PRE-MEDICAL

PHYSICAL CHEMISTRY

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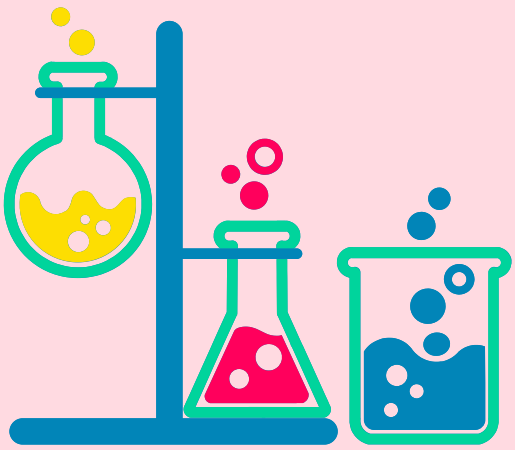


EXERCISE

Solutions

ENGLISH MEDIUM

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
LS0001

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
LS0002

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
LS0003

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
LS0004

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
LS0005

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
LS0006

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
LS0007

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
LS0008

9. Normality of 0.3 M phosphorous acid is:-
(1) 0.15 (2) 0.6
(3) 0.9 (4) 0.1
LS0009

10. The molarity of pure water is :
(1) 100 M (2) 55.5 M
(3) 50 M (4) 18M
LS0010

11. Molarity of 720 g of pure water -
(1) 40M
(2) 4M
(3) 55.5M
(4) Can't be determined
LS0011

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
LS0012

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
LS0013

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) $\frac{1}{3}$
LS0014

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
LS0015

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
LS0017

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
LS0018

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
LS0019

19. Normality of 10% (w\V) H_2SO_4 solution is nearly
(1) 0.1 (2) 0.2 (3) 0.5 (4) 2
LS0020

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
LS0021

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
LS0022

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
LS0023

23. Two bottles of A and B contain 1M and 1m aqueous solutionof 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
LS0024

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
LS0025

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
LS0026

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}
LS0027

27. Which of the following gas does not obey Henry's law ?
(1) NH_3 (2) H_2 (3) O_2 (4) He
LS0028

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
LS0029

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
LS0030

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
LS0031

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) $\frac{P_A^0 X_A}{P_S}$
LS0032

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

LS0033

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

LS0034

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

LS0035

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

LS0036

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

LS0037

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

LS0038

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

LS0040

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

LS0041

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) $\frac{3}{2}$

LS0042

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) $\frac{1}{76}$

LS0043

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

LS0044

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

LS0045

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) $C_6H_5NO_2$

LS0046

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

LS0047

46. The vapour pressure of a pure liquid 'A' is 70 torr at 27^0C. 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 27^0C. The vapour pressure of pure liquid B at 27^0C is -
(1) 14 (2) 56 (3) 140 (4) 70

LS0048

47. The boiling point of an aqueous solution of a non volatile solute is 100.15 ℃. 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 ℃ (2) –0.512 ℃
(3) –0.272 ℃ (4) –1.86 ℃

LS0049

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

LS0050

49 Elevation in boiling point was 0.52 ℃ when 6 g of a compound X was dissolved in 100 g of water. Molecular weight of X is : (Kb for water = 0.52 K mol^{-1})
(1) 120 (2) 60 (3) 100 (4) 342

LS0051

50. An aqueous solution containing 1g of urea boils at 100.25 ℃. The aqueous solution containing 3g of glucose in the same volume will boil at -
(1) 100.75 ℃ (2) 100.5 ℃
(3) 100 ℃ (4) 100.25 ℃

LS0052

51. Pure benzene freezes at 5.45 ℃ at a certain place but a 0.374 m solution of tetrachloroethane in benzene freezes at 3.55 ℃. 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 ℃ Kg mol^{-1}

LS0053

52. An aqueous solution freezes at – 0.186 ℃ (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

LS0054

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 of freezing point
(4) Only solvent molecules solidify at freezing point

LS0056

54. Molal depression constant of water is 1.86 K Kg mol^{-1} . 0.02 mole of urea dissolved in 100 g of water will produce a depression in freezing point of :
(1) 0.186 ℃ (2) 0.372 ℃
(3) 1.86 ℃ (4) 3.72 ℃

LS0057

55. What would be the freezing point of aqueous solution containing 18 g of $C_6H_{12}O_6$ in 1000 g 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

LS0058

56. A solution of 1.25 g of a non-electrolyte in 20 g 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}

LS0059

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

LS0060

58. 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 concentratioin to lower concentration
(4) Solute molecules occurs from lower concentration to higher concentration

LS0061

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

LS0062

60. Which inorganic compounds can act as semipermeable membrane ?
(1) Calcium sulphate
(2) Barium oxalate
(3) Nickel phosphate
(4) Copper ferrocyanide

LS0063

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.

