	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	**Department: SCIENCE 2025-2026** **SUBJECT: CHEMISTRY**	**Date:** **23/11/2025**
Worksheet No: 06 **(**With answers)	**Chapter: SOLUTIONS**	**Note:** **A4 FILE FORMAT**
CLASS & SECTION	**NAME OF THE STUDENT**	**ROLL NO.**

Q.NO.	Objective Type Questions (1 Mark)	MARKS
1	Which of the following units is useful in relating the concentration of a solution with its vapour pressure? a. Mole fraction b. Parts per million c. Mass percentage d. Molality	1
2	People add sodium chloride to water while boiling eggs because: a. Decreases boiling point b. Increases boiling point c. Prevents breaking d. Makes eggs tasty	1
3	The number of moles of NaCl in 3 L of 3M solution is: a. 1 b. 3 c. 9 d. 27	1
4	Identify the law stated as: “The partial vapour pressure of each component in a solution is directly proportional to its mole fraction.” a. Henry’s law b. Raoult’s law	1

	c. Dalton's law d. Gay-Lussac's law	
5	Which mixture shows a positive deviation from Raoult's law? a. Methanol–acetone b. Chloroform–acetone c. Nitric acid–water d. Phenol–aniline	1
6	Solubility of gases in liquids decreases with rise in temperature because dissolution is: a. Endothermic & reversible b. Exothermic & reversible c. Endothermic & irreversible d. Exothermic & irreversible	1
7	A mixture of benzene and toluene: (i) $\Delta_{mix}H = 0$ (ii) $\Delta_{mix}V = 0$ (iii) Forms minimum-boiling azeotrope (iv) Non-ideal solution a. Only i b. i and ii c. i, ii, iii d. ii, iii, iv	1
8	The hard shell of an egg dissolves in HCl. When placed in conc. NaCl, the egg will: a. Shrink b. Swell c. Become harder d. Show no change	1
9	Scuba divers carry the cylinder consisting the mixture of gases diluted in air a. O_2, He, CO_2 b. O_2, He, N_2 c. O_2, He, Ne d. O_2, Ar, N_2	1

10	Soft drinks are prepared by dissolution of CO_2, by applying more pressure, this can be understood by a. Daltons law b. Charles law c. Henrys law d. Avogadro law	1
11	The people living longer at high altitudes suitably suffer from the disease known as a. High blood pressure b. Breathlessness c. Suffocation d. Anoxia	1
12	What is the effect of temperature on solubility of gases in liquids. a. No effect b. Increase in temperature decreases solubility c. Increase in temperature increases solubility d. It cannot be correlated.	1
13	If scuba divers do not carry the proper diving device along with appropriate cylinder containing suitable mixture of required gases, meant for breathing support, when they come to surface they experience a. Blood clots b. Scratches on the skin c. Burst capillaries d. causes bends	1
14	**Assertion:** When a solution is separated from solvent by a semipermeable membrane, solvent passes to solution side. **Reason:** Diffusion occurs from higher to lower concentration of solution. a. Assertion and Reason true, Reason explains Assertion b. Assertion and Reason true, Reason does not explain Assertion c. Assertion true, Reason false d. Assertion false, Reason true	1

15	**Assertion:** If mixing two liquids makes solution hot → it shows negative deviation. **Reason:** Negative deviation is accompanied by decrease in volume. a. Assertion and Reason true, Reason explains Assertion b. Assertion and Reason true, Reason does not explain Assertion c. Assertion true, Reason false d. Assertion false, Reason true	1
Q.NO.	**Short Answer Type Questions (2 Marks)**	**Marks**
16	State colligative properties of dilute solution. Write down the different types of colligative properties.	2
17	18 g of glucose $(C_6H_{12}O_6)$ was added to 1 kg water at 1.013 bar atmospheric pressure in a vessel. At which temperature will water boil? K_b For water is 0.52 $K\ Kg\ mol^{-1}$.	2
18	Define ideal solution. *(Mention four points always)*	2
19	(a) What is the relation of K_H with temperature ? (b) Write expression for Henry's law.	2
20	Calculate the molality of a solution when 20 g NaOH is dissolved in 440 g of solvent.	2
Q.NO.	**Short Answer Type Questions (3 Marks)**	**Marks**
21	Calculate solubility of methane in benzene at 298 K under 760 mm Hg. (Given Henry's constant $= 4.27 \times 10^5$ mm Hg) ?	3
22	The partial pressure of ethane over a saturated solution containing 6.56×10^{-2} g of ethane is 1 bar. If the solution contains 5.00×10^{-2} g of ethane then what will be the partial pressure (in bar) of the gas ?	3

