Exercise - I (Conceptual Questions) Build Up Your Understanding

CONCENTRATION TERMS

1. 8 g NaOH is dissolved in one litre of solution. Its molarity is :
(1) 0.8 M (2) 0.4 M (3) 0.2 M (4) 0.1 M
CSO001

2. If 18 g of glucose is present in 1000 g of solvent, the solution is said to be :
(1) 1 molar (2) 0.1 molar
(3) 0.5 molar (4) 0.1 molal
CSO002

3. The molarity of a solution of sodium chloride (mol wt. = 58.5) in water containing 5.85 g of sodium chloride in 500 mL of solution is :-
(1) 0.25 (2) 2.0 (3) 1.0 (4) 0.2
CSO003

4. For preparing 0.1 M solution of H_2SO_4 in one litre, we need H_2SO_4 :
(1) 0.98 g (2) 4.9 g (3) 49.0 g (4) 9.8 g
CSO004

5. Mole fraction of glycerine($C_3H_5(OH)_3$) in a solution of 36 g of water and 46 g of glycerine is :
(1) 0.46 (2) 0.36 (3) 0.20 (4) 0.40
CSO005

6. 1000 g aqueous solution of $CaCO_3$ contains 10 g of calcium carbonate, concentration of the solution is :
(1) 10 ppm (2) 100 ppm
(3) 1000 ppm (4) 10,000 ppm
CSO006

7. What is the normality of 1M H_3PO_4 solution ?
(1) 0.5 N (2) 1.0 N (3) 2.0 N (4) 3.0 N
CSO007

8. The molarity of 0.2 N Na_2CO_3 solution will be:
(1) 0.05 M (2) 0.2 M (3) 0.1 M (4) 0.4 M
CSO008

9. Normality of 0.3 M phosphorous acid is:-
(1) 0.15 (2) 0.6 (3) 0.9 (4) 0.1
CSO009

10. The molarity of pure water is :
(1) 100 M (2) 55.5 M (3) 50 M (4) 18M
CSO010

11. Molarity of 720 g of pure water -
(1) 40M
(2) 4M
(3) 55.5M
(4) Can't be determined
CSO011

12. Equal weight of NaCl and KCl are dissolved separately in equal volumes of solutions then molarity of the two solutions will be –
(1) Equal
(2) That of NaCl will be less than that of KCl
(3) That of NaCl will be more than that of KCl Solution
(4) That of NaCl will be half of that of KCl solution
CSO012

13. The mole fraction of oxygen in a mixture of 7g of nitrogen and 8g of oxygen is :
(1) $\frac{8}{15}$ (2) 0.5 (3) 0.25 (4) 1.0
CSO013

14. In a solution of 7.8 g benzene (C_6H_6) and 46.0g toluene ($C_6H_5CH_3$), the mole fraction of benzene is:-
(1) $\frac{1}{6}$ (2) $\frac{1}{5}$ (3) $\frac{1}{2}$ (4) $\frac{1}{3}$
CSO014

15. An X molal solution of a compound in benzene has mole fraction of solute equal to 0.2. The value of X is:-
(1) 14 (2) 3.2 (3) 1.4 (4) 2
CSO015

16. A 500 g tooth paste sample has 0.02 g fluoride concentration. What is the concentration of fluorine in terms of ppm level:-
(1) 250 (2) 40 (3) 400 (4) 1000
CSO016

17. The normality of 10 mL of a '20 V' H_2O_2 solution is
(1) 1.79 (2) 3.58
(3) 60.86 (4) 6.086
CSO017

18. H_2O_2 solution used for hair bleaching is sold as a solution of approximately 5.0 g H_2O_2 per 100 mL of the solution. The molecular mass of H_2O_2 is 34. The molarity of this solution is approximately:-
(1) 0.15 M (2) 1.5 M (3) 3.0 M (4) 3.4 M
CSO018

19. Normality of 10% (w\V) H_2SO_4 solution is nearly
(1) 0.1 (2) 0.2 (3) 0.5 (4) 2
CSO019

20. What volume of 0.1 N HNO_3 solution can be prepared from 6.3 g of HNO_3 ?
(1) 1 litre (2) 2 litre
(3) 0.5 litre (4) 5 litre
CSO020

21. A molal solution is one that contains one mole of a solute in
(1) 1000 g of the solvent
(2) one litre of the solution
(3) one litre of the solvent
(4) 22.4 litres of the solution
CSO021

22. Which of the following statement is true :-
(a) Molarity is the no. of moles of solute dissolved per litre of solvent.
(b) The molarity and normality of a solution of sodium carbonate are same.
(c) Molality (m) of a solution is defined as the number of moles of solute dissolved is 1000 gm of solution
(d) The ratio of mole fraction of solute and solvent is in the ratio of their respective moles.
(1) a & c (2) a & d
(3) b & c (4) Only d
CSO022

23. Two bottles of A and B contain 1M and 1m aqueous solution of sulphuric acid respectively-
(1) A is more concentrated than B
(2) B is more concentrated than A
(3) Concentration of A = concentration of B
(4) It is not possible to compare the concentration
CSO023