LS0064

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

LS0066

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

LS0067

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.

LS0068

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

LS0069

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

LS0070

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

LS0071

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

LS0072

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

LS0073

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

LS0075

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

LS0076

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

LS0250

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

LS0077

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

LS0079

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

LS0080

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

LS0081

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

LS0082

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

LS0083

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

LS0084

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) $\frac{1}{3}$

LS0085

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

LS0086

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

LS0087

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

LS0088

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

LS0089

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

LS0092

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%

LS0093

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%

LS0094

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

LS0095

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

LS0096

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

LS0097

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

LS0098

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)

LS0099

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) $(NH_4)_3PO_4$

LS0100

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 > $BaCl_2$

LS0101

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

LS0102

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) $\frac{P_1}{P_1+P_2} = \frac{P_2}{P_1+P_2}$

LS0103

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) $T_2 \geq T_1$

LS0104

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

LS0105

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 $MgSO_4$

LS0106

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) $M_{normal}(1+4\alpha)^{-1}$

LS0107

101. Which solution will have 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

LS0108

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

LS0109

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

LS0110

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

LS0111

105. Which of the following solutions will have 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

LS0112

106. The freezing point of equimolal aqueous solution will be highest for :
(1) urea (2) $Ca(NO_3)_2$
(3) $Al(NO_3)_3$ (4) NaCl

LS0113

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

LS0114

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

LS0115

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

LS0116

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) $Al_2(SO_4)_3$

LS0117

EXERCISE-I (Conceptual Questions) — ANSWER KEY

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

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2009

1. 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 1mol of ionic compound produces on being dissolved in water will be (K_f = 1.86°C m^{-1}) :-

(1) 1 (2) 2 (3) 3 (4) 4

LS0124

AIPMT 2010

2. An aqueous solution of KI is 1.00 molal. Which change will cause increase in vapour pressure of the solution ?

(1) Addition of water

(2) Addition of NaCl

(3) Addition of Na_2SO_4

(4) Addition of 100 molal KI

LS0125

3. 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 = 1.86 K kg mol^{-1})

(1) –0.570°C (2) –0.372°C

(3) –0.520°C (4) +0.372°C

LS0126

AIPMT Pre. 2011

4. The freezing point depression constant for water is –1.86°C m^{-1}. If 5 g Na_2SO_4 is dissolved in 45.0 g H_2O, the freezing point is changed by –3.82°C. Calculate the Van't Hoff factor for Na_2SO_4

(1) 2.05 (2) 2.63

(3) 3.11 (4) 0.381

LS0128

5. The Van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively :

(1) Less than one and greater than one

(2) Less than one and less than one

(3) Greater than one and less than one

(4) Greater than one and greater than one

LS0129

6. Mole fraction of the solute in a 1.00 molal aqueous solution is :

(1) 0.1770 (2) 0.0177

(3) 0.0344 (4) 1.7700

LS0130

AIPMT Mains 2011

7. 200 mL of an aqueous solution of a protein contain 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 L bar mol^{-1} K^{-1})

(1) 61038 g mol^{-1} (2) 51022 g mol^{-1}

(3) 122044 g mol^{-1} (4) 31011 g mol^{-1}

LS0131

AIPMT Pre 2012

8. 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.