23	(i) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing a. 1.2% sodium chloride solution? b. 0.4% sodium chloride solution? (ii) Calculate the freezing point of the solution when 31 g of ethylene glycol ($C_2H_6O_2$) is dissolved in 500 g of water. (K_f for water = 1.86 $KKgmol^{-1}$)	3
24	Give reasons for the following. a. Fruits are preserved in sugar and hence protected from bacteria. b. Aquatic animals are more comfortable in cold water than in warm water. c. Solubility of gases in liquids decreases with rise in temperature. d. Ethylene glycol is added to car radiators in cold countries. e. A mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law. *(Answer any three)*	3
25	Write three differences between ideal and non-ideal solution.	3
26	**Case Study Type Question** A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapour pressure of 2.8 K Pa at 298 k Further 18 g of water is added to this solution. The new vapour pressure becomes 2.9 k Pa at 298 K When a non-volatile solute is added to a solvent, the surface has molecules of solute and solvent both. Thus, the number of molecules of solvent present in upper surface is less. The number of solvent molecules escaping from the surface is reduced. Answer the following questions : (a) Write down the expression for relative lowering of vapour pressure with the mole fraction of the solute. (b) Calculate the vapour pressure of water at 298 K. (c) Find out the molecular mass of solute? **OR** (d) Name two factors on which the vapour pressure of the liquid depends.	4

Q.NO.	Long Answer Type Questions (5 Marks)	Marks
27	(a) Identify which liquid will have a higher vapour pressure at 90°C if the boiling points of two liquids A and B are 140°C and 180°C, respectively. (b) For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0·0821 L atm K^{-1} mol^{-1}] (c) Visha took two aqueous solutions — one containing 7·5 g of urea (Molar mass = 60 g/mol) and the other containing 42·75 g of substance Z in 100 g of water, respectively. It was observed that both the solutions froze at the same temperature. Calculate the molar mass of Z.	1 2 2
28	(A) Calculate the mass of ascorbic acid (Molar mass = 176 g mol^{-1}) to be dissolved in 75 g of acetic acid, to lower its freezing point by 1·5°C. (K_f = 3·9 K kg mol^{-1}) (B) 30 g of urea 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 2
29	(i) 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 ? (ii) How does the size of blood cells change when placed in an aqueous solution containing more than 0·9% (mass/volume) sodium chloride ? (iii) 1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionized. Calculate the boiling point of the solution. (Given : K_b for H_2O = 0·52 K kg mol^{-1})	1 1 3

30	(i) The vapour pressures of A and B at 25°C 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. (ii) Define colligative property. Which colligative property is preferred for the molar mass determination of macromolecules ? (iii) Why are equimolar solutions of sodium chloride and glucose not isotonic ?	2 2 1

Marking Scheme		
Q.NO.	**Answers**	**MARKS**
1	a. Mole fraction	1
2	b. Increases boiling point	1
3	c. 9	1
4	b. Raoult's law	1
5	a. Methanol–acetone	1
6	b. Exothermic & reversible	1
7	b. i and ii	1
8	a. Shrink	1
9	b. O_2, He, N_2	1
10	c. Henry's law	1
11	d. Anoxia	1
12	b. Increase in temperature decreases solubility	1
13	d. causes bends	1
14	c. Assertion true, Reason false.	1
15	b. Assertion and Reason true, Reason does not explain Assertion	1