24. Molar concentration of a solution in water is :
(1) Always equal to normality
(2) More than molality of the solution
(3) Equal to molality of the solution
(4) Less than the molality of the solution
CSO024

25. The molarity of 98% (w/W) H_2SO_4 (d = 1.8 g mL^{-1}) is :-
(1) 6 M (2) 18 M
(3) 10 M (4) 4 M
CSO025

SOLUBILITY (HENRY'S LAW)

26. Henry's law constant for dissolution of CH_4 in benzene at 298 K is 2×10^5 mm of Hg. Then solubility of CH_4 in benzene at 298 K (in terms of mole fraction) under 760 mm of Hg is :
(1) 1.2×10^{-5} (2) 3.8×10^{-3}
(3) 4×10^{-7} (4) 1×10^{-2}
CSO026

27. Which of the following gas does not obey Henry's law ?
(1) NH_3 (2) H_2
(3) O_2 (4) He
CSO027

VAPOUR PRESSURE (LIQUID-LIQUID MIXTURE)

28. 1 mol of heptane (V. P. = 92 mm of Hg) was mixed with 4 mol of octane (V. P. = 31mm of Hg). The vapour pressure of resulting ideal solution is :
(1) 46.2 mm of Hg (2) 40.0 mm of Hg
(3) 43.2 mm of Hg (4) 38.4 mm of Hg
CSO028

29. At 88°C benzene has a vapour pressure of 900 torr and toluene has a vapour pressure of 360 torr. What is the mole fraction of benzene in the mixture with toluene that will boil at 88°C at 1 atm. pressure, (benzene - toluene form an ideal solution) :
(1) 0.416 (2) 0.588
(3) 0.688 (4) 0.740
CSO029

30. If P_A^0 and P_B^0 are 108 and 36 torr respectively. What will be the mole fraction of A in vapour phase if B has mole fraction of 0.5 in solution :-

(1) 0.25 (2) 0.75

(3) 0.60 (4) 0.35

CSO030

31. What is correct relation between mole fraction in vapour phase (Y_A) of A in terms of X_A. If mole fraction in solution of A is (X_A) (If P_A^0 is vapour pressure of A in pure state)

(1) $(1-X_A)P_A^0$ (2) $\frac{X_A}{1-X_A}P_A^0$

(3) $\frac{1-X_A}{X_A}P_A^0$ (4) $\frac{P_A^0 X_A}{P_S}$

CSO031

IDEAL AND NON-IDEAL SOLUTIONS

32. Which condition is not satisfied by an ideal solution ?

(1) $\Delta H_{mixing} = 0$

(2) $\Delta V_{mixing} = 0$

(3) $\Delta S_{mixing} = 0$

(4) Obeyance of Raoult's law

CSO032

33. Among the following, that does not form an ideal solution is ?

(1) C_6H_6 and $C_6H_5CH_3$

(2) C_2H_5Cl and C_6H_5OH

(3) C_6H_5Cl and C_6H_5Br

(4) C_2H_5Br and C_2H_5I

CSO033

34. An azeotropic mixture of two liquids has boiling point lower than either of them when it :-

(1) Shows a (+ve) deviation from Raoult's law

(2) Shows no deviation from Raoult's law

(3) Shows (+ve) deviation from Henry's law

(4) Shows (–ve) deviation from Henry's law

CSO034

COLLIGATIVE PROPERTIES

35. Which is not a colligative property ?

(1) Osmotic pressure

(2) Relative lowering in vapour pressure

(3) Depression in freezing point

(4) Refractive index

CSO035

36. The lowering of vapour pressure of a solvent by addition of a non-volatile solute to it, is directly proportional to :

(1) Mole fraction of solute

(2) The nature of the solute in the solution

(3) The atmospheric pressure

(4) All

CSO036

37. The relative lowering of vapour pressure is equal to the mole fraction of the nonvolatile solute. This statement was given by :

(1) Raoult (2) Henry

(3) Joule (4) Dalton

CSO037

38. The vapour pressure of a solution having solid as solute and liquid as solvent is :

(1) Directly proportional to mole fraction of the solvent

(2) Inversely proportional to mole fraction of the solvent

(3) Directly proportional to mole fraction of the solute

(4) Inversely proportional to mole fraction of the solute

CSO038

39. If P_0 and P_S are the vapour pressure of solvent and its solution respectively. N_1 and N_2 are the mole fraction of solvent and solute respectively then :

(1) $P_S = \frac{P_0}{N_2}$

(2) $P_0 - P_S = P_0N_2$

(3) $P_S = P_0N_2$

(4) $\frac{(P_0 - P_S)}{P_S} = \frac{N_1}{(N_1 + N_2)}$

CSO039

40. One mole of non volatile solute is dissolved in two mole of water. The vapour pressure of the solution relative to that of water is