(1) $p_B + x_A (p_B - p_A)$ (2) $p_B + x_A (p_A - p_B)$

(3) $p_A + x_A (p_B - p_A)$ (4) $p_A + x_A (p_A - p_B)$

LS0132

AIPMT Mains 2012

9. Which of the following compounds can be used as antifreeze in automobile radiators ?

(1) Nitrophenol (2) Ethyl alcohol

(3) Methyl alcohol (4) Glycol

LS0133

10. Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 25°C are 200 mmHg and 415 mmHg respectively. Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40g of CH_2Cl_2 at the same temperature will be: (Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of CH_2Cl_2 = 85 u)

(1) 347.9 mmHg (2) 280.5 mmHg

(3) 173.9 mmHg (4) 615 mmHg

LS0134

NEET-UG 2013

11. 6.02×10^{20} molecules of urea are present in 100mL of its solution. The concentration of solution is :-

(1) 0.1 M (2) 0.02 M

(3) 0.01 M (4) 0.001M

LS0135

AIPMT 2014

12. 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

LS0138

AIPMT 2015

13. 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.

LS0140

14. 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}

LS0141

15. 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

LS0142

Re-AIPMT 2015

16. 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

LS0143

NEET-I 2016

17. 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

LS0146

18. 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

LS0147

19. 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) $\frac{d\ell nP}{dT} = \frac{\Delta H_v}{RT^2}$

LS0148

NEET-II 2016

20. 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

LS0149

21. 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) $\Delta U_{mix} = 0$

LS0150

NEET(UG) 2017

22. 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

LS0155

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

LS0156

NEET(UG) 2019

24. 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

LS0238

NEET(UG)(Odisha) 2019

25. 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.

LS0239

26. 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

LS0240

NEET (UG) 2020

27. 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

LS0251

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

LS0252

NEET (UG) 2020 (COVID-19)

29. 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 114 g mol^{-1}]
(1) 40 (2) 60 (3) 80 (4) 20

LS0253

30. Isotonic solutions have same
(1) vapour pressure
(2) freezing temperature
(3) osmotic pressure
(4) boiling temperature

LS0254

NEET (UG) 2021

31. 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) $P_3 > P_1 > P_2$

LS0255

32. 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 gas]
(1) 160 mm of Hg (2) 168 mm of Hg
(3) 336 mm of Hg (4) 350 mm of Hg

LS0256

NEET (UG) 2022

33. 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

LS0257

NEET (UG) 2022 (OVERSEAS)

34. One mole of sugar is dissolved in three moles of water at 298 K. The relative lowering of vapour pressure is

(1) 0.20 (2) 0.50

(3) 0.33 (4) 0.25

LS0258

Re-NEET (UG) 2022

35. 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) $HCHO < CH_4 < CO_2 < Ar$

LS0259

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**1**	**2**	**2**	**3**	**2**	**1**	**2**	**4**	**1**	**3**	**3**	**4**	**1**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**1**	**1**	**4**	**2**	**2**	**3**	**1**	**3**	**1**	**3**	**4**	**2**	**1**	**3**
Que.	31	32	33	34	35										
Ans.	**1**	**3**	**1**	**4**	**1**										

EXERCISE-III (Analytical Questions) Master Your Understanding

1. Which of the following solutions has the highest normality :-
(1) 8 g of KOH per litre
(2) 1 N phosphoric acid
(3) 6 g of NaOH per 100 mL
(4) 0.5 M H_2SO_4

LS0165

2. An aqueous solution of glucose is 10% in strength. The volume in which 2 g mole of it is dissolved will be :-
(1) 18 litre (2) 3.6 litre
(3) 0.9 litre (4) 1.8 litre

LS0166

3. The mole fraction of the solute in one molal aqueous solution is :-
(1) 0.027 (2) 0.036
(3) 0.018 (4) 0.009

LS0168

4. What will be density (in g mL^{-1}) of 3.60 molar sulphuric acid having 29% by mass.
(Molar mass = 98 g mol^{-1})
(1) 1.88 (2) 1.22
(3) 1.45 (4) 1.64

LS0170

5. The molality of a urea solution in which 0.0100g of urea. $[(NH_2)_2CO]$ is added to 0.3000 dm^3 of water at STP is :-
(1) 0.555 m (2) 5.55×10^{-4} m
(3) 33.3 m (4) 3.33×10^{-2} m

LS0171

6. The concentration of a solution of H_2O_2 is 6.8%(w/V) then the volume concentration of the solution is:-
(1) 22.4 (2) 11.2 (3) 20 (4) 5

LS0172

7. A gaseous mixture was prepared by taking equal mole of CO and N_2. If the total pressure of the mixture was found 1 atmosphere, the partial pressure of the nitrogen (N_2) in the mixture is :
(1) 0.5 atm (2) 0.8 atm
(3) 0.9 atm (4) 1 atm

