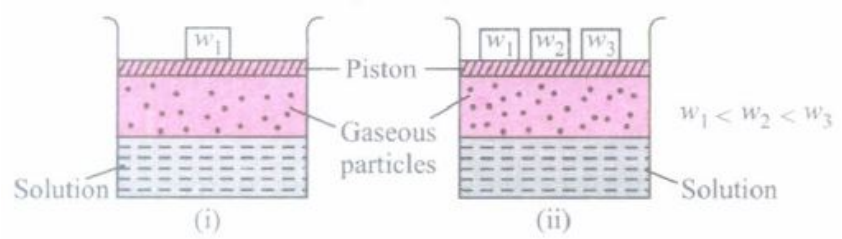
147. Sea water is desalinated to get fresh water by which of the following methods?
a)
When pressure more than osmotic pressure is applied pure water is squeezed out of sea water by reverse osmosis.
b)
When excess pressure is applied on sea water pure water moves in by osmosis.
c) Water moves out from sea water due to osmosis.
d) Salt is precipitated from sea water when kept undisturbed for sometime

148. Which one is not equal to zero for an ideal solution?
a) $\Delta H_{mix}$ b) $\Delta S_{mix}$ c) $\Delta V_{mix}$ d) $\Delta P=P_{observed} - P_{Raoult's}$

149. On the basis of information given below mark the correct option. Information:
(i) In bromo ethane and chloroethane mixture intermolecular interactions of A-A and B-B type are nearly same as A-B type interactions.
(ii) In ethanol and acetone mixture A-A or B-B type intermolecular interactions are stronger than A-B type interactions.
(iii) In chloroform and acetone mixture A-A or B- B type intermolecular interactions are weaker than A-B type interactions.
a) Solution (II) and (III) will follow Raoult's law.
b) Solution (I) will follow Raoults law.
c) Solution (II) will show negative deviation from Raoults law.
d) Solution (III) will show positive deviation from Raoult's law.

50. Which one of the following modes of expressing concentration is independent of temperature?
    a) Molarity  b) Molality  c) Formality  d) Normality

51. Consider the two figures given below.




    Which of the following statements regarding the experiment is true?
    a) Ihe solubility of a gas in liquid in beaker (i) is greater than that in beaker (ii).
    b) The solubility of a gas in beaker (i) is less than that in beaker (ii).
    c) The solubility of a gas is equal in both beakers.
    d) The solubility of a gas remains unaffected by change in weights.

52. Which of the following solutions is an example of negative deviation from Raoult's law?
    a) Acetone + Ethanol  b) Carbon tetrachloride + Chloroform
    c) Acetone + Chloroform  d) Water + Ethanol

53. 3 moles of P and 2 moles of Q are mixed, what will be their total vapour pressure in the solution if their partial vapour pressures are 80 and 60 torr respectively?
    a) 80 torr  b) 140 torr  c) 72 torr  d) 70 torr

54. In amalgam of mercury with sodium, solvent is
    a) mercury  b) sodium  c) amalgam  d) none of these.

55. For an ideal solution with PA > PB, which of the following is true?
    a) $(x_A)_{liquid} = (x_A)_{vapour}$  b) $(x_A)_{liquid} > (x_A)_{vapour}$  c) $(x_A)_{liquid} > (x_A)_{vapour}$
    d) $(x_A)_{liquid}$ and $(x_A)_{vapour}$ do not bear any relationship with each other

56. 1 .00 g of a non-electrolyte solute (molar mass 250 g $mol^{-l}$) was dissolved in 51 .2 g of benzene. If the freezing point depression constant, $K_f$ of benzene is 5.12 K kg $mol^{-1}$, the freezing point of benzene will be lowered by
    a) 0.3 K  b) 0.5 K  c) 0.4 K  d) 0.2

57. What is the mass of urea required for making 2.5 kg of 0.25 molal aqueous solution?
    a) 37 g  b) 25 g  c) 125 g  d) 27.5 g

58. 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

59. 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

60. **Assertion:** Pressure does not have any effect on solubility of solids in liquids.
    **Reason:** Solids and liquids are highly incompressible
    a)
    If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false.
    d) If both assertion and reason are false

61. 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) 0.654°C  b) -0.654°C  c) 6.54°C  d) -6.54°C

62. An organic compound contains C = 40%, O = 53 .34% O and H = 6.60%. The empirical formula of the compound is:
    a) $CH_2O$  b) CHO  c) $CH_4O_2$  d) $C_2H_2O$