(1) $\frac{2}{3}$ (2) $\frac{1}{3}$ (3) $\frac{1}{2}$ (4) $\frac{3}{2}$

CSO040

41. The vapour pressure of a dilute aqueous solution of Glucose is 750 mm Hg at 373 K. The mole fraction of solute is :

(1) $\frac{1}{10}$ (2) $\frac{1}{7.6}$ (3) $\frac{1}{35}$ (4) $\frac{1}{76}$

CSO041

42. The vapour pressure of water at room temperature is 23.8 mm of Hg. The vapour pressure of an aqueous solution of sucrose with mole fraction 0.1 is equal to :

(1) 23.9 mm Hg (2) 24.2 mm Hg
(3) 21.42 mm Hg (4) 31.44 mm Hg

CSO042

43. The vapour pressure of pure A is 10 torr. At the same temperature, when 1 g of B is dissolved in 20 gm of A, its vapour pressure is reduced to 9.0 torr. If the molecular mass of A is 200 amu, then the molecular mass of B is :

(1) 100 amu (2) 90 amu
(3) 75 amu (4) 120 amu

CSO043

44. The boiling point of C_6H_6, CH_3OH, $C_6H_5NH_2$ and $C_6H_5NO_2$ are 80°C, 65°C, 184°C and 212°C respectively. Which will show highest vapour pressure at room temperature :

(1) C_6H_6 (2) CH_3OH
(3) $C_6H_5NH_2$ (4) $C_6H_5NO_2$

CSO044

45. If Raoult's law is obeyed, the vapour pressure of the solvent in a solution is directly proportional to :

(1) Mole fraction of the solvent
(2) Mole fraction of the solute
(3) Mole fraction of the solvent and solute
(4) The volume of the solution

CSO045

46. The vapour pressure of a pure liquid 'A' is 70 torr at 27°C. It forms an ideal solution with another liquid B. The mole fraction of B is 0.2 and total vapour pressure of the solution is 84 torr at 27°C. The vapour pressure of pure liquid B at 27°C is -

(1) 14 (2) 56 (3) 140 (4) 70

CSO046

47. The boiling point of an aqueous solution of a non volatile solute is 100.15 °C. What is the freezing point of an aqueous solution obtained by diluting the above solution with an equal volume of water? The values of K_b and K_f for water are 0.512 and 1.86 K molality^{-1} :

(1) –0.544 °C (2) –0.512 °C
(3) –0.272 °C (4) –1.86 °C

CSO047

48. The molal elevation constant is the ratio of the elevation in B.P. to :

(1) Molarity
(2) Molality
(3) Mole fraction of solute
(4) Mole fraction of solvent

CSO048

49 Elevation in boiling point was 0.52°C when 6 g of a compound X was dissolved in 100 g of water. Molecular weight of X is :

(K_b for water = 0.52 K mol^{-1})

(1) 120 (2) 60 (3) 100 (4) 342

CSO049

50. An aqueous solution containing 1g of urea boils at 100.25°C. The aqueous solution containing 3g of glucose in the same volume will boil at -

(1) 100.75°C (2) 100.5°C
(3) 100°C (4) 100.25°C

CSO050

51. Pure benzene freezes at 5.45°C at a certain place but a 0.374 m solution of tetrachloroethane in benzene freezes at 3.55 °C. The K_f for benzene is-

(1) 5.08 K kg mol^{-1} (2) 508 K kg mol^{-1}
(3) 0.508 K kg mol^{-1} (4) 50.8°C kg mol^{-1}

CSO051

52. An aqueous solution freezes at – 0.186°C (K_f = 1.86 K kg mol^{-1} ; K_b = 0.512 K kg mol^{-1}). What is the elevation in boiling point ?

(1) 0.186 (2) 0.512

(3) $\frac{0.512}{1.86}$ (4) 0.0512

CSO052

53. In the depression of freezing point experiment, it is found that :-

(1) The vapour pressure of solution is more than of pure H_2O.

(2) The vapour pressure of solution is less than that of pure solute

(3) Only solute molecules solidify at freezing point

(4) Only solvent molecules solidify at freezing point

CSO053

54. Molal depression constant of water is 1.86 K kg mol^{-1}. 0.02 mole of urea dissolved in 100g of water will produce a depression in freezing point of :

(1) 0.186°C (2) 0.372°C

(3) 1.86°C (4) 3.72°C

CSO054

55. What would be the freezing point of aqueous solution containing 18 g of $C_6H_{12}O_6$ in 1000g of water ? (K_f = 1.86 K molality^{-1})

(1) –0.186°C (2) –0.372°C

(3) –0.54°C (4) –0.72°C

CSO055

56. A solution of 1.25 g of a non-electrolyte in 20g of water freezes at 271.94 K. If K_f = 1.86K molality^{-1} and F.pt. of water is 273.15 K then the molar mass of solute is :

(1) 207.8 g mol^{-1} (2) 179.79 g mol^{-1}

(3) 209.6 g mol^{-1} (4) 96.01 g mol^{-1}

CSO056

57. 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

CSO057

58. In osmosis phenomenon net flow of :

(1) Solvent molecules occurs from higher concentration to lower concentration

(2) Solvent molecules occurs from lower concentrated solution to higher concentrated solution

(3) Solute molecules occurs from higher concentration to lower concentration

(4) Solute molecules occurs from lower concentration to higher concentration

CSO058

59. 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

CSO059

60. Which inorganic compounds can act as semipermeable membrane ?

(1) Calcium sulphate

(2) Barium oxalate

(3) Nickel phosphate

(4) Copper ferrocyanide

CSO060

61. 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 no 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.