LS0173

8. 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 mole of P and 2 mol of Q would be :-
(1) 68 torr (2) 140 torr
(3) 72 torr (4) 20 torr

LS0174

9. Which of the following plots does not represent the behaviour of an ideal binary liquid solution :-
(1) Plot of P_A versus X_A (mole fraction of A in liquid phase) is linear
(2) Plot of P_B versus X_B is linear
(3) Plot of p_{total} versus X_A (or X_B) is linear
(4) Plot of p_{total} versus X_A is non linear

LS0175

10. The vapour pressure of two pure liquids (A) and (B) are 100 and 80 torr respectively. The total pressure of the solution obtained by mixing 2 mol of (A) and 3 mol of (B) would be
(1) 20 torr (2) 36 torr
(3) 88 torr (4) 180 torr

LS0176

11. For a solution of two liquids A and B, it was proved that $P = X_A (P_A^0 - P_B^0) + P_B^0$. The solution is:–
(1) Ideal (2) Non ideal
(3) Both (1) and (2) (4) None of the above

LS0177

12. Mole fraction of A vapours above solution in mixture of A and B ($X_A = 0.4$) will be :-
($P_A^\circ = 100$mm, $P_B^\circ = 200$mm)
(1) 0.4 (2) 0.8 (3) 0.25 (4) None

LS0178

13. The vapour pressure of pure benzene and toluene are 160 and 60 torr respectively. The mole fraction of toluene in vapour phase in contact with equimolar solution of benzene and toluene is:
(1) 0.50 (2) 0.6 (3) 0.27 (4) 0.73

LS0179

14. A solution has a 1 : 4 mole ratio of pentane to hexane. The vapour pressures of the pure hydrocarbons at 20°C are 440 mm Hg for pentane and 120 mm Hg for hexane. The mole fraction of pentane in the vapour phase would be :-
(1) 0.200 (2) 0.478
(3) 0.549 (4) 0.786

LS0181

15. A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be

(1) 300 (2) 700

(3) 360 (4) 350

LS0182

16. A mixture of liquid showing positive deviation in Raoult's law is :-

(1) $(CH_3)_2$ CO + C_2H_5OH

(2) $(CH_3)_2CO$ + $CHCl_3$

(3) $(C_2H_5)_2O$ + $CHCl_3$

(4) $(CH_3)_2CO$ + $C_6H_5NH_2$

LS0183

17. Azeotropic mixture are :

(1) Mixture of two solids

(2) Those which boil at different temperatures

(3) Those which can be fractionally distilled

(4) Constant boiling mixtures

LS0185

18. An azeotropic mixture of two liquids boil at a lower temperature than either of them when

(1) It is saturated

(2) It does not deviate from Raoult's law

(3) It shows negative deviation from Raoult's law

(4) It shows positive deviation from Raoult's law

LS0186

19. The azeotropic mixture of water (B.P 100.15°C) and HCl (B.P. –85°C) boils at 108.5°C. When this mixture is distilled, it is possible to obtain :

(1) Pure HCl

(2) Pure water

(3) Pure water as well as HCl

(4) Neither HCl nor H_2O in their pure states

LS0187

20. Colligative properties depend on the :-

(1) Relative no. of solute molecules in solution and the nature of the solvent

(2) Relative no. of solute molecules in solvent and the nature of solute

(3) Relative no. of solute molecules and the nature of solute and solvent

(4) Relative no. of solute molecules, irrespective of the nature of solvent and solute

LS0188

21. The vapour pressure of a solution of 5 g of non electrolyte in 100 g. of water at a particular temperature is 2985 Nm^{-2}. The vapour pressure of pure water at that temperature is 3000 Nm^{-2}. The molecular weight of the solute is :-

(1) 180 (2) 90 (3) 270 (4) 200

LS0190

22. The vapour pressure of a pure liquid solvent (X) is decreased to 0.60 atm. from 0.80 atm on addition of a non volatile substance (Y). The mole fraction of (Y) in the solution is:-

(1) 0.20 (2) 0.25

(3) 0.5 (4) 0.75

LS0192

23. 18 g of glucose ($C_6H_{12}O_6$) is added to 178.2 g of water. The vapour pressure of this aqueous solution at 100 °C is :

