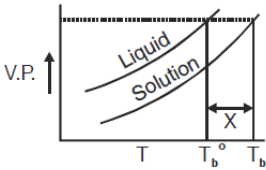
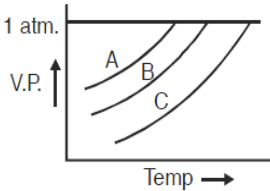


	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	Department of Science 2024 - 25 SUBJECT: CHEMISTRY	Date : 16.09.2024
Worksheet No: 06 WITH ANSWERS	Chapter: SOLUTIONS	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

	<u>MULTIPLE CHOICE QUESTIONS</u>	
1.	K_H value for Ar(g), CO ₂ (g), HCHO (g) and CH ₄ (g) are 40.39, 1.67, 1.83×10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility. a) HCHO < CH ₄ < CO ₂ < Ar b) HCHO < CO ₂ < CH ₄ < Ar c) Ar < CO ₂ < CH ₄ < HCHO d) Ar < CH ₄ < CO ₂ < HCHO	1
2.	When a non-volatile solid is added to pure <u>water</u> it will: a) boil above 100°C and freeze above 0°C b) boil below 100°C and freeze above 0°C c) boil above 100°C and freeze below 0°C d) boil below 100°C and freeze below 0°C	1
3.	<u>Water- HCl mixture</u> I. shows positive deviations II. forms minimum boiling azeotrope III. shows negative deviations IV. forms maximum boiling azeotrope a) I and II b) II and III c) I and IV d) III and IV	1
4.	An azeotropic solution of two liquids has boiling point lower than either of them when solute solvent interactions are: a) Equal to solute solute and solvent solvent interactions b) Stronger than solute solute and solvent solvent interactions c) Weaker than solute solute and solvent solvent interactions d) None of the above	1
5.	Molarity of a solution at 60°C is----- than molarity at 30°C a) More b) less c) same d) no effect of temperature	1
6.	For isotonic solutions which of the following is not equal a) concentration b) temperature c) osmotic pressure d) vapour pressure	1
7.	For non-electrolyte solute value of Van't Hoff factor is a) 0 b) 1 c) >1 d) <1	1

8.	In reverse osmosis: a) a pressure greater than osmotic pressure is applied on pure water side b) a pressure lesser than osmotic pressure is applied on pure water side c) a pressure greater than osmotic pressure is applied on salt water side d) a pressure lesser than osmotic pressure is applied on salt water side	1
9.	Which of the following salt will have same value of Van't Hoff's factor (i) as that of $K_4[Fe(CN)_6]$ (a) $Al_2(SO_4)_3$ (b) NaCl (c) $Al(NO_3)_3$ (d) Na_2SO_4	1
10.	Which among the following is an example of a solid solution? (a) Copper dissolved in gold (b) Ethanol dissolved in water (c) Glucose dissolved in water (d) Sodium chloride dissolved in water	1
<u>ASSERTION –REASON TYPE QUESTIONS</u>		
Note: In the following questions (1-5) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices. (a) Assertion and reason both are correct statements and reason is the correct explanation for assertion. (b) Assertion and reason both are correct statements but the reason is not a correct explanation for assertion. (c) Assertion is a correct statement but the reason is the wrong statement. (d) Assertion is a wrong statement but the reason is a correct statement.		
11.	Assertion: When methyl alcohol is added to water, the boiling point of water decreases. Reason: When a volatile solute is added to a volatile solvent elevation in boiling point is observed.	1
12.	Assertion: Cooking time in a pressure cooker is reduced Reason: The boiling point inside the pressure cooker is raised	1
13.	Assertion: The vapour pressure of a liquid is constant at a constant temperature Reason: At equilibrium rate of evaporation becomes equal to the rate of condensation.	1
14.	Assertion: The components of the azeotropic mixture can be separated by distillation Reason: At a particular composition azeotropic mixture boils at the same temperature.	1
15.	Assertion: The shrinking of cells is called hemolysis. Reason: Hemolysis occurs when a cell comes in contact with a solution of lower osmotic pressure than that of a cell	1
<u>SHORT AND LONG ANSWER TYPE QUESTIONS</u>		