CSO061

62. If mole fraction of the solvent in solution decreases then :

(1) Vapour pressure of solution increases

(2) B. P. decreases

(3) Osmotic pressure increases

(4) All are correct

CSO062

63. 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

CSO063

64. 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 0.585g 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.

CSO064

65. 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) 40.7 atm (4) 3.4 atm

CSO065

66. 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

CSO066

67. 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

CSO067

68. Osmotic pressure of a solution (density is 1g 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

CSO068

69. Osmotic pressure of a sugar solution at 24°C is 2.5 atm. The concentration of the solution in mole per litre is :
(1) 10.25 (2) 1.025
(3) 1025 (4) 0.1025

CSO069

70. 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 organic solute is :
(1) 348.9 (2) 34.89 (3) 3489 (4) 861.2

CSO070

71. If 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

CSO071

72. 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

CSO072

73. ___(A)___ injection are dissolved in water containing salts at particular ___(B)___ concentrations that matches ___(C)___ concentration. Here A, B and C refer to :
(1) Intravenous, ionic, blood plasma
(2) Intravenous, blood plasma, ionic
(3) Blood plasma, intravenous, ionic
(4) Blood plasma, ionic, intravenous

CSO073

ABNORMAL COLLIGATIVE PROPERTIES

74. Equimolal solutions of A and B show depression in freezing point in the ratio of 2 : 1. If A remains in normal state in solution, B will be in ..... state in solution :
(1) Normal (2) Associated
(3) Hydrolysed (4) Dissociated

CSO074

75. Vant Hoff factor is :
(1) Less than one in case of dissociation
(2) More than one in case of association
(3) Always less than one
(4) Less than one in case of association
CSO075

76. The vant Hoff factor (i) for a dilute solution of $K_3[Fe(CN)_6]$ is :
(1) 10 (2) 4 (3) 5 (4) 0.25
CSO076

77. The experimental molecular weight of an electrolyte will always be less than its calculated value because the value of vant Hoff factor, 'i' is :
(1) Less than 1 (2) Greater than 1
(3) One (4) Zero
CSO077

78. The vant Hoff factor (i) for a dilute aqueous solution of Glucose is :
(1) Zero (2) 1.0 (3) 1.5 (4) 2.0
CSO078

79. Osmotic pressure of 0.585% w/v NaCl solution at 27°C is.
(1) 2.49 atm (2) 4.92 atm
(3) 1.2 atm (4) 3.8 atm
CSO079

80 The substance A when dissolved in solvent B shows the molecular mass corresponding to A_3. The vant Hoff's factor will be -
(1) 1 (2) 2 (3) 3 (4) $\frac{1}{3}$
CSO080

81. The ratio of the value of any colligative property for KCl solution to that for sugar solution is nearly ..... time :
(1) 1 (2) 0.5 (3) 2 (4) 2.5
CSO081

82. The lowering of vapour pressure of 0.1M aqueous solutions of NaCl, $CuSO_4$ and K_2SO_4 are:
(1) All equal
(2) In the ratio of 1 : 1 : 1.5
(3) In the ratio of 3 : 2 : 1
(4) In the ratio of 1.5 : 1 : 2.5
CSO082

83. The freezing point of 1 molal NaCl solution assuming NaCl to be 100% dissociated in water is: (K_f = 1.86 K Molality^{-1})
(1) –1.86°C (2) –3.72°C
(3) +1.86°C (4) + 3.72°C
CSO083

84. The molal elevation constant of water is 0.51. The boiling point of 0.1 molal aqueous NaCl solution is nearly :
(1) 100.05°C (2) 100.1°C
(3) 100.2°C (4) 101.0°C
CSO084

85. Phenol associates in benzene as

$$C_6H_5OH \rightleftharpoons \frac{1}{2}(C_6H_5OH)_2$$

If degree of association of phenol is 40%, Van't Hoff factor i is :-
(1) 1 (2) 0.8 (3) 1.4 (4) 0.6
CSO085

86. The values of observed and calculated molecular weight of calcium nitrate are respectively 65.6 and 164. The degree of dissociation of calcium nitrate will be :
(1) 25% (2) 50% (3) 75% (4) 60%
CSO086

87. A 0.004M solution of Na_2SO_4 is isotonic with a 0.010M solution of glucose at the 25°C temperature. The degree of dissociation of Na_2SO_4 is
(1) 25% (2) 50% (3) 75% (4) 85%
CSO087

