

## SOLUTIONS-MCQ

- 1) Brass is  
( a ) **Solid solution** ( b ) Liquid solution ( c ) Gas solution ( d ) All of these
- 2) 200 mL of water is added to 500mL of 0.2 M solution. What is the molarity of the diluted solution ?  
( a ) 0.5010 M ( b ) 0.2897 M ( c ) 0.7093 M ( d ) **0.1428 M**
- 3) In which mode of expression, the concentration of solution remains independent of temperature ?  
( a ) Molarity ( b ) Normality ( c ) Formality ( d ) **Molality**
- 4) Increasing the temperature of an aqueous solution will cause  
( a ) Decrease in molality ( b ) **decrease in molarity** ( c ) decrease in mole fraction  
( d ) decrease in % w/w
- 5) Molarity of the liquid HCL if density of the solution is 1.17 g/cc is  
( a ) 36.5 ( b ) 18.25 ( c ) **32.05** ( d ) 42.10
- 6) 5ml of 1 N HCl, 20ml of N/2 H<sub>2</sub>SO<sub>4</sub> and 30ml of N/3 HNO<sub>3</sub> are mixed together and the volume made to one litre. The normality of the resulting solution is  
( a ) N/5 ( b ) N/10 ( c ) N/20 ( d ) **N/40**
- 7) Which one of the following gases has the lowest value of the Henry's law constant ?  
( a ) N<sub>2</sub> ( b ) He ( c ) H<sub>2</sub> ( d ) **CO<sub>2</sub>**
- 8) An aqueous solution of methanol in water has vapour pressure  
( a ) equal to that of water ( b ) equal to that of methanol ( c ) **more than that of water**  
( d ) less than that of water
- 9) 12.0g of urea is dissolved in 1 litre of water and 68.4g sucrose is dissolved in 1 litre of water. The relative lowering of vapour pressure of urea solution is  
( a ) greater than sucrose solution ( b ) less than sucrose solution  
( c ) double that of sucrose solution ( d ) **equal to that of sucrose solution**
- 10) Formation of a solution from two components can be considered as (i) pure solvent → separated solvent molecules,  $\Delta H_1$  (ii) pure solute → separated solute molecules,  $\Delta H_2$  (iii) separated solvent and solute molecules → solution,  $\Delta H_3$ . Solution so formed will be ideal if  
( a )  $\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$  ( b )  $\Delta H_{soln} = \Delta H_1 + \Delta H_2 - \Delta H_3$   
( c )  $\Delta H_{soln} = \Delta H_1 - \Delta H_2 - \Delta H_3$  ( d )  $\Delta H_{soln} = \Delta H_3 - \Delta H_1 - \Delta H_2$
- 11) The system that forms maximum boiling azeotrope is  
( a ) carbon disulphide-acetone ( b ) benzene-toluene ( c ) **acetone-chloroform**  
( d ) n-hexane-n-heptane
- 12) The molal freezing point constant of water is 1.86° C/M. Therefore the freezing point of 0.1 M NaCl solution in water is expected to be  
( a ) - 1.86°C ( b ) - 0.186°C ( c ) **- 0.372°C** ( d ) + 0.372°C
- 13) What is the osmotic pressure of a 0.0020 mol dm<sup>-3</sup> sucrose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>) solution at 20°C ? (Molar gas constant, R = 8.314 JK<sup>-1</sup>mol<sup>-1</sup>)  
( a ) **4870 Pa** ( b ) 4.87 Pa ( c ) 0.00487 Pa ( d ) 0.33 Pa