63. Which of the following has the highest freezing point?
    a) 1 m NaCl solution  b) 1 m KCl solution  c) 1 m $AlCl_3$ solution
    d) 1 m $C_6H_{12}O_6$ solution

64. Vapour pressure of benzene at $30^\circ C$ is 121.8 mm. When 15g of a non-volatile solute is dissolved in 250 g of benzene weight of the solute is (mol. weight of solvent: 78)
    a) 356.2  b) 456.8  c) 530.1  d) 656.7

65. During dissolution when solute is added to the solvent, some solute particles separate out from the solution as a result of crystallisation. At the stage of equilibrium, the concentration of solute in the solution at given temperature and pressure

a) increases b) decreases c) remains constant d) keeps changing.

66. **Assertion:** The vapour pressure of an aqueous solution of sucrose is less than 1.013 bar at 373.15 K.

**Reason:** Vapour pressure of water is 1.013 bar at 373.15 K.

a)

If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.

d) If both assertion and reason are false

67. 25.3 g of sodium carbonate, $Na_2CO_3$ is dissolved in enough water to make 250 mL of solution . If sodium carbonate dissociates completely, molar concentration of sodium ions, $Na^+$ and carbonate ions, $CO_3^{2-}$ are respectively. (Molar mass of $Na_2CO_3$ = 106 g $mol^{-1}$)

a) 0.955 M and L.910 M b) 0.910 M and 0.955 M c) 1.90 M and 1.910 M

d) 0.477 M and 0.477 M

68. 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

69. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at - 0.00732°C. Number of moles of ions which 1 mole of ionic compound produces on being dissolved in water will be : ($k_f$ = - 1.86°C/m)

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

70. Henry's law constant for molality of methane in benzene at 298 K is 4.27 X $10^5$ mm Hg. The mole fraction of methane in benzene at 298 K under 760 mm Hg is

a) 1.78 x $10^{-3}$ b) 17.43 c) 0.114 d) 2.814

171. Which of the following statements is correct about diffusion and osmosis?
(i) In osmosis, a semipermeable membrane is used while diffusion is without membrane.
(ii) In osmosis, movement of molecules occurs in one direction while in diffusion, movement occurs in all directions.
(iii) In osmosis, only the solvent moves while in diffusion both solute and solvent move.
a) Only (i) and (ii) b) (i) only c) Only (ii) and (iii) d) (i), (ii) and (iii)

172. Benzene and naphthalene form an ideal solution at room temperature. For this process, the true statement (s) is (are)
(i) $\triangle$ G is positive
(ii) $\triangle S_{system}$ is positive
(iii) $\triangle S_{surroundings} = 0$ (iv) $\triangle H = 0$
a) (ii) and (iv) only b) (i) and (iii) only c) (ii), (iii) and (iv) only d) all of these

173. For carrying reverse osmosis for desalination of water the material used for making semipermeable membrane is
a) potassium nitrate b) parchment membrane c) cellulose acetate
d) cell membrane.

174. 10% solution of urea is isotonic with 6% solution of a non-volatile solute X. What is the molecular mass of solute X?
a) 6 g $mol^{-1}$ b) 60 g $mol^{-1}$ c) 36 g $mol^{-1}$ d) 32 g $mol^{-1}$

175. What is the molarity of a solution containing 10 g of NaOH in 500 mL of solution?
a) 0.25 mol $L^{-1}$ b) 0.5 mol $L^{-1}$ c) 0.75 mol $L^{-1}$ d) 1.25 mol $L^{-1}$

176. Which one of the following salts will have the same value of van't Hoff factor (i) as that of $K_4[Fe(CN)_6]$?
a) $Al_2(SO_4)_3$ b) $NaCl$ c) $Al(NO_3)_3$ d) $Na_2SO_4$

177. At a given temperature, osmotic pressure of a concentrated solution of a substance_____.
a) is same as that of a dilute solution
b) cannot be compared with osmotic pressure of dilute solution
c) is higher than that at a dilute solution
d) is lower than that of a dilute solution

178. What will be the molality of a solution of glucose in water which is 10% w/W?

a) 0.01 m  b) 0.617 m  c) 0.668 m  d) 1.623 m

179. 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?
a) 23.4 g $mol^{-1}$  b) 41.35 g $mol^{-1}$  c) 10 g $mol^{-1}$  d) 20.8 g $mol^{-1}$

180. Why is the molecular mass determined by measuring colligative property in case of some solutes is abnormal?
a) Due to association or dissociation of solute molecules.
b) Due to insolubility of solute molecules.
c) Due to decomposition of solute molecules.
d) Due to large size of solute molecules.