88. A 5.8% (wt./vol.) NaCl solution will exert an osmotic pressure closest to which one of the following :
(1) 5.8% (wt./vol) sucrose solution
(2) 5.8% (wt./vol) glucose solution
(3) 2 M sucrose solution
(4) 1 M glucose solution
CSO088

89. Which salt shows maximum osmotic pressure in its 1M solution :
(1) $AgNO_3$ (2) Na_2SO_4
(3) $(NH_4)_3PO_4$ (4) $MgCl_2$
CSO089

90. Which solution will exert highest osmotic pressure?
(1) 1M glucose solution
(2) 1M urea solution
(3) 1M Alum solution
(4) 1M NaCl solution

CSO090

91. Which is the correct relation between osmotic pressure of 0.1M NaCl solution and 0.1M Na_2SO_4 solution ?
(1) The osmotic pressure of Na_2SO_4 is less than NaCl solution
(2) The osmotic pressure Na_2SO_4 is more than NaCl solution
(3) Both have same osmotic pressure
(4) None of the above

CSO091

92. Which one of the following solutions will have highest osmotic pressure ? (Assume that all the salts are equally dissociated)
(1) 0.1M $Al_2(SO_4)_3$
(2) 0.1M $BaCl_2$
(3) 0.1 M Na_2SO_4
(4) The solution obtained by mixing equal volumes of (2) and (3)

CSO092

93. The following solutions have equal concentrations. Which one will show minimum osmotic pressure?
(1) $BaCl_2$ (2) $AgNO_3$
(3) Na_2SO_4 (4) $(NH_4)_3PO_4$

CSO093

94. The osmotic pressure of equimolar solutions of $BaCl_2$, NaCl, and glucose will be in the order:
(1) Glucose > NaCl > $BaCl_2$
(2) $BaCl_2$ > NaCl > Glucose
(3) NaCl > $BaCl_2$ > Glucose
(4) NaCl > Glucose > $BaCl_2$

CSO094

95. Which one of the following pairs of solutions will be expected to be isotonic under the same temperature ?
(1) 0.1M urea and 0.1 M NaCl
(2) 0.1M urea and 0.2 M $MgCl_2$
(3) 0.1M NaCl and 0.1M Na_2SO_4
(4) 0.1M $Ca(NO_3)_2$ and 0.1M Na_2SO_4

CSO095

96. Two solutions of KNO_3 and CH_3COOH are prepared separately. Molarity of both is 0.1M and osmotic pressures are P_1 and P_2 respectively. The correct relationship between the osmotic pressures is
(1) $P_2 > P_1$ (2) $P_1 = P_2$
(3) $P_1 > P_2$ (4) $\frac{P_1}{P_1+P_2} = \frac{P_2}{P_1+P_2}$

CSO096

97. The correct relationship between the boiling points of dilute solutions of $AlCl_3(T_1)$ and $CaCl_2(T_2)$, having the same molar concentration is :
(1) $T_1 = T_2$ (2) $T_1 > T_2$
(3) $T_2 = T_1$ (4) $T_2 \geq T_1$

CSO097

98. Which of the following 0.1 M aqueous solutions will have the lowest freezing point :
(1) Potassium Sulphate
(2) Sodium Chloride
(3) Urea
(4) Glucose

CSO098

99. Which aqueous solution has minimum freezing point?
(1) 0.01 M NaCl (2) 0.005 M C_2H_5OH
(3) 0.005 M MgI_2 (4) 0.005 M $MgSO_4$

CSO099

100. If α is the degree of dissociation of $K_4[Fe(CN)_6]$, then abnormal mass of complex in the solution will be :-
(1) $M_{normal}\,(1+2\alpha)^{-1}$ (2) $M_{normal}\,(1+3\alpha)^{-1}$
(3) $M_{normal}\,(1+\alpha)^{-1}$ (4) $M_{normal}\,(1+4\alpha)^{-1}$

CSO100

101. Which solution will have the least vapour pressure :
(1) 0.1 M $BaCl_2$ (2) 0.1 M urea
(3) 0.1 M Na_2SO_4 (4) 0.1 M Na_3PO_4

CSO101

102. Which has maximum freezing point :
(1) 1M of NaCl solution (2) 1M of KCl solution
(3) 1M of $CaCl_2$ solution (4) 1M of urea solution

CSO102

103. The freezing point of 1% w/w aqueous solution of calcium nitrate will be :
(1) 0^0C (2) Above 0^0C
(3) 1^0C (4) Below 0^0C
CSO103

104. The following aqueous solution in the correct order of decreasing freezing point is -
(1) 0.2M $BaCl_2$, 0.2M KCl, 0.1M Na_2SO_4
(2) 0.2M KCl, 0.1M Na_2SO_4, 0.2M $BaCl_2$
(3) 0.1M Na_2SO_4, 0.2M KCl, 0.2M $BaCl_2$
(4) 0.1M Na_2SO_4, 0.2M $BaCl_2$, 0.2M KCl
CSO104

