



DPP –9 [Osmotic Pressure] Chapter: Solution

“Jab padhna mushkil lagta hai, tab yaad rakho — ghar par koi tum par bharosa karke baitha hai”

TYPE–1 : Conceptual / Theory of Osmosis

1. **A colligative property of a solution depends on the**

[NSEC-2000]

(A) arrangement of atoms in solute molecule (B) total number of molecules of solute and solvent

(C) number of molecules of solute in solution (D) mass of the solute molecules

2. **If a thin slice of sugar beet is placed in concentrated solution of NaCl then**

- (1) Sugar beet will lose water from its cells
- (2) Sugar beet will absorb water from solution
- (3) Sugar beet will neither absorb nor lose water
- (4) Sugar beet will dissolve in solution

3. **In osmosis phenomenon net flow of :**

- (1) Solvent molecules occurs from higher concentration to lower concentration
- (2) Solvent molecules occurs from lower concentration to higher concentration
- (3) Solute molecules occurs from higher concentration to lower concentration
- (4) Solute molecules occurs from lower concentration to higher concentration

4. **During osmosis, flow of water through a semipermeable membrane is :**

- (1) from both sides of semipermeable membrane with equal flow rates
- (2) from both sides of semipermeable membrane with unequal flow rates
- (3) from solution having lower concentration only
- (4) from solution having higher concentration only

5. **In the case of osmosis, solvent molecules move from**

- (1) Higher vapour pressure to lower vapour pressure
- (2) Higher concentration to lower concentration
- (3) Lower vapour pressure to higher vapour pressure
- (4) Higher osmotic pressure to lower osmotic pressure

6. **The desalination of sea water involves the phenomenon of :**

[NSEC-2008]

(A) Sedimentation (B) Distillation (C) Precipitation (D) Reverse osmosis

7. **Select correct statement :**

- (A) Osmosis produced by semipermeable membrane
- (B) Desalination of sea-water is done by reverse osmosis
- (C) Both are correct statements
- (D) None is correct statement

8. Which of the following is not a colligative property ?

[NSEC-2007]

- (A) solubility (B) vapor pressure lowering
(C) boiling point elevation (D) osmotic pressure

9. The best colligative property used for the determination of molecular masses of polymers is :

- (1) Relative lowering in vapour pressure (2) Osmotic pressure
(3) Elevation in boiling point (4) Depression in freezing point

10. The colligative property used in the determination of molar mass of a polymer is :

[NSEC-2014]

- (A) lowering of the vapour pressure (B) elevation in the boiling point
(C) depression in the freezing point (D) osmotic pressure

TYPE-2 : Basic π Calculation ($\pi = CRT$)

11. The osmotic pressure of a solution is given by the equation :

[NSEC-2001]

- (A) $p = \frac{CR}{T}$ (B) $\frac{\pi}{C} = RT$ (C) $p = \frac{CT}{R}$ (D) $p = \sqrt{C} \cdot \frac{R}{T}$

12. At constant temperature the osmotic pressure of a solution is :

- (1) Directly proportional to the concentration
(2) Inversely proportional to the concentration
(3) Directly proportional to the square of concentration
(4) Directly proportional to the square root of concentration

13. The osmotic pressure of a solution increases if :

- (1) Temperature is lowered (2) Volume is increased
(3) Number of solute molecules is increased (4) None

14. The osmotic pressure of 1M solution of urea is at 27°C is

- (1) 2.46 atm (2) 24.6 atm
(3) 1.21 atm (4) 12.1 atm

15. If total concentration of dissolved particles inside red blood cells is 0.3 M (approximate) and the membrane surrounding the cell is semipermeable. Find osmotic pressure inside the cell

- (1) 7.34 atm (2) 1.78 atm
(3) 2.34 atm (4) 0.74 atm

16. A solution is prepared by dissolving 0.6 g of urea (molar mass = 60 g mol⁻¹) and 1.8 g of glucose (molar mass = 180 g mol⁻¹) in 100 mL of water at 27°C. The osmotic pressure of the solution is: (R = 0.08206 L atm K⁻¹ mol⁻¹)

[JEE(Main) 2019 Online (12-04-19)S2, 4/120]

- (1) 8.2 atm (2) 1.64 atm (3) 2.46 atm (4) 4.92 atm

17. Osmotic pressure of a solution (density is 1 g mL⁻¹) containing 3 g of glucose (molecular weight = 180) in 60 g of water at 15°C is :

- (1) 0.34 atm (2) 0.65 atm
(3) 6.25 atm (4) 5.57 atm

18. 1 g of a protein polymer having molar mass 16×10^4 is present in 800 mL solution at