181. Which of the following statement about the compositions of the vapour over an ideal 1 : 1 molar mixture of benzene and toiuene is correct? Assume that the temperature is constant at $25^oC$.
(Given: Vapour Pressure Data at $25^oC$ benzene= 12.8 kPa, toluene = 3.85 kPa)
a) The vapour will contain a hight percentage of benzene
b) The vapour will contain a higher percentage of toluene
c) The vapour will contain equal amounts of benezene and toluene
d) Not enough information is given to make a prediction

182. The mixture which shows positive deviation from Raoult's law is
a) Chioroethane + Brornoethane  b) Ethanol + Acetone  c) Benzene + Toluene
d) Acetone + Chloroform

183. Sprinkling of salt helps in clearing the snow covered roads in hills. The phenomenon involved in the process is
a) lowering in vapour pressure of snow
b) depression in freezing point of snow  c) increase in freezing point of snow
d) melting of ice due to increase in temperature by putting salt.

184. Concentrated aqueous sulphuric acid is 98% $H_2SO_4$ by mass and has a density of 1.80 $gmL^{-1}$ Volume of acid required to make one liter of 0.1M $H_2SO_4$ solution is :
a) 11.10 mL  b) 16.65 mL  c) 22.20 mL  d) 5.55 mL

185. Relative lowering of vapour pressure, osmotic pressure of a solution and elevation in boiling points are___(p)_____properties. Osmosis is the passage of____(q)____through a semipermeable membrane from a solution

of_____(r)_____towards a solution of ____(s)_____. Osmotic pressure is equivalent to mechanical pressure which must be applied on____(t)_____to prevent osmosis. In the above paragraph p, q, r, s and t respectively are

a) colligative, solution, higher concentration, lower concentration, solution

b) colligative, solvent, higher concentration, lower concentration, solution

c) colligative, solution, lower concentration, higher concentration, solvent

d) colligative, solvent, lower concentration, higher concentration, solution.

186. $P_A$ 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:

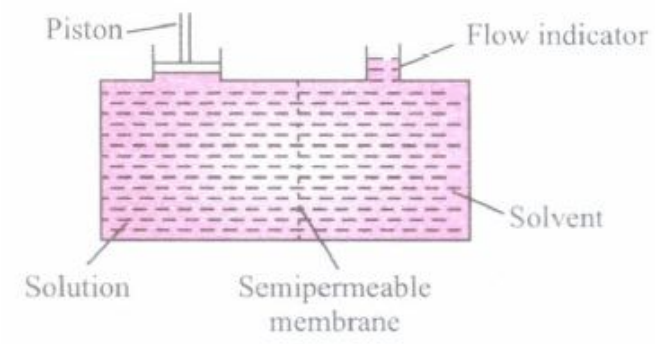
a) $P_A + X_A (P_B - P_A)$ b) $P_A + X_A (P_A - P_B)$ c) $P_B + X_A (P_B - P_A)$

d) $P_B + X_A (P_A - P_B)$

187. At $25^oC$, the highest osmotic pressure is exhibited by 0.1 M solution of

a) urea b) $CaCl_2$ c) KCl d) glucose

188. Study the following figure showing osmosis and mark the correct statement.




a)

The external pressure applied on the solution to stop osmosis is called osmotic pressure.

b)

The external pressure applied on the solvent to stop osmosis is called osmotic pressure.

c)

The hydrostatic pressure built up on solvent which just stops osmosis is osmotic pressure.

d)

Pressure developed by solvent while solution flows through semipermeable membrane.

89. The vapour pressures of ethanol and methanol are 44.5 mm Hg and 88.7 mm Hg respectively. An ideal solution is formed at the same temperature by mixing 60 g of ethanol with 40 g of methanol. The total vapour pressure of the solution and the mole fraction of methanol in the vapour are respectively.
a) 43.46 mm and 0.51 b) 66.15 mm and 0.657 c) 66.15 mm and 0.791
d) 70.59 mm and 0.657

90. The values of van't Hoff factors for KCl, NaCl and $K_2SO_4$, respectively, are:
a) 2, 2 and 2 b) 2, and 3 c) 1, 1 and 2 d) 1, 1 and 1