105. Which of the following solutions will have the highest boiling point ?
(1) 1% w/w Glucose in water
(2) 1% w/w NaCl in water
(3) 1% w/w $Ca_3(PO_4)_2$ in water
(4) 1% w/w Urea in water
CSO105

106. The freezing point of equimolal aqueous solution will be highest for :
(1) Urea (2) $Ca(NO_3)_2$
(3) $C_6H_{12}O_6$(Glucose) (4) (1) and (3) both
CSO106

107. When mercuric Iodide is added to the aqueous solution of potassium iodide ?
(1) The boiling point does not change
(2) Freezing point is raised
(3) The freezing point is lowered
(4) Freezing point does not change
CSO107

108. The molecular weight of benzoic acid in benzene as determined by depression in freezing point method corresponds to :
(1) Ionisation of benzoic acid
(2) Dimerization of benzoic acid
(3) Trimerization of benzoic acid
(4) Solvation of benzoic acid
CSO108

109. What would be the osmotic pressure of 0.1 M K_2SO_4 solution (90% dissociated) at 27°C :-
(1) 6.89 atm (2) 0.689 atm
(3) 0.344 atm (4) 3.4 atm
CSO109

110. Which one has same Van't Hoff factor i as that of Hg_2Cl_2 :-
(1) NaCl (2) Na_2SO_4
(3) $Al(NO_3)_3$ (4) $Al_2(SO_4)_3$
CSO110

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	4	4	4	3	4	4	3	2	2	3	3	2	1	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	2	2	2	4	1	1	4	1	4	2	2	1	3	4	2
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	4	3	2	1	4	1	1	1	2	1	4	3	2	2	1
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	3	3	2	2	4	1	4	4	2	1	4	1	2	1	4
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	1	3	3	2	3	1	2	3	4	2	2	4	1	2	4
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	2	2	2	2	4	3	2	2	2	2	3	3	3	3	3
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	2	1	2	2	4	3	2	1	1	4	4	4	4	3	2
Question	106	107	108	109	110										
Answer	4	2	2	1	2										

Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2014

1. Of the following 0.10m aqueous solutions, which one will exhibit the largest freezing point depression?
(1) KCl (2) $C_6H_{12}O_6$
(3) $Al_2(SO_4)_3$ (4) K_2SO_4

CSO122

AIPMT 2015

2. 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?
(1) Molecular mass of X is greater than the molecular mass of Y.
(2) Molecular mass of X is less than the molecular mass of Y.
(3) Y is undergoing dissociation in water while X undergoes no change.
(4) X is undergoing dissociation in water while Y undergoes no change.

CSO123

3. Which one is not equal to zero for an ideal solution ?
(1) ΔS_{mix}
(2) ΔV_{mix}
(3) $\Delta P = P_{observed} - P_{Raoult}$
(4) ΔH_{mix}

CSO124

4. Which one of the following electrolytes has the same value of van't Hoff's factor (i) as that of the $Al_2(SO_4)_3$ (if all are 100% ionised) ?
(1) $K_3[Fe(CN)_6]$ (2) $Al(NO_3)_3$
(3) $K_4[Fe(CN)_6]$ (4) K_2SO_4

CSO125

Re-AIPMT 2015

5. What is the mole fraction of the solute in a 1.00 m aqueous solution ?
(1) 0.0354 (2) 0.0177
(3) 0.177 (4) 1.770

CSO126

NEET-I 2016

6. Which of the following statement about the composition of the vapour over an ideal a 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)
(1) The vapour will contain a higher percentage of benzene
(2) The vapour will contain a higher percentage of toluene
(3) The vapour will contain equal amounts of benezene and toluene
(4) Not enough information is given to make a predication

CSO127

7. At 100°C the vapour pressure of a solution of 6.5g of a solute in 100 g water is 732 mm. If K_b = 0.52°C m^{-1}, the boiling point of this solution will be :-
(1) 101°C (2) 100°C (3) 102°C (4) 103°C

CSO128

8. Consider the following liquid - vapour equilibrium.
Liquid $\rightleftharpoons$ Vapour
Which of the following relations is **correct** ?
(1) $\frac{d\ell nG}{dT^2} = \frac{\Delta H_v}{RT^2}$ (2) $\frac{d\ell nP}{dT} = \frac{-\Delta H_v}{RT}$
(3) $\frac{d\ell nP}{dT^2} = \frac{-\Delta H_v}{T^2}$ (4) $\frac{d\ell nP}{dT} = \frac{\Delta H_v}{RT^2}$

CSO129

NEET-II 2016

9. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is
(1) 2 (2) 3 (3) 0 (4) 1

CSO130

10. Which one of the following is **incorrect** for ideal solution ?
(1) $\Delta P = P_{obs} - P_{calculated\ by\ Raoult's\ law} = 0$
(2) $\Delta G_{mix} = 0$
(3) $\Delta H_{mix} = 0$
(4) $\Delta U_{mix} = 0$