16.	Give an example of a 'liquid in solid' type solution.	1			
17.	Which of the following is a dimensionless quantity; molarity, molality, or mole fraction?	1			
18.	10 gm glucose is dissolved in 400 gm. of solution. Calculate the percentage concentration of the solution.	1			
19.	Gases tend to be less soluble in liquids as the temperature is raised. Why?	1			
20.	A mixture of chlorobenzene and bromobenzene forms a nearly ideal solution but a mixture of chloroform and acetone does not. Why?	1			
21.	State the conditions which must be satisfied if an ideal solution is to be formed.	2			
22.	Suppose k_f for water is $1.86 \text{ K kg mol}^{-1}$. What is the freezing point of 0.1 molal solution?	2			
23.	a. What is the value of van't Hoff factor (i) for $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$? b. What is the value of the van't Hoff factor (i) if solute molecules undergo dimerization?	2			
24.	a. The Phase diagram for pure solvent and the solution containing non-volatile solute are recorded below. The quantity indicated by 'X' in the figure is  b. AgNO_3 on reaction with NaCl in aqueous solution gives white precipitate. If the two solutions are separated by a semi-permeable membrane will there be appearance of a white ppt. in the side 'X' due to osmosis? <table border="1" data-bbox="657 1071 979 1182"> <tr> <td>0.1 M AgNO_3 X</td> <td>S P M</td> <td>0.01 M NaCl Y</td> </tr> </table>	0.1 M AgNO_3 X	S P M	0.01 M NaCl Y	2
0.1 M AgNO_3 X	S P M	0.01 M NaCl Y			
25.	a. The vapour pressure curve for three solutions having the same non-volatile solute in the same solvent are shown. The curves are parallel to each other and do not intersect. What is the correct order of the concentrations of the solutions.  b. Can we separate water from the HNO_3 solution? Justify your answer	2			
26.	30 g of urea ($M = 60 \text{ g mol}^{-1}$) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.	3			
27.	Calculate the temperature at which a solution containing 54 g of glucose, ($\text{C}_6\text{H}_{12}\text{O}_6$), in 250 g of water will freeze. (K_f for water = $1.86 \text{ K kg mol}^{-1}$)	3			

	osmotic pressure of seawater is about 30 atm; this is the pressure that must be applied to the seawater (separated from pure water using a semi-permeable membrane) to get drinking water. i) What will happen if a plant cell is kept in a hypertonic solution? ii) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing in 1.2% sodium chloride solution? iii) What happens when the external pressure applied becomes more than the osmotic pressure of the solution? OR iii) Which mechanisms help in the transportation of water in a plant?	
32.	The boiling point or freezing point of the liquid solution would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of raising its boiling point and depressing its freezing point. The addition of non-volatile substances to a solvent decreases the vapor pressure and the added solute particles affect the formation of pure solvent crystals. According to many researchers, the decrease in freezing point directly correlated to the concentration of solutes dissolved in the solvent. This phenomenon is expressed as freezing point depression and it is useful for several applications such as freezing the concentration of liquid food and finding the molar mass of an unknown solute in the solution. Freeze concentration is a high-quality liquid food concentration method where water is removed by forming ice crystals. This is done by cooling the liquid food below the freezing point of the solution. The freezing point depression is referred to as a colligative property and it is proportional to the molar concentration of the solution (m), along with vapor pressure relative lowering, boiling point elevation, and osmotic pressure. These are physical characteristics of solutions that depend only on the identity of the solvent and the concentration of the solute. The characters are not depending on the solute's identity. <i>(Jayawardena, J. A. E. C., Vanniarachchi, M. P. G., & Wansapala, M. A. J. (2017). Freezing point depression of different Sucrose solutions and coconut water.)</i> <u>Answer the following:</u> a. What is the relation between the vapour pressure of solid and liquid states at freezing point? b. Why freezing point of 0.1m solution of acetic acid in benzene is less than freezing point of 0.01m solution? c. Out of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression? KCl, C₆H₁₂O₆, Al₂(SO₄)₃, K₂SO₄ OR c. If K_f for water is 1.86 °C/m, explain why 1m NaCl in water does not have a freezing point equal to	4