91. Which condition is not satisfied by an ideal solution?
a) $\Delta_{\text{mix}}\text{H} = 0$ b) $\Delta_{\text{mix}}\text{V} = 0$ c) $\Delta_{\text{mix}}\text{S} = 0$
d) Obeyance to Raoult's Law

92. What will be the degree of dissociation of 0.1 M $Mg(NO_3)_2$ solution if van't Hoff factor is 2.7 4?
a) 75% b) 87% c) 100% d) 92%

93. Which mixture of the solutions will lead to the formation of negatively charged colloidal $[AgI]I^-$ so?
a) $50\ \text{mL}\ of\ 1\text{M}\text{AgNO}_3 + 50\ \text{mL}\ of\ 2\text{MKI}$
b) $50\ \text{mL}\ of\ 2\text{M}\text{AgNO}_3 + 50\ \text{mL}\ of\ 1.5\text{MKI}$
c) $50\ \text{mL of}\ 0.1\text{M}\text{AgNO}_3 + 50\ \text{mL of}\ 0.1\text{MKI}$
d) $50\ \text{mL of}\ 1\text{M}\text{AgNO}_3 + 50\ \text{mL of}\ 1.5\text{MKI}$

94. What will be the molarity of 30 mL of 0.5 M $H_2SO_4$ solution diluted to 500 mL?
a) 0.3 M b) 0.3 M c) 3 M d) 0.103 M

95. Intermolecular forces between n-hexane and n-heptane are nearly same as between hexane and heptane individually. When these two are mixed, which of the following is not true about the solution formed?
a) It obeys Raoult's law, i.e. $P_A = X_A P^o$ and $P_B = x_B P^o$ b) $\triangle H_{\text{mixing}}$ is zero.
c) $\triangle V_{\text{mixing}}$ is zero. d) It forms minimum boiling azeotrope.

96. Two liquids $HNO_3$ (A) and water (B) form a maximum boiling azeotrope when mixed in the ratio of 68% and 32% respectively. It means
a) A - B interactions are stronger than A - A and B - B interactions
b) A - B interactions are weaker than A - A and B - B interactions
c) vapour pressure of solution is more than the pure components
d) vapour pressure of solution is less since only one component vaporises .

197. The elevation in boiling point of a solution of 9.43 g of $MgCl_2$ in 1 kg of water is (Kb = 0.52 K kg $mol^{-1}$, Molar mass of $MgCl_2$ = 94.3 g $mol^{-1}$)
a) 0.156 b) 0.52 c) 0.17 d) 0.

198. How many gram of a dibasic acid (mol. wt. 200) should be present in 100 mL of the aqueous solution to give 0.1 N?
a) 1 g b) 2 g c) 10 g d) 20 g

199. Match the column I with column II and mark the appropriate choice

| Column I | | Column II | |
|---|---|---|---|
| (A) | $\triangle H_{mix}=0$, $\triangle V_{mix}=0$ | (i) | Non-ideal solution |
| (B) | $\triangle H_{mix}\neq 0$, $\triangle V_{mix}\neq 0$ | (ii) | Positive deviation |
| (B) | $\triangle H_{mix}<0$, $\triangle V_{mix}<0$ | (iii) | Ideal solution |
| (D) | $\triangle H_{mix}>0$, $\triangle V_{mix}>0$ | (iv) | Negative deviation |

a) (A) → (i), (B)→ (iii), (C)→ (ii), (D)→ (iv)
b) (A) → (iii), (B) → (i), (C) → (iv), (D) → (ii)
c) (A)→(ii), (B)→(iii), (C)→(iv), (D)→(i)
d) (A)→ (iii), (B)→ (ii), (C)→ (i), (D)→ (iv)

200. Out 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) $K_2SO_4$

201. **Assertion:** Aquatic species are more comfortable in warm waters than cold waters.
**Reason:** $K_H$ values for both $N_2$ and $O_2$ decrease with increase of temperature.
a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

202. An ideal solution is formed when its components
a) have no volume change on mixing b) have no enthalpy change on mixing
c) have both the above characteristics d) have high solubility

203. 200 mL of an aqueous solution of a protein contains its 1.26 g.The osmotic pressure of this solution at 300 K is found to be 2.57 x 1 $0^{-3}$ bar. The molar mass of protein will be (R = 0.083 L bar $mol^{-1}$ $K^{-1}$)
a) 51022 g $mol^{-1}$ b) 122044 g $mol^{-1}$ c) 31011 g $mol^{-1}$ d) 61038 g $mol^{-1}$