CSO131

NEET(UG) 2017

11. If molality of a dilute solution is doubled, the value of molal depression constant (K_f) will be:-
(1) Halved (2) Tripled
(3) Unchanged (4) Doubled
CSO132

12. Which of the following is dependent on temperature?
(1) Molarity (2) Mole fraction
(3) Weight percentage (4) Molality
CSO133

NEET(UG) 2019

13. For an ideal solution, the **correct** option is :-
(1) Δ_{mix} S = 0 at constant T and P
(2) Δ_{mix} V ≠ 0 at constant T and P
(3) Δ_{mix} H = 0 at constant T and P
(4) Δ_{mix} G = 0 at constant T and P
CSO134

NEET(UG)(Odisha) 2019

14. Which of the following statements is correct regarding a solution of two compounds A and B exhibiting positive deviation from ideal behaviour?
(1) Intermolecular attractive forces between A-A and B-B are stronger than those between A-B.
(2) Δ_{mix} H = 0 at constant T and P
(3) Δ_{mix} V = 0 at constant T and P
(4) Intermolecular attractive forces between A-A and B-B are equal to those between A-B.
CSO135

15. The density of 2 M aqueous solution of NaOH is 1.28 g/cm^3. The molality of the solution is [Given that molecular mass of NaOH = 40 g mol^{-1}]
(1) 1.20 m (2) 1.56 m
(3) 1.67 m (4) 1.32 m
CSO136

NEET (UG) 2020

16. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :
(1) 0.60 K (2) 0.20 K
(3) 0.80 K (4) 0.40 K
CSO137

17. The mixture which shows positive deviation from Raoult's law is :-
(1) Chloroethane + Bromoethane
(2) Ethanol + Acetone
(3) Benzene + Toluene
(4) Acetone + Chloroform
CSO138

NEET (UG) 2020 (COVID-19)

18. If 8g of a non-electrolyte solute is dissolved in 114 g of n-octane to reduce its vapour pressure to 80%, the molar mass (in g mol^{-1}) of the solute is
[Given that molar mass of n-octane is 114g mol^{-1}]
(1) 40 (2) 60 (3) 80 (4) 20
CSO139

19. Isotonic solutions have same
(1) Vapour pressure
(2) Freezing temperature
(3) Osmotic pressure
(4) Boiling temperature
CSO140

NEET (UG) 2021

20. The following solutions were prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in 250 ml of water (P_1), 10 g of urea (CH_4N_2O) in 250 ml of water (P_2) and 10 g of sucrose ($C_{12}H_{22}O_{11}$) in 250 ml of water (P_3). The right option for the decreasing order of osmotic pressure of these solutions is :
(1) $P_2 > P_1 > P_3$ (2) $P_1 > P_2 > P_3$
(3) $P_2 > P_3 > P_1$ (4) $P_3 > P_1 > P_2$
CSO141

21. The correct option for the value of vapour pressure of a solution at 45°C with benzene to octane in molar ratio 3 : 2 is :
[At 45°C vapour pressure of benzene is 280 mm Hg and that of octane is 420 mm Hg. Assume Ideal solution]
(1) 160 mm of Hg (2) 168 mm of Hg
(3) 336 mm of Hg (4) 350 mm of Hg
CSO142

NEET (UG) 2022

22. In one molal solution that contains 0.5 mole of a solute, there is
(1) 500 g of solvent (2) 100 mL of solvent
(3) 1000 g of solvent (4) 500 mL of solvent
CSO143

23. K_H value for some gases at the same temperature 'T' are given :

gas	K_H/k bar
Ar	40.3
CO_2	1.67
HCHO	1.83×10^{-5}
CH_4	0.413

where K_H is Henry's Law constant in water. The order of their solubility in water is :

(1) Ar < CO_2 < CH_4 < HCHO

(2) Ar < CH_4 < CO_2 < HCHO

(3) HCHO < CO_2 < CH_4 < Ar

(4) HCHO < CH_4 < CO_2 < Ar

CSO144

NEET (UG) 2023

24. Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : Helium is used to dilute oxygen in diving apparatus.

Reasons R : Helium has high solubility in O_2.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.

(2) **A** is true but **R** is false

(3) **A** is false but **R** is true

(4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

CSO165

NEET (UG) 2024

25. The Henry's law constant (K_H) values of three gases (A, B, C) in water are 145, 2×10^{-5} and 35 kbar, respectively. The solubility of these gases in water follow the order :

(1) B > A > C (2) B > C > A

(3) A > C > B (4) A > B > C

CSO190

26. The plot of osmotic pressure (Π) vs concentration (mol L^{-1}) for a solution gives a straight line with slope 25.73 L bar mol^{-1}. The temperature at which the osmotic pressure measurement is done is:

(Use R = 0.083 L bar mol^{-1} K^{-1})

(1) 37°C (2) 310°C

(3) 25.73°C (4) 12.05°C

CSO191

NEET (UG) 2024 (Re-examination)

27. The amount of glucose required to prepare 250 mL of $\frac{M}{20}$ aqueous solution is :

(Molar mass of glucose : 180 g mol^{-1})