	ANSWERS – SHORT & LONG ANSWERS TYPE	
16.	Amalgam of Hg in Sodium	1
17.	mole fraction	1
18.	$= 10\text{g}/410\text{g} \times 100$ $= 2.43\% \text{ w/w}$	$\frac{1}{2}$ $\frac{1}{2}$
19.	because the dissolution of gases in liquids is an exothermic process. When the temperature rises, heat is supplied, which shifts the equilibrium of the solution towards the backward direction, thus reducing gas solubility.	1
20.	A mixture of chlorobenzene and bromobenzene forms a nearly ideal solution because they have similar molecular structures and do not create new interactions upon mixing. In contrast, when chloroform and acetone are mixed, there is a significant change in enthalpy and volume, indicating that new interactions (H-bonding) are formed, which deviates from ideal behavior.	$\frac{1}{2}$ $\frac{1}{2}$
21.	- The solution must obey Raoult's law, meaning that the partial vapor pressure of each component in the solution is proportional to its mole fraction. - The enthalpy of mixing ($\Delta_{\text{mix}}H$) must be zero, indicating no heat is absorbed or released during the mixing process. - The volume change on mixing ($\Delta_{\text{mix}}V$) must also be zero, meaning there are no volumetric changes when the components are combined.	ANY TWO POINTS 1 1
22.	$\Delta T_f = K_f \cdot m$ $\Delta T_f = 1.86^\circ\text{C kg mol}^{-1} \cdot 0.1 \text{ mol/kg}$ $\Delta T_f = 0.186^\circ\text{C}$ Freezing Point = $0^\circ\text{C} - 0.186^\circ\text{C}$ Freezing Point = -0.186°C	1 1
23.	$i = 3$ $I = 0.5$	1 1
24.	ΔT_t - No precipitate, because only solvent particles move through SPM	1 1
25.	$A < B < C$ - No, we cannot separate water from a nitric acid (HNO_3) solution because water and nitric acid form an azeotropic mixture. This means that during processes like evaporation or vaporization, both components vaporize together to maintain a constant composition in the liquid phase, making complete separation impossible.	1 1

	<u>ANSWERS - CBSE BOARD-BASED</u>	
33.	a) $\Delta T_b = K_b m$, $\Delta T_f = K_f m$ $K_f/K_b = \frac{T_f^2 \times \text{latent heat of fusion}}{T_b^2 \times \text{latent heat of vapourisation}}$ $= \Delta T_f / \Delta T_b$ $K_f = \frac{R \times M_1 \times T_f^2}{1000 \times \Delta_{fus} H}$ $\Delta T_f = 0.542$ $K_b = \frac{R \times M_1 \times T_b^2}{1000 \times \Delta_{vap} H}$ $T_f = 0 - 0.542$ $= -0.542^\circ \text{C}$ b) 0.8p	3
34.	mass of acetic acid = volume $\times$ density $\Delta T_f = i K_f m$ mass of acetic acid = $0.6 \times 1.06 = 0.636 \text{ g}$ molar mass of acetic acid = 60 g/mol $i = \frac{0.0205}{1.86 \times 0.0106} = 1.04$ $\text{no. of moles of acetic acid} = \frac{\text{mass of acetic acid}}{\text{molar mass of acetic acid}} = \frac{0.636}{60} = 0.0106$ As $n=2$, $\text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}^+$ $\text{molality} = \frac{\text{No. of moles}}{\text{mass of solvent}} = \frac{0.0106}{1} = 0.0106 \text{ m}$ $\alpha = \frac{i-1}{n-1} = \frac{1.04-1}{2-1} = 0.04$ (As density of water = 1 g/cm^3) $\therefore 1 \text{ L} = 1 \text{ kg}$ Dissociation constant $K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]} = \frac{c\alpha \times c\alpha}{c(1-\alpha)} = \frac{c\alpha^2}{1-\alpha} = \frac{0.0106 \times 0.04 \times 0.04}{1-0.04} = 1.76 \times 10^{-5}$	3
35.	(a) (c)	1 1

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