	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	**DEPARTMENT: SCIENCE (2026-27)** **SUBJECT: CHEMISTRY**	**Date: 25/05/2026**
Worksheet: 03	**TOPIC: SOLUTIONS**	**Note:** **A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

MULTIPLE CHOICE QUESTIONS

1.	50 mL of an aqueous solution of glucose $C_6H_{12}O_6$ (Molar mass: 180 g/mol) contains $6{\cdot}02 \times 10^{22}$ molecules. The concentration of the solution will be (A) 0·1 M (B) 0·2 M (C) 1·0 M (D) 2·0 M
2.	For an electrolyte undergoing dissociation in an aqueous solution, the Van't Hoff factor: (A) is always less than one (B) is always greater than one (C) has zero value (D) has negative value.
3.	An azeotropic mixture of two liquids has a boiling point higher than either of the two liquids when it: (A) shows large negative deviation from Raoult's law (B) shows no deviation from Raoult's law (C) shows large positive deviation from Raoult's law (D) obeys Raoult's law
4.	Which of the following colligative properties is used to find the molar mass of proteins? (A) Osmotic pressure (B) Elevation in boiling point (C) Depression in freezing point (D) Relative lowering of vapour pressure
5.	1 mole of liquid A and 2 moles of liquid B make a solution having a total vapour pressure 40 torr. The vapour pressure of pure A and pure B are 45 torr and 30 torr respectively. The above solution: (A) is an ideal solution. (B) shows positive deviation.

	(C) shows negative deviation. (D) is a maximum boiling azeotrope.
6.	If molality of a dilute solution is doubled, the value of the molal elevation constant (K_b) will be: (A) halved (B) doubled (C) unchanged (D) tripled
7.	The boiling point of one molal NaCl solution in water is: (K_b = 0.52 $Kkgmol^{-1}$) (A) 100.52°C (B) 101.04°C (C) 101.54°C (D) 99.48°C **(2026 March)**
8.	The osmotic pressure of a solution increases if the: (A) number of solute molecules is increased. (B) temperature is decreased. (C) volume is increased. (D) number of solute molecules is decreased.
9.	Assertion (A): Elevation in boiling point is a colligative property. Reason (R): Elevation in boiling point is directly proportional to molarity. (A) Both (A) and (R) are true and (R) is the correct explanation of (A) (B) Both (A) and (R) are true and (R) is not the correct explanation of (A). (C) Assertion (A) is true, but Reason (R) is false (D) Assertion (A) is false, but Reason (R) is true
10.	Assertion (A): Molarity of a solution in liquid state changes with temperature. Reason (R): The volume of solution changes with the change in temperature. (A) Both (A) and (R) are true and (R) is the correct explanation of (A) (B) Both (A) and (R) are true and (R) is not the correct explanation of (A). (C) Assertion (A) is true, but Reason (R) is false (D) Assertion (A) is false, but Reason (R) is true

Question – Answer Type:

11.	Predict the state of the solute in the solution in the following situations: (a) When 'i' is found to be more than one. (b) When 'i' is found to be less than one.	**2**
12.	Give reasons: (i) 0·1 M KCl has higher boiling point than 0·1 M Glucose.	**2**