(1) 759.00 torr (2) 7.60 torr

(3) 76.00 torr (4) 752.40 torr

LS0193

24. Water is added to the solution such that the mole fraction of water in the solution becomes 0.9. The boiling point of the solution is

(1) 354.7 K (2) 375.5 K

(3) 376.2 K (4) 380.4 K

LS0194

25. Glucose is added to 1 litre water to such an extent that $\frac{\Delta T_f}{K_f}$ becomes equal to $\frac{1}{1000}$, the wt. of glucose added is :-

(1) 180 g (2) 18 g

(3) 1.8 g (4) 0.18 g

LS0195

26. A solution of urea boils at 100.18°C at the atomospheric pressure. If K_f and K_b for water are 1.86 and 0.512K kg mol^{-1} respectively, the above solution will freeze at :-

(1) –6.54°C (2) –0.654°C

(3) 6.54°C (4) 0.654°C

LS0196

27. K_f for water is 1.86 K kg mol^{-1}. If your automobile radiator holds 1.0 kg of water, how many grams of ethylene glycol ($C_2H_6O_2$) must you add to get the freezing point of the solution lowered to –2.8°C ?

(1) 27 g (2) 72 g
(3) 93 g (4) 39 g

LS0198

28. 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

LS0199

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

(1) 0.16 mol L^{-1} (2) 0.32 mol L^{-1}
(3) 0.60 mol L^{-1} (4) 0.45 mol L^{-1}

LS0201

30. A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass=60g mol^{-1}) in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 gcm^{-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}

LS0203

31. A 5% (w/V) solution of cane sugar (molar mass 342) is isotonic with 1% (w/V) 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

LS0204

32. The degree of dissociation (α) of a weak electrolyte, A_xB_y is related to Vant Hoff factor (i) by the expression :-

(1) $\alpha = \frac{x+y-1}{i-1}$ (2) $\alpha = \frac{x+y+1}{i-1}$
(3) $\alpha = \frac{i-1}{(x+y-1)}$ (4) $\alpha = \frac{i-1}{x+y+1}$

LS0205

33. The Vant Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74 . The degree of dissociation is :-

(1) 91.3% (2) 87%
(3) 100% (4) 74%

LS0206

34. 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
(1) (i) < (ii) < (iv) < (iii) (2) (ii)<(i)=(iii)<(iv)
(3) (ii)<(i)<(iii)<(iv) (4) (iv)<(iii)<(i)=(ii)

LS0207

35. Among 0.1M solutions of urea,Na_3PO_4 and $Al_2(SO_4)_3$:-

(a) The vapour pressure and freezing point are the lowest for urea
(b) The vapour pressure and freezing point are the highest for urea
(c) The elevation in boiling point is the highest for $Al_2(SO_4)_3$
(d) The depression in freezing point is the highest for $Al_2(SO_4)_3$

(1) Only a (2) b & c both
(3) b, c and d (4) a, b, c and d

LS0209

36. When equimolar aqueous solutions of glucose, sodium chloride and barium nitrate are compared the vapour pressure of the solutions will be in the following order :-

(1) Glucose > NaCl > $Ba(NO_3)_2$
(2) Glucose = NaCl = $Ba(NO_3)_2$
(3) $Ba(NO_3)_2$ > NaCl > Glucose
(4) NaCl > $Ba(NO_3)_2$ > Glucose

LS0210

37. What is the freezing point of a solution containing 8.1 g of HBr in 100g water assuming the acid to be 90% ionised
(K_f for water = 1.86 K $molality^{-1}$)

(1) 0.85°C (2) –3.53°C
(3) 0°C (4) –0.35°C

LS0211

38. A 0.2 molal aqueous solution of a weak acid (HX) is 20% ionised. The elevation in boiling point of this solution is (given K_b = 0.52°C kg mol^{-1} for H_2O)

(1) 0.81 (2) 0.125
(3) 0.48 (4) 1.3

LS0212

39. The substance when dissolved in water would decrease the vapour pressure of water to the greatest extent is :-
(1) 0.1 M KCl (2) 0.1 M urea
(3) 0.1 M $BaCl_2$ (4) 0.1 M NaCl

LS0213

40. The molar mass of NaCl determined by the osmotic pressure method will be :–
(1) Higher than the theoretical value
(2) Lower than the theoretical value
(3) The same as the theoretical value
(4) None of these

