AS PER LATEST NTA NOTIFICATION

CHAPTER WISE TEST

YOUR COLLEGE NAME HERE

CHEMISTRY JEE MAIN (2025)

Topic – Solutions

Time Allowed: 60 mins **Maximum Marks: 100**

Instructions for the Candidate:

The Paper consist of 25(Twenty-Five) Question, which are divided in to two Sections
(a) Section A (MCQ's) Shall consist of 20 (Twenty) Questions. In which all are compulsory.
(b) Section B (NTA) Shall Consist of 5 (Five) Questions. In which all are compulsory.

Section – A (MCQ's)

1. The density of 2% (w/w) aqueous NaCl solution is 1.049 g mL^{-1}. What is the approximate molality?
(A) 0.16 m (B) 0.52 m
(C) 0.29 m (D) 0.35 m

2. At 40°C, the vapour pressure in torr of methyl and ethyl alcohol solutions is represented by $P = 119X_A + 135$ where X_A is mole fraction of methyl alcohol. The value of P_B^o and P_A^o are:
(A) 135, 230 (B) 135, 254
(C) 140, 135 (D) 119, 135

3. When a non - volatile solute with molar mass 45 g mol^{-1} is dissolved in 120 g of octane, its vapor pressure is reduced to 70%. Calculate the mass of solute. (M.W. of octane = 114 g/mol^{-1})
(A) 20.3 g (B) 15.6 g
(C) 5.1 g (D) 10.2 g

4. A current of dry air is passed through a bulb containing 5 g of a solute in 100 g of water and then through water alone. The losses in weight of the solution and pure water were respectively 0.78 g and 0.02 g. Calculate the relative lowering of vapour pressure.
(A) 1.05 (B) 2.04
(C) 0.09 (D) 0.03

5. The vapour pressure of benzene at a certain temperature is 640 mm of Hg. A non - volatile and non - electrolyte solid weighing 2.175 g is added to 39.08 g of benzene. The vapour pressure of the solution is 600 mm of Hg. What is the molecular weight of solid substance?
(A) 59.60 (B) 49.59
(C) 108.30 (D) 69.40

6. The freezing point of 1 molal NaCl solution assuming NaCl to be 100% dissociated in water is: (K_f = 1.86 K $molality^{-1}$)
(A) +1.86°C (B) +3.72°C
(C) - 3.72°C (D) - 1.86°C

7. Solution A containing 0.05 M glucose is separated from solution B containing 0.005 M glucose by a semipermeable membrane. Find the magnitude of applied pressure and also identify the solution on which it must be applied to prevent osmosis at 300 K.
(A) 2.216 atm on solution A
(B) 1.108 atm on solution A
(C) 1.108 atm on solution B
(D) 2.216 atm on solution B

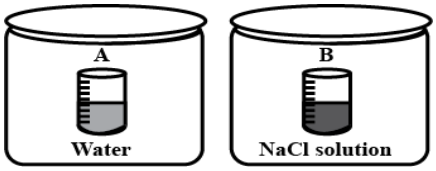
8. 18 g of glucose ($C_6H_{12}O_6$) is added to 178.2 g water. The vapour pressure of water (in torr) for this aqueous solution is
(A) 76.0 (B) 752.4
(C) 7.6 (D) 759.0

9. Which one of the following modes of expressing concentration is independent of temperature?
(A) Molality (B) Formality
(C) Normality (D) Molarity

10. An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because:
(A) it gains water due to endo osmosis
(B) it gains water due to reverse osmosis
(C) it loses water due to exo osmosis
(D) it loses water due to reverse osmosis

11. Boiling point of a 2% aqueous solution of a non - volatile solute A is equal to the boiling point of 8% aqueous solution of a non - volatile solute B. The relation between molecular weights of A and B is
(A) $M_A = 4M_B$ (B) $M_B = 4M_A$
(C) $M_A = 8M_B$ (D) $M_B = 8M_A$

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



(A) Vapour pressure is equal in both containers.
(B) Vapour pressure in container (A)is more than that in a container (B).
(C) Vapour pressure in container (B)is twice the vapour pressure in container (A).
(D) Vapour pressure in container (A)is less than that in a container (B).

13. Which of the following is correct for the effect of temperature on the solubility of Na_2SO_4 in water?
(A) As the temperature increases, the solubility decreases.
(B) As the temperature increases, the solubility first increases and then decreases.
(C) As the temperature increases, the solubility increases.
(D) Solubility of Na_2SO_4 is unaffected by temperature.

14. On dissolving sugar in water at room temperature solution feels cool to touch. Under which of the following cases dissolution sugar will be most rapid?
(A) Sugar crystals in cold water
(B) Powdered sugar in cold water
(C) Powdered sugar in hot water
(D) Sugar crystals in hot water

15. Aqueous solution of 0.004 M Na_2SO_4 and 0.01 M glucose are isotonic. The degree of dissociation of Na_2SO_4 is:
(A) 85% (B) 75%
(C) 25% (D) 60%

16. 5 g of Na_2SO_4 was dissolved in x g of H_2O. The change in freezing point was found to be 3.82°C. If Na_2SO_4 is 81.5% ionised, the value of x is
(K_f for water = 1.86°C kg mol^{-1}) is approximately:
(molar mass of S = 32 g mol^{-1} and that of Na = 23 g mol^{-1})
(A) 45 g (B) 65 g
(C) 25 g (D) 15 g

17. A supersaturated solution is a metastable state of solution in which solute concentration:
(A) less than its solubility
(B) is equal to the solubility of that substance in water
(C) continuously change
(D) exceeds than its solubility

18. At 35 °C, the vapour pressure of CS_2 is 512 mm Hg and that of acetone is 344 mm Hg. A solution of CS_2 in acetone has a total vapour pressure of 600 mm Hg. The false statement amongst the following is:

(A) CS_2 and acetone are less attracted to each other than to themselves
(B) heat must be absorbed in order to produce the solution at 35 °C
(C) Raoult's law is not obeyed by this system
(D) a mixture of 100 mL CS_2 and 100 mL acetone has a volume < 200 mL

19. The boiling point elevation constant for benzene is 2.57ºC/m. The boiling point of benzene is 81ºC. Determine the boiling point of the solution formed when 10 g of C_4H_{12} is dissolved in 20 g benzene.
(A) 71.46 (B) 88.14
(C) 85.76 (D) 7.14

20. **Assertion (A):** Elevation in boiling point and depression in freezing point are colligative properties.
Reason (R): All colligative properties are used for the calculation of molecular masses.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

Section – B (NTA)

21. The vapour pressures of A and B at 25°C are 90 mm Hg and 15 mm Hg respectively. If A and B are mixed such that the mole fraction of A in the mixture is 0.6, then the mole fraction of B in the vapour phase is $X \times 10^{-1}$. The value of x is _____. (Nearest integer)

22. 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. The vapour pressure of the solution is 600 mm Hg. What is the molecular weight (g mol^{-1}) of solid substance?

23. The total pressure of a mixture of non - reacting gases X (0.6 g) and Y (0.45 g) in a vessel is 740 mm of Hg. The partial pressure of the gas X is _____mm of Hg.
(Nearest Integer)
(Given: molar mass X = 20 and Y = 45 g mol^{-1})

24. 1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionised. The boiling point of the solution at 1 atm is _____ K.
(Rounded - off to the nearest integer)
[Given K_b for (H_2O) = 0.52 K kg mol^{-1}].

25. 0.004 M K_2SO_4 solution is isotonic with 0.01 M glucose solution. Percentage dissociation of K_2SO_4 is _____. (Nearest integer)

SPACE FOR ROUGH WORK