	(ii) Meat is preserved for a longer time by salting.	
13.	Give two differences between ideal and non-ideal solutions.	**2**
14.	Give reasons for the following: (a) Aquatic animals are more comfortable in cold water in comparison to warm water. (b) Sprinkling of salt helps in clearing the snow-covered roads in hilly areas.	**2**
15.	When 19·5 g of FCH_2COOH (Molar mass = 78 g mol^{-1}) is dissolved in 500 g of water, the depression in freezing point is observed to be 1°C. Calculate the degree of dissociation of FCH_2COOH [Given: K_f for water = 1·86 K kg mol^{-1}]	**3**
16.	An antifreeze solution is prepared by dissolving 31 g of ethylene glycol (Molar mass = 62 g mol^{-1}) in 600 g of water. Calculate the freezing point of the solution. (K_f for water = 1·86 K kg mol^{-1})	**3**
17.	Calculate the vapour pressure of a solution containing 61g of benzoic acid (Molar mass = 122 $gmol^{-1}$) dissolved in 500 g of benzene, assuming complete dimerisation of benzoic acid. (Vapour pressure of pure benzene is 66 torr) **(2026 March)**	**3**
18.	a) Define Azeotrope. What type of azeotrope is formed by negative deviation from Raoult's law? Give an example. b) Calculate the boiling point elevation for a solution prepared by adding 10g of $MgCl_2$ to 200g of water, assuming $MgCl_2$ is completely dissociated. (K_b for Water = 0.512 K kg mol^{-1}, Molar mass $MgCl_2$ = 95g mol^{-1})	**3**
19.	**Passage-based question.** Raoult's law for volatile liquids states that the partial vapour pressure of each component in the solution is directly proportional to its mole fraction, whereas for a non-volatile solute, it states that the vapour pressure of a solution of a non-volatile solute is equal to the vapour pressure of the pure solvent at that temperature multiplied by its mole fraction. Two liquids A and B are mixed with each other to form a solution, the vapour phase consists of both components of the solution. Once the components in the solution have reached equilibrium, the total vapour pressure of the solution can be determined by combining Raoult's law with Dalton's law of partial pressures. If a non-volatile solute B is dissolved into a solvent A to form a solution, the vapour pressure of the solution will be lower than that of the pure solvent. The solutions which obey over the entire range of concentration are ideal solutions, whereas the solutions for which vapour pressure is either higher or lower than that predicted by Raoult's law are called non-ideal solutions. Non-ideal solutions either show positive or negative deviation from Raoult's law depending on whether the A-B	**4**

	interactions in solution are stronger or weaker than A-A and B-B interactions. Answer the following questions: (a) 20 mL of a liquid A was mixed with 20 mL of liquid B. The volume of resulting solution was found to be less than 40 mL. What do you conclude from the above data? (b) Which of the following shows positive deviation from Raoult's law? Carbon disulphide and Acetone; Phenol and Aniline; Ethanol and Acetone (c) The vapour pressure of a solution of glucose in water is 750 mm Hg at 100 ^{0}C. Calculate the mole fraction of solute. (Vapour pressure of water at 373 K = 760 mm Hg) **OR** (c) The boiling point of solution increases when 1 mol of NaCl is added to 1 litre of water while addition of 1 mol of methanol to one litre of water decreases its boiling point. Explain the above observations.	
20.	(a) A solution contains 5·85 g NaCl (Molar mass = 58·5 g mol^{-1}) per litre of solution. It has an osmotic pressure of 4·75 atm at 27°C. Calculate the degree of dissociation of NaCl in this solution. (Given: R = 0·082 L atm K^{-1} mol^{-1}) (b) State Henry's law. Why is air diluted with helium in the tanks used by scuba divers?	**5**
21.	(a) The vapour pressures of A and B at 25ºC are 75 mm Hg and 25 mm Hg, respectively. If A and B are mixed such that the mole fraction of A in the mixture is 0·4, then calculate the mole fraction of B in vapour phase. (b) At the same temperature, CO_2 gas is more soluble in water than O_2 gas. Which one of them will have higher value of K_H and why? (c) Why are equimolar solutions of sodium chloride and glucose not isotonic?	**5**