LS0214

41. A solution containing 10g per dm^3 of urea (molecular mass = 60g mol^{-1}) is isotonic with a 5% solution of a nonvolatile solute. The molecular mass of this nonvolatile solute is :
(1) 250g mol^{-1} (2) 300g mol^{-1}
(3) 350g mol^{-1} (4) 200g mol^{-1}

LS0118

42. 1.00g of a non-electrolyte solute (molar mass 250g mol^{-1}) was dissolved in 51.2g 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 :
(1) 0.4 K (2) 0.3 K
(3) 0.5 K (4) 0.2 K

LS0119

43. 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

LS0121

44. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionised. If K_f for water is1.86 K kg mol^{-1}, the lowering in freezing point of the solution is :
(1) –0.56 K (2) –1.12 K
(3) 0.56 K (4) 1.12 K

LS0123

45. Which of the two processes occur at the same rate in order to achieve this equilibrium ?

$$\text{Solute} + \text{Solvent} \rightleftharpoons \text{Solution}$$

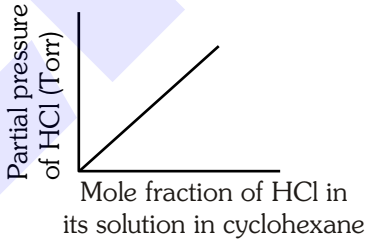
(1) Saturation, unsaturation
(2) Saturation, crystallization
(3) Crystallization, dissolution
(4) Unsaturation, crystallization

LS0241

46. What happens to the solubility of substance with the rise in temperature, if the dissolution process is endothermic ?
(1) Increases
(2) Decreases
(3) Increases or decreases depend on nature of substance
(4) No effect of temperature on solubility

LS0242

47. In the graph given below, what does the slope of the line represent ?



(1) Partial pressure of the gas in vapour phase (p)
(2) Mole fraction of gas in the solution (x)
(3) Henry's law constant (K_H)
(4) All of the above

LS0243

48. ΔT_b and ΔT_f for ethanoic acid in benzene will be___ (i)___ of normal value (neither association nor dissocation) and molar mass of solute (Ethanoic acid) ____(ii)____ of expected value. Here, (i) and (ii) refer to :
(1) (i) Half ; (ii) half (2) (i) Twice ; (ii) half
(3) (i) Half ; (ii) twice (4) (i) Twice ; (ii) twice

LS0244

49. Which of the following units is useful in relating concentration of solution with its vapour pressure?
(1) Mole fraction
(2) Mass percentage
(3) Parts per million
(4) Molality

LS0245

50. In comparison to a 0.01 M solution of glucose, the depression in freezing point of 0.01 M K_2SO_4 solution is :-

(1) the same (2) about thrice

(3) exactly three times (4) about seven times

LS0246

51. Different gases have different K_H values at the same temperature. Their solubilities will be in the order.

Gas	K_H/kbar
He	114.97
H_2	69.16
N_2	76.48
O_2	34.86

(1) $O_2 > H_2 > N_2 > He$ (2) $He > N_2 > H_2 > O_2$

(3) $He > H_2 > N_2 > O_2$ (4) $O_2 > H_2 > He > N_2$

LS0247

52. Calculate the mass of urea (NH_2CONH_2) required to prepare 2.06 kg of 0.5 molal aqueous solution?

(1) 90 g (2) 120 g

(3) 60 g (4) 45 g

LS0248

53. Vapour pressure of pure water at 298 K is 25 mm of Hg. 60 g of urea (NH_2CONH_2) is dissolved in 882 g of water. Calculate the vapour pressure of water for this solution and its relative lowering?

(1) 22mm ; 0.02 (2) 24.5 mm ; 0.02

(3) 20mm ; 0.01 (4) 27mm ; 0.01

LS0249

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**2**	**3**	**2**	**2**	**1**	**1**	**3**	**4**	**3**	**1**	**3**	**3**	**2**	**4**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**4**	**4**	**4**	**1**	**1**	**2**	**4**	**3**	**4**	**2**	**3**	**4**	**1**	**3**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**2**	**3**	**2**	**2**	**1**	**2**	**4**	**3**
Que.	46	47	48	49	50	51	52	53							
Ans.	**1**	**3**	**3**	**1**	**2**	**1**	**3**	**2**							