300 K then osmotic pressure (in pascal) is

[$R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$]:-

- (1) 0.4 (2) 0.02 (3) 0.04 (4) 0.2

19. If density of 2 molal sucrose solution is 1.4 g mL^{-1} at 25°C , find osmotic pressure.
(1) 4.06 atm (2) 2 atm
(3) 40.6 atm (4) 3.4 atm
20. What would be osmotic pressure of a solution containing 5.85 g NaCl and 3.42 g sugar in 500 mL at 27°C ?
(1) 103.4 atm (2) 10.34 atm
(3) 1.034 atm (4) 0.1034 atm

TYPE-3 : Molar Mass from Osmotic Pressure (Numerical)

21. 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? (m_2 - mass of solute, V - volume of solution, π - osmotic pressure)
(1) $M_2 = \left(\frac{m_2}{V}\right) VRT$ (2) $M_2 = \left(\frac{m_2}{V}\right) \frac{RT}{\pi}$
(3) $M_2 = \left(\frac{m_2}{V}\right) \pi RT$ (4) $M_2 = \left(\frac{m_2}{V}\right) \frac{\pi}{RT}$
22. A solution containing 4 g of a non volatile organic solute per 100 mL was found to have an osmotic pressure equal to 500 cm of mercury at 27°C . The molecular weight of solute is :
(1) 14.97 (2) 149.7 (3) 1697 (4) 1.497
23. A solution containing 500 g of a protein per litre is isotonic with a solution containing 3.42 g of sucrose per litre. The molecular mass of protein is
(1) 5 (2) 146
(3) 34200 (4) 50000
24. 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 2.57×10^{-3} bar. The molar mass of protein will be :-
($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)
(1) 61038 g mol^{-1} (2) 51022 g mol^{-1}
(3) 122044 g mol^{-1} (4) 31011 g mol^{-1}
25. Osmotic pressure of a solution containing 1 g protein in 100 mL solution at 300 K is 1.66 bar. What is the molecular weight of protein
($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)
(1) 150 (2) 120
(3) 130 (4) 300
26. Insulin ($\text{C}_2\text{H}_{10}\text{O}_5$)_n is dissolved in a suitable solvent and the osmotic pressure (π) of solutions of various concentrations (g cm^{-3}) C is measured at 20°C . The slope of a plot of π against C is found to be 4.65×10^{-3} . The molecular weight of the insulin is
(1) 4.8×10^5 (2) 9×10^5
(3) 3×10^5 (4) 5.16×10^6

TYPE-4 : Isotonic Solutions / Molar Mass from Isotonicity

27. **Osmosis of A into solution B will not take place if :-**
(1) A is hypertonic (2) A is hypotonic
(3) A is isotonic (4) Either 1 or 3 may correct
28. **Solutions having the same osmotic pressure are called** [NSEC-2000]
(A) isotonic solutions (B) molar solutions
(C) hypotonic solutions (D) ideal solutions
29. **If 0.1 M solution of glucose and 0.1 M urea solution are placed on two sides of a semipermeable membrane to equal heights, then it will be correct to say that :**
(1) There will be not net movement across the membrane
(2) Glucose will flow towards urea solution
(3) Urea will flow towards glucose solution
(4) Water will flow from urea solution towards glucose solution
30. **Equal volume of 0.1 M urea and 0.1 M glucose are mixed. The mixture will have :-**
(1) Lower osmotic pressure (2) Same osmotic pressure
(3) Higher osmotic pressure (4) None of these
31. **Which of the following solutions at the same temperature will be isotonic :**
(1) 3.42 g of cane sugar in one litre water and 0.18 g of glucose in one litre water
(2) 3.42 g of cane sugar in one litre water and 0.18 g of glucose in 0.1 litre water
(3) 3.42 g of cane sugar in one litre water and 0.585 g of NaCl in one litre water
(4) 3.42 g of cane sugar in one litre water and 1.17 g of NaCl in one litre water
32. **A solution containing 10 g per dm³ of urea (molecular mass = 60 g mol⁻¹) is isotonic with a 5% solution of a nonvolatile solute. The molecular mass of this nonvolatile solute is :**
(1) 250 g mol⁻¹ (2) 300 g mol⁻¹
(3) 350 g mol⁻¹ (4) 200 g mol⁻¹
33. **A solution containing 8.6 g urea in one litre was found to be isotonic with 0.5% (wt./vol) solution of an organic, non volatile solute. The molecular weight of later is :**
(1) 348.9 (2) 34.89 (3) 3489 (4) 861.2
34. **If a 6.84% (w/V) solution of cane-sugar (mol. wt. 342) is isotonic with 1.52% (w/V) solution of thiocarbamide, then the molecular weight of thiocarbamide is :**
(1) 152 (2) 76 (3) 60 (4) 180
35. **A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass = 60 g mol⁻¹) in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 g cm⁻³, molar mass of the substance will be.**
(1) 115.0 g mol⁻¹ (2) 105.0 g mol⁻¹
(3) 210.0 g mol⁻¹ (4) 90.0 g mol⁻¹
36. **A 5% solution of cane sugar (molar mass 342) is isotonic with 1% of a solution of an unknown solute. The molar mass of unknown solute in g mol⁻¹ is :-**
(1) 136.2 (2) 171.2
(3) 68.4 (4) 34.2
37. **A 5% (w/v) solution of cane sugar (mol. wt. = 342) is isotonic with 1% (w/v) solution of a substance X. The molecular weight of X is**