(1) 2.25 g (2) 4.5 g (3) 0.44 g (4) 1.125g

CSO192

28. Mass of glucose ($C_6H_{12}O_6$) required to be dissolved to prepare one litre of its solution which is isotonic with 15g L^{-1} solution of urea (NH_2CONH_2) is :

(Given : Molar mass in g mol^{-1}C : 12, H : 1, O : 16, N : 14)

(1) 55 g (2) 15 g (3) 30 g (4) 45 g

CSO193

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	4	1	3	2	1	1	4	2	2	3	1	3	1	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28		
Answer	4	2	1	3	1	3	1	1	2	2	1	1	4		

Exercise - III (Analytical Questions) Build Up Your Understanding

1. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : Raoult's law is a special case of Henry's law

Reason (R) : According to Raoult's law $P_i = x_i p_i°$

According to Henry's law $P = K_H X$

Here K_H differ from $p_i°$. In special case K_H becomes equal to $p_i°$.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.

(2) **(A)** is correct but **(R)** is not correct.

(3) **(A)** is not correct but **(R)** is correct.

(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

CSO145

2. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : Van't Hoff factor (i) depend on concentration in case of incomplete dissociation.

Reason (R) : For incomplete dissociation of electrolyte, value of Van't Hoff factor(i) increase with decrease in concentration.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A).**

(2) **(A)** is correct but **(R)** is not correct.

(3) **(A)** is not correct but **(R)** is correct.

(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**

CSO146

3. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : Cooking time is reduced in pressure cooker.

Reason (R) : Boiling point of liquid inside the pressure cooker is raised.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.

(2) **(A)** is correct but **(R)** is not correct.

(3) **(A)** is not correct but **(R)** is correct.

(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

CSO147

4. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : Isotonic solutions does not show net phenomenon of osmosis.

Reason (R) : Isotonic solutions have equal osmotic pressure.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A).**

(2) **(A)** is correct but **(R)** is not correct.

(3) **(A)** is not correct but **(R)** is correct.

(4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**

CSO148

5. Consider following statements :-

(a) Isotonic solution does not show net phenomenon of osmosis

(b) Isotonic solution does not show flow of solvent

(c) Isotonic solution have equal osmotic pressure

(d) Osmotic pressure depend on temperature.

Which is/are correct statements

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

(3) b, d (4) b, c

CSO151

6. Match the column

	Column-I		Column-II
(I)	Van't Hoff factor for dissociation	(a)	More than 1
(II)	Van't Hoff factor for association	(b)	Less than 1
(III)	Van't Hoff factor for non electrolyte	(c)	May be greater than 1 or less than 1.
(IV)	Van't Hoff factor for electrolyte	(d)	Equal to 1

Which is correct :-

(1) (I) → (a), (II) → (d), (III) → (c), (IV) → (b)

(2) (I) → (d), (II) → (b), (III) → (a), (IV) → (c)

(3) (I) → (b), (II) → (c), (III) → (a), (IV) → (d)

(4) (I) → (a), (II) → (b), (III) → (d), (IV) → (c)

CSO152

7. Consider following statements.

(a) Ideal solutions are one which obeys Raoult's law at all temperature & concentration

(b) Very dilute solution can be treated as ideal solution.

(c) Ideal solution form azeotropic mixture

(d) Azeotropic mixture are not constant boiling mixture.

Which are correct :-

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

CSO154

8. Which is correct statement :-

(1) Colligative properties depend on chemical nature of solute.

(2) Colligative properties depend on relative number of solute particles.

(3) Colligative properties are same for electrolyte and nonelectrolyte solute solution.

(4) Osmosis is a colligative property.

CSO157

9. Which is correct statement :-

(1) Solute and solvent molecules pass through SPM.

(2) Only solute molecules pass through SPM.

(3) Only solvent molecules pass through SPM

(4) Neither solute nor solvent pass through SPM

CSO158

10. Formula of Van't Hoff factor will be :-

(1) $i = \frac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$

(2) $i = \frac{\text{Theoretical colligative property}}{\text{Observed colligative property}}$

(3) $i = \frac{\text{Abnormal molar mass}}{\text{Normal molar mass}}$

(4) $i = \frac{\text{No. of mole of particles before association or dissociation}}{\text{No. of mole of particle after association or dissociation}}$

CSO159

11. Which are colligative properties

(1) Boiling point, osmotic pressure

(2) Freezing point and osmosis

(3) Elevation in boiling point and osmotic pressure

(4) Vapour pressure and depression in freezing point

CSO160

12. Consider the following statements.

(a) Molal depression constant depend on the nature of solvent.

(b) Elevation in boiling point for dilute solution is directly proportional to molality.

(c) The unit of molal depression constant is K kg eq^{-1}.

(d) Molality is the function of temperature.

Which are correct statement.

(1) a, b (2) b, c

(3) c, d (4) a, d

CSO161

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12
Answer	4	4	4	4	2	4	1	2	3	1	3	1