- 14) Camphor is often used in molecular mass determination because  
 ( a ) it is readily available ( **b** ) **it has a very high cryoscopic constant** ( c ) it is volatile  
 ( d ) it is solvent for organic substances
- 15) 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 is  
 ( a ) 136.2 ( b ) 171.2 ( **c** ) **68.4** ( d ) 34.2
- 16) The osmotic pressure of 0.1 M aqueous solution of NaCl is ..... Osmotic pressure of 0.1 M aqueous solution of glucose  
 ( a ) equal to ( b ) less than ( c ) half of ( **d** ) **nearly double**
- 17) Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it from freezing at 60°C will be : [ $K_f$  for water = 1.86 K kg mol<sup>-1</sup>, and molar mass of ethylene glycol = 62g mol<sup>-1</sup>]  
 ( a ) 204.30g ( b ) 400.00g ( c ) 304.60g ( **d** ) **804.32g**
- 18) If an aqueous solution of glucose is allowed to freeze, then crystals of which will be separated out first ?  
 ( a ) glucose ( **b** ) **water** ( c ) both of these ( d ) none of these
- 19) If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point of water ( $\Delta T_f$ ), when 0.01 mol of sodium sulphate is dissolved in 1 kg of water, is ( $K_f=1.86$  K kg mol<sup>-1</sup>).  
 ( a ) 0.0744K ( b ) 0.0186K ( c ) 0.0372K ( **d** ) **0.0558K**
- 20) Which of the following 0.1 M aqueous solution is likely to have the highest boiling point ?  
 ( **a** )  **$Na_2SO_4$**  ( b ) KCl ( c ) Glucose ( d ) Urea
- 21) Four solutions of  $K_2SO_4$  with the concentrations 0.1 m, 0.01 m, 0.001 m and 0.0001 m are available. The maximum value of van't Hoff factor,  $i$ , corresponds to.  
 ( **a** ) **0.0001 m solution** ( b ) 0.001 m solution ( c ) 0.01 m solution ( d ) 0.1 m solution
- 22) Van't Hoff factor for 0.1 M ideal solution is  
 ( a ) 0.1 ( **b** ) **1** ( c ) -0.01 ( d ) none of these
- 23) The depression in freezing point for 1 M urea, 1 M glucose and 1 M NaCl are in the ratio  
 ( a ) 1:2:3 ( b ) 3:2:2 ( **c** ) **1:1:2** ( d ) None of these.
- 24) The van't Hoff factor  $i$  for a compound which undergoes dissociation in one solvent and association in other solvent is respectively  
 ( a ) Greater than one and greater than one ( b ) Less than one and greater than one  
 ( c ) Less than one and less than one ( **d** ) **Greater than one and less than one**
- 25) The solubility of a substance in ether is  $2.0 \times 10^{-3}$  M. The distribution coefficient of the substance in ether - water mixture is 4. The solubility of the substance in water is.  
 ( a )  $3.0 \times 10^{-4}M$  ( **b** )  $5.0 \times 10^{-4}M$  ( c )  $6.0 \times 10^{-4}M$  ( d )  $8.0 \times 10^{-4}M$
- 26) Which of the following units is useful in relating concentration of solution with its vapour pressure ?  
 ( **a** ) **mole fraction** ( b ) parts per million ( c ) mass percentage ( d ) molality
- 27) On dissolving sugar in water at room temperature, solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid ?  
 ( a ) Sugar crystals in cold water ( b ) Sugar crystals in hot water  
 ( c ) Powdered sugar in cold water ( **d** ) **Powdered sugar in hot water**
- 28) At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is .....  
 ( a ) less than the rate of crystallisation ( b ) greater than the rate of crystallisation  
 ( **c** ) **equal to the rate of crystallisation** ( d ) zero
- 29) A beaker contains a solution of substance 'A'. Precipitation of substance 'A' takes place when small amount of 'A' is added to the solution. The solution is .....  
 ( a ) saturated ( **b** ) **supersaturated** ( c ) unsaturated ( d ) concentrated

- 30) Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon ..... .  
 ( a ) Temperature ( b ) Nature of solute (  **c ) Pressure** ( d ) Nature of solvent
- 31) Low concentration of oxygen in the blood and tissues of people living at high altitude is due to ..... .  
 ( a ) low temperature (  **b ) low atmospheric pressure** ( c ) high atmospheric pressure  
 ( d ) both low temperature and high atmospheric pressure
- 32) Considering the formation, breaking and strength of hydrogen bond, predict which of the following mixtures will show a positive deviation from Raoult's law ?  
 (  **a ) Methanol and acetone** ( b ) Chloroform and acetone ( c ) Nitric acid and water  
 ( d ) Phenol and aniline
- 33) Colligative properties depend on ..... .  
 ( a ) the nature of the solute particles dissolved in solution  
 (  **b ) the number of solute particles in solution**  
 ( c ) the physical properties of the solute particles dissolved in solution  
 ( d ) the nature of solvent particles
- 34) Which of the following aqueous solutions should have the highest boiling point ?  
 ( a ) 1.0 M NaOH (  **b ) 10 M Na<sub>2</sub>SO<sub>4</sub>** ( c ) 1.0 M NH<sub>4</sub>NO<sub>3</sub> ( d ) 1.0 M KNO<sub>3</sub>
- 35) The unit of ebullioscopic constant is ..... .  
 (  **a ) K kg mol<sup>-1</sup> or K (molality)<sup>-1</sup>** ( b ) mol kg K<sup>-1</sup> or K<sup>-1</sup> (molality)  
 ( c ) kg mol<sup>-1</sup> K<sup>-1</sup> or K<sup>-1</sup> (molality)<sup>-1</sup> ( d ) K mol kg<sup>-1</sup> or K (molality)
- 36) In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M MgCl<sub>2</sub> solution is ..... .  
 ( a ) the same ( b ) about twice (  **c ) about three times** ( d ) about six times
- 37) An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because ..... .  
 ( a ) it gains water due to osmosis ( b ) it loses water due to reverse osmosis  
 ( c ) it gains water due to reverse osmosis (  **d ) it loses water due to osmosis**
- 38) At a given temperature, osmotic pressure of a concentrated solution of a substance ..... .  
 (  **a ) is higher than that at a dilute solution** ( b ) is lower than that of a dilute solution  
 ( c ) is same as that of a dilute solution  
 ( d ) can not be compared with osmotic pressure of dilute solution.
- 39) Which of the following statements is false ?  
 (  **a ) Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point.**  
 ( b ) The osmotic pressure of a solution is given by the equation  $\Pi = CRT$  (where C is the molarity of the solution)  
 ( c ) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is BaCl<sub>2</sub> > KCl > CH<sub>3</sub>COOH > sucrose.  
 ( d ) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution.
- 40) The values of van't Hoff factors for KCl, NaCl and K<sub>2</sub>SO<sub>4</sub>, respectively, are ..... .  
 ( a ) 2,2 and 2 (  **b ) 2,2 and 3** ( c ) 1,1, and 2 ( d ) 1,1 and 1
- 41) Which of the following statements is false ?  
 ( a ) Units of atmospheric pressure and osmotic pressure are the same  
 (  **b ) In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration**  
 ( c ) The value of molal depression constant depends on nature of solvent  
 ( d ) Relative lowering of vapour pressure, is a dimensionless quantity.