204. A plant cell shrinks when it is kept in a
a) hypotonic solution b) hypertonic solution c) isotonic solution
d) pure water

205. **Assertion:** Osmosis does not take place in two isotonic solutions separated by semipermeable membrane.
**Reason:** Isotonic solutions have same osmotic pressure.
a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

206. **Assertion:** One molar aqueous solution is more concentrated than that of 1 molal aqueous solution.
**Reason:** Molarity is a function of temperature as volume depends on temperature
a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

207. The freezing point depression constant ($K_f$) of benzene is 5.12 K kg $mol^{-l}$. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off up to two decimal places)
a) 0.60K b) 0.20K c) 0.80K d) 0.40K

208. 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) -1.18°C b) -54°C c) -0.36°C d) -24°C

209. What amount of $CaCl_2$ (i = 2.47) is dissolved in 2 litres of water so that its osmotic pressure is 0.5 atm at 27°C?
a) 3.42 g b) 9.24 g c) 2.834 g d) 1.820 g

210. Which one of the following salts will have the same value of van't Hoff factor (i) as that of $K_4[Fe(CN)_6]$?
a) $Al_2[Fe(CN)6]$ b) NaCl c) $Al(NO_3)_2$ d) $Na_2SO_4$

211. A solution has 1: 4 mole ratio of pentane to hexane. The vapour pressure 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 be :
a) 0.549 b) 0.200 c) 0.786 d) 0.478

212. **Assertion:** The concentration of pollutants in water or atmosphere is often expressed in terms of ppm.
**Reason:** Concentration in parts per million can be expressed as mass to mass, volume to volume and mass to volume.
a)
If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.
d) If both assertion and reason are false

213. 0.001 molal solution of $[Pt(NH_3)_4Cl_4]$ in water had a freezing point depression of 0.0054 $^0$c. If Kf for water is 1.80, the correct formula of the compound is
a) $[Pt(NH_3)_4Cl_3]Cl$ b) $[Pt(NH_3)_4Cl_4]$ c) $[Pt(NH_3)_4Cl_2]Cl_2$ d) $[Pt(NH_3)_4Cl]Cl_3$

214. Which of the following is not an industrial or biological importance of osmosis?
a) Movement of water from soil into plant roots and upper portion of plant.
b) Salting of meat to prevent bacterial action.
c) Reverse osmosis for desalination of sea water.
d) Filling of ink in a fountain pen.

215. 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

216. How many $Na^+$ ions are present in 100mL of 0.25M of NaCl solution?
a) $0.025 \times 10^{23}$ b) $1.505 \times 10^{22}$ c) $15 \times 10^{22}$ d) $2.5 \times 10^{23}$

217. 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

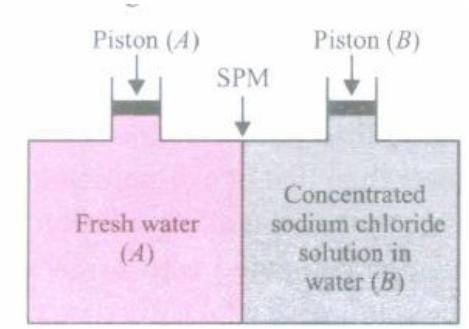
218. A solution is obtained by mixing 200 g of 30% and 300 g of 20% solution by weight. What is the percentage of solute in the final solution?
a) 50% b) 28% c) 64% d) 24%

219. People taking lot of salt experience puffiness or swelling of the body due to
a) water retention in tissue cells and intercellular spaces because of osmosis
b) water loss from the cells through skin tissues
c) capillary action of water through skin pores
d) excessive thirst and drinking more water.

220. Which of the following will have same value of van't Hoff factor as that of $K_4[Fe(CN)_6]$?
a) $Al_2(SO_4)_3$ b) $AlCl_3$ c) $Al(NO_3)_3$ d) $Al(OH)_3$

221. A solution containing 12.5 g of non-electrolyte substance in 185 g of water shows boiling point elevation of 0.80 K. Calculate the molar mass of the substance. ($K_b$ = 0.52 K kg $mol^{-1}$)
a) 53.06 g $mol^{-1}$ b) 25.3 g $mol^{-1}$ c) 16.08 g $mol^{-1}$ d) 43.92 g $mol^{-1}$

222. 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).