- (1) 68.4 (2) 171.2
 (3) 34.2 (4) 136.8

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

[AIEEE-2007, 3/120]

- (1) 105.0 g mol⁻¹ (2) 210.0 g mol⁻¹
 (3) 90.0 g mol⁻¹ (4) 15.0 g mol⁻¹

39. Osmotic pressure of a 2% w/v solution of glucose is same as 5% w/v solution of a nonvolatile non-electrolyte solute. The molar mass of the solute is :

[NSEC-2014]

- (A) 180 (B) 450 (C) 72 (D) 45

40. A solution of urea was found to be isotonic with a solution of salt XY of molecular weight 74.6. If 0.15 moles of urea are dissolved in a certain volume V mL of the isotonic solution, the amount of salt in the solution will be :

[NSEC-2008]

- (A) 22.4 g (B) 5.6 g (C) 11.2 g (D) 7.46 g

TYPE-5 : Blood Osmotic Pressure / Applications

41. Osmotic pressure of a sugar solution at 24°C is 2.5 atmosphere. The concentration of the solution in mole per litre is :

- (1) 10.25 (2) 1.025
 (3) 1025 (4) 0.1025

42. The osmotic pressure of blood is 7.65 atm. at 310 K. an aqueous solution of Glucose that will be isotonic with blood is w/V :

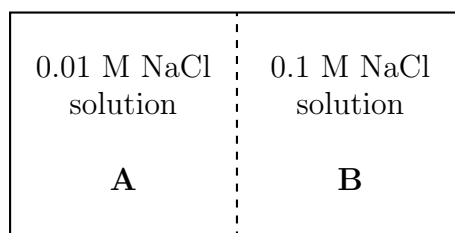
- (1) 5.41% (2) 54.1%
 (3) 3.5% (4) 4.53%

43. The average osmotic pressure of human blood is 7.8 bar at 37°C. The concentration of aqueous NaCl solution that could be used in the blood stream is

[NCERT Pg. 54]

- (1) 0.15 mol/L (2) 0.32 mol/L
 (3) 0.30 mol/L (4) 0.45 mol/L

44. Two solutions marked as A and B are separated through semipermeable membrane as below. The phenomenon undergoing is



SPM

- (1) Na⁺ moves from solution A to solution B
 (2) Both Na⁺ and Cl⁻ moves from solution (A) to solution (B)

- (3) Both Na^+ and Cl^- moves from solution (B) to (A)
(4) Solvent molecules moves from solution (A) to (B)

TYPE-6 : Dilution & Miscellaneous Numerical

45. **The relationship between osmotic pressure (P) at 273 K when 10 g glucose (P_1), 10 g urea (P_2) and 10 g sucrose (P_3) are dissolved in 250 mL of water is**
- (1) $P_1 > P_2 > P_3$ (2) $P_2 > P_1 > P_3$
(3) $P_2 > P_3 > P_1$ (4) $P_3 > P_2 > P_1$
46. **At 17°C osmotic pressure of sugar solution was 580 torr. The solution is diluted and temperature is raised to 57°C, osmotic pressure become 165 torr. The extent of dilution is**
- (1) 2 times (2) 3 times
(3) 4 times (4) 5 times
47. **Camphor is often used in molecular mass determination because :-**
- (1) It has a very high cryoscopic constant (2) It is volatile
(3) It is solvent for organic substances (4) It is readily available
48. **Which inorganic precipitate acts as semipermeable membrane ?**
- (1) Calcium sulphate (2) Barium oxalate
(3) Nickel phosphate (4) Copper ferrocyanide