- 42) Value of Henry's constant  $K_H$  ..... .  
**( a ) increases with increase in temperature** ( b ) decreases with increase in temperature  
 ( c ) remains constant ( d ) first increases, then decreases
- 43) The value of Henry's constant  $K_H$  is ..... .  
 ( a ) greater for gases with higher solubility **( b ) greater for gases with lower solubility**  
 ( c ) constant for all gases ( d ) not related to the solubility of gases
- 44) We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1 M, 0.01 M, respectively. The value of van't Hoff factor for these solutions will be in the order ..... .  
**( a )  $i_A < i_B < i_C$**  ( b )  $i_A > i_B > i_C$  ( c )  $i_A = i_B = i_C$  ( d )  $i_A < i_B > i_C$
- 45) On the basis of information given below mark the correct option. Information : (A) In bromoethane and chloroethane mixture, intermolecular interactions of A - A and B - B type are nearly same as A - B type interactions. (B) In ethanol and acetone mixture, A - A or B - B type intermolecular interactions are stronger than A - B type interactions. (C) In chloroform and acetone mixture, A - A or B - B type intermolecular interactions are weaker than A - B type interactions.  
 ( a ) Solution (B) and (C) will follow Raoult's law **( b ) Solution (A) will follow Raoult's law**  
 ( c ) Solution (B) will show negative deviation from Raoult's law  
 ( d ) Solution (C) will show positive deviation from Raoult's law
- 46) If two liquids A and B form minimum boiling azeotrope at some specific composition, then ..... .  
 ( a ) A - B interactions are stronger than those between A - A or B - B  
 ( b ) vapour of solution increases because more number of molecules of liquids A and B can escape from the solution.  
 ( c ) vapour pressure of solution decreases because less number of molecules of only one of the liquids escape from the solution.  
**( d ) A - B interactions are weaker than those between A - A or B - B.**
- 47) 4 L of 0.02 M aqueous solution of NaCl was diluted by adding one litre of water. The molality of the resultant solution is ..... .  
 ( a ) 0.004 ( b ) 0.008 ( c ) 0.012 **( d ) 0.016**
- 48) On the basis of the information given below mark the correct option. Information: On adding acetone to methanol some of the hydrogen bonds between methanol molecules break.  
**( a ) At specific composition, methanol - acetone mixture will form minimum boiling azeotrope and will show positive deviation from Raoult's law.**  
 ( b ) At specific composition, methanol - acetone mixture forms maximum boiling azeotrope and will show positive deviation from Raoult's law  
 ( c ) At specific composition methanol - acetone mixture will form minimum boiling azeotrope and will show negative deviation from Raoult's law  
 ( d ) At specific composition methanol - acetone mixture will form maximum boiling azeotrope and will show negative deviation from Raoult's law
- 49)  $K_H$  value for Ar(g), CO<sub>2</sub>(g), HCHO (g) and CH<sub>4</sub> (g) are 4.39, 1.67,  $1.83 \times 10^{-5}$  and 0.413 respectively. Arrange these gases in the order of their increasing solubility.  
 ( a ) HCHO < CH<sub>4</sub> < CO<sub>2</sub> < Ar ( b ) HCHO < CO<sub>2</sub> < CH<sub>4</sub> < Ar **( c ) Ar < CO<sub>2</sub> < CH<sub>4</sub> < HCHO**  
 ( d ) Ar < CH<sub>4</sub> < CO<sub>2</sub> < HCHO
- 50) Which following factor (s) affect the solubility of a gaseous solute in the fixed volume of liquid solvent ? (i) nature of solute (ii) temperature (iii) pressure  
 ( a ) (i) and (iii) at constant T **( b ) (i) and (ii) at constant P** ( c ) (ii) and (iii) only  
 ( d ) (iii) only