ANSWERS

<table>
<tr><td>1.</td><td>(D) 2·0 M</td></tr>
<tr><td>2.</td><td>(B) is always greater than one</td></tr>
<tr><td>3.</td><td>(A) shows large negative deviation from Raoult’s law</td></tr>
<tr><td>4.</td><td>(A) Osmotic pressure</td></tr>
<tr><td>5.</td><td>(B) shows positive deviation</td></tr>
<tr><td>6.</td><td>(C) unchanged</td></tr>
<tr><td>7.</td><td>(B) 101.04^{o}C</td></tr>
<tr><td>8.</td><td>(A) number of solute molecules is increased.</td></tr>
<tr><td>9.</td><td>(C) Assertion (A) is true, but Reason (R) is false</td></tr>
<tr><td>10.</td><td>(A) Both (A) and (R) are true and (R) is the correct explanation of (A)</td></tr>
<tr><td>11.</td><td>(a) Dissociated
(b) Associated</td></tr>
<tr><td>12.</td><td>i) Due to dissociation of KCl, number of particles in 0.1 M KCl is more.
ii) Due to osmosis, bacteria lose its water and dies which causes preservation.</td></tr>
<tr><td>13.</td><td>
<table>
<tr><th>Ideal Solution</th><th>Non-Ideal solution</th></tr>
<tr><td>It obeys Raoult’s law over the entire range of concentration.</td><td>It doesn’t obey Raoult’s law over the entire range of concentration.</td></tr>
<tr><td>ΔVmixing = 0 and $\Delta H_{mixing} = 0$</td><td>$\Delta V_{mixing} \neq 0$ and $\Delta H_{mixing} \neq 0$.</td></tr>
</table>
</td></tr>
<tr><td>14.</td><td>(a) Due to more solubility of oxygen in cold water than in warm water.
(b) Sprinkling of salt causes depression in freezing point and snow easily melts.</td></tr>
<tr><td>15.</td><td>$\Delta T_f = i K_f m$
$1 = i \times 1.86 \times \frac{19.5}{78} \times \frac{1000}{500}$
$i = 1.075$
$\alpha = \frac{i-1}{n-1} = \frac{1.075-1}{2-1} = 0.075$ or 7.5%</td></tr>
<tr><td>16.</td><td>$\Delta T_f = K_f m$
$= 1.86 \times 31 \times 1000 / 62 \times 600$
$= 1.55\ ^{o}C$ or K
$\Delta T_f = T_f^{o} - T_f$
$T_f = -1.55^{o}C$ OR $T_f = 271.45K$ OR 271.6K</td></tr>
</table>

17.	$\frac{p_1^0 - p_1}{p_1^0} = \frac{w_2 \times M_1}{M_2 \times w_1}$ $p_1^0 = 66$ torr, $w_2 = 61g$, $M_1 = 18gmol^{-1}$, $M_2 = 122\ gmol^{-1}$, $w_1 = 500g$, $i = ½$ $p_1 = 63.426$ torr
18.	a) A liquid binary mixture that distills at constant temperature without undergoing a change in composition. Maximum boiling azeotrope 68% HNO_3+ 32% H_2O b) $\Delta T_b = i K_b m$ $i = 3$ $\Delta T_b = 3 \times 0{\cdot}512 \times \frac{10}{95} \times \frac{1000}{200}$ $\Delta T_b = 0{\cdot}81$ K or °C
19.	(a) Solution shows a negative deviation from Raoult's law / A-A and B-B interactions are weaker than A-B interactions. (b) Carbon disulphide and acetone, Ethanol and acetone. (c) According to Raoult's law: $p_1 = p_1^0 x_1$ **or** $x_1 = \frac{p_1}{p_1^0}$ $x_1 = \frac{750}{760} = 0.987$ $x_2 = 1 - x_1$ $= 1 - 0.987 = 0.013$ **OR** The difference in boiling behaviour arises because sodium chloride (NaCl) is a non-volatile solute that lowers the vapour pressure of water, thereby increasing its boiling point, whereas methanol is a highly volatile solute that increases the overall vapour pressure of the solution, thereby decreasing its boiling point.
20.	a) $\pi = i\ CRT$ $4.75 = i \times \frac{5.85}{58.5} \times \frac{1}{1} \times 0.082 \times 300$ $i = 1.93$ $\alpha = \frac{i-1}{n-1} = \frac{1.93-1}{2-1} = 0.93$ or 93%

	b) Partial pressure of gas in liquid is directly proportional to its mole fraction. To prevent 'Bends'
21.	a) $P_T = p_A {}^0x_A + p_B {}^0x_B$ $P_T = 75 \times 0{\cdot}4 + 25 \times 0{\cdot}6$ $P_T = 30 + 15 = 45$ mm Hg In Vapour phase $p_B = y_B \times P_T$ $y_B = {}^{p_B}/_{P_T} = \frac{p_B^o x_B}{P_T}$ $y_B = \frac{15}{45} = \frac{1}{3} = 0{\cdot}33$ mm Hg b) O_2 gas has higher K_H; because higher the K_H value, lower the solubility of gas in liquid. c) Because sodium chloride undergoes dissociation in water while glucose doesn't / $\pi = i\,C\,R\,T$; For NaCl , i=2 and for glucose i=1

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