223. $A\ 5\%$ solution of cane sugar (mol. wt. = 342) is isotonic with 1 % solution of a substance X. The moiecular weight of x is:

a) 34.2 b) 171.2 c) 68.4 d) 136.8

224. M and 2.5L NaOH solution is mixed with another 0.5M and 3L NaOH solution. Then, find out the molarity of resultant solution?

a) 0.80M b) 1.0M c) 0.73M d) 0.50M

225. Which one is a colligative property ?

a) Boiling point b) Vapour pressure c) Osmotic pressure d) Freezing point

226. The unit of ebulioscopic 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-1or K (molality)

227. What is the mole fraction of the solute in a 1.00 m aqueous solution?

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

228. A solution of acetone in ethanol

a) shows a positive deviation from Raoult's law

b) behaves like a non-ideal solution c) Obeys Raoult's law

d) Show a negative deviation from Raoult's law

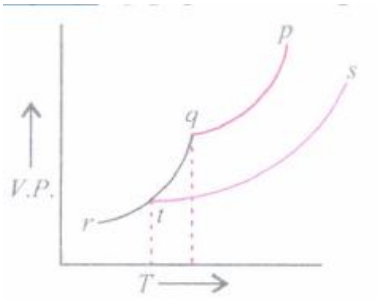
229. Which of the following representations of i (van't Hoff factor) is not correct?

a) $i=\frac{Observed\ colligative\ property}{Expected\ colligative\ property}$ b) $i=\frac{Norma\ molecular\ mass}{Observed\ molecular\ mass}$

c) $i=\frac{Number\ of\ molecules\ actually\ present}{Number\ of\ molecules\ expected\ to\ be\ present}$

d) $i=\frac{Total\ number\ of\ particles\ taken\ before\ association/dissciation}{Number\ of\ particles\ after\ association/dissociation}$

230. In the given graph, pq, qr and st represent



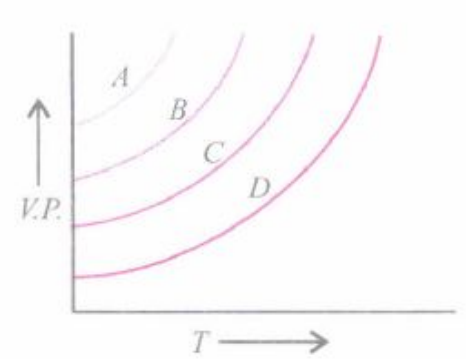

a)
pq ⟶ liquid state of solution, qr ⟶ solid state of solution, st ⟶ liquid state of solvent
b)
pq ⟶ liquid state of solvent, qr ⟶ solid state of solvent, st ⟶ liquid state of solution
c)
pq ⟶ liquid state of solvent, qr ⟶ solid state of solution, st ⟶ liquid state of solution
d)
pq ⟶ solid state of solvent, qr ⟶ liquid state of solvent, st ⟶ solid state of solution.

231. Which of the following statements is not correct?
a) 5% aqueous solutions of NaCl and KCl are said to be isomolar.
b) 1 M sucrose solution and 1 M glucose solution are isotonic
c)
Molecular mass of acetic acid and benzoic acid is higher than normal mass in cryoscopic methods.
d) For the same solution, $\frac{\Delta T_b}{\Delta T_f} = \frac{K_b}{K_f}$

232. The vapour pressure at a given temperature of an ideal solution containing 0.2 mole of a non-volatile solute and 0.8 mole of solvent is 60 mm of Hg. The vapour pressure of the pure solvent at the same temperature is :
a) 150 mm of Hg b) 60 mm of Hg c) 75 mm of Hg d) 120 mm of Hg

233. 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

234. The given graph shows the vapour pressure-temperature curves for some liquids.




Liquids A, B, C and D respectively are

a) diethyl ether, acetone, ethyl alcohol, water

b) acetone, ethyl alcohol, diethyl ether, water

c) water, ethyl alcohol, acetone, diethyl ether

d) ethyl alcohol, acetone, diethyl ether, water.

235. Which of the following is an example of gaseous solution?

a) Camphor in nitrogen gas b) Solution of hydrogen in palladium

c) Chloroform mixed with nitrogen gas d) Both (a) and (c)

236. 25.3 g of sodium carbonate, $Na_2CO_3$ is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, $Na^+$ and carbonate ion, $CO_3^{2-}$ are respectively (Molar mass of $Na_2CO_3$ = 106 g $mol^{-1}$)

a) 0955M and 1.910M b) 1.910M and 0.955M c) 1.90M and 1.910M

d) 0.477M and 0.477M