16	There are four main colligative properties: 1. Relative lowering in Vapour pressure. 2. Elevation is boiling point. 3. Depression in freezing point. 4. Osmotic pressure. All the above said colligative properties (C.P) are directly propositional to the concentration i.e. C.P. ∝ Concentration.	1 1
17	$\Delta T_b = 0.52 \times \frac{18}{180} \times \frac{1}{1} = \frac{0.52}{10}$ $\Delta T_b = 0.052$ $\text{Boiling Temperature}(T_b) = 100 + 0.052 = 100.052^{\circ}\text{C}$ $T_b(\text{K}) = 100.052 + 273.15$ $T_b(\text{K}) = 373.202\ \text{K}$	1 1
18	• Ideal solutions are those that obey Raoult's law over the entire range of concentration. • For these solutions, the change in enthalpy upon mixing is zero and the change in volume upon mixing is zero • Examples include a solution of n-hexane and n-heptane, and a solution of bromoethane and chloroethane. • In these binary solutions, the solute-solvent (A-B) intermolecular interactions are comparable in strength to the solute-solute (A-A) and solvent-solvent (B-B) interactions.	½ x 4=2
19	(a) K_H, increases with temperature. (b) $p = K_H \times x$ *(explain the parameters always)*	1 1
20	$= \frac{20}{40 \times 0.44}$ $= 1.136\ \text{mol kg}^{-1}$	1 1

21	$p = K_H \times x_{CH_4}$ $x_{CH_4} = \frac{p}{K_H} = \frac{760}{4.27 \times 10^5}$ $= 1.78 \times 10^{-3}$	1 1 1
22	According to Henry's law, $m = K_H \times p$ $6.56 \times 10^{-2} = K_H \times 1$ $K_H = 6.56 \times 10^{-2}$ For another case, $5 \times 10^{-2} = 6.56 \times 10^{-2} \times p$ $p = \frac{5 \times 10^{-2}}{6.56 \times 10^{-2}} = 0.762$ bar	1 1 1
23	(i) a. Blood cells will shrink b. Blood cells swell. (ii) $\Delta Tf = \frac{Kf \times w_2 \times 1000}{M_2 \times w_1}$ = 1.86 K $\Delta Tf = Tf^\circ - Tf$ Tf = 271.29 K	1 1 1
24	a. Through the process of osmosis, a bacterium on can- dried fruit loses water, shrivels and dies b. Solubility of gases increases decrease in temperature. c. Dissolution of gas in liquid is exothermic. Low temp favours dissolution (Le Chatelier's principle) d. To prevent water from freezing. It's an antifreeze. It lowers the freezing point of water. e. This is because chloroform molecule is able to form hydrogen bond with acetone molecule. This decreases the escaping tendency of molecules for each component and consequently, the vapour pressure decreases resulting in negative deviation from Raoult's law	1 each

25		1 each

Ideal solution	Non-ideal solution
It obeys Raoults law over the entire range of concentration.	It does not obey Raoults law over the entire range of concentration.
$\triangle$mixH = 0, $\triangle$mixV = 0	$\triangle$mixH $\neq$ 0 , $\triangle$mixV $\neq$ 0
The intermolecular attraction between the components (A-B interactions) are of same magnitude as intermolecular interactions in the pure components. (A-A and B-B)	The intermolecular attraction between the components (A-B interactions) are not of the same magnitude as intermolecular interactions in the pure components. (A-A and B-B)
Eg Benzene and toluene	Eg – Chloroform and acetone

(Any three points)

26	(a)	1

$$\frac{(p^{\circ}_{solvent} - p_{solution})}{p^{\circ}_{\text{solvent}}} = \frac{n_2}{(n_1 + n_2)}$$

(b) 2

For dilute solutions,

$$n_2 << n_1,$$

Therefore,

$$\frac{(p^{\circ}_{solvent} - p_{solution})}{p^{\circ}_{\text{solvent}}} = \frac{n_2}{n_1}$$

$$= \frac{(W_2 \times M_1)}{(M_2 \times W_1)}$$

$$\frac{(p^{\circ}_{solvent} - 2.8)}{p^{\circ}_{\text{solvent}}} = \frac{6}{M_2}$$

Similarly for Second case we get,

$$\frac{(p^{\circ}_{solvent} - 2.9)}{p^{\circ}_{\text{solvent}}} = \frac{(30 \times 18)}{(M_2 \times 108)}$$

$$\frac{(p^{\circ}_{solvent} - 2.9)}{p^{\circ}_{\text{solvent}}} = \frac{5}{M_2}$$

On solving eq.(1) and (2), we get

$$\frac{(p^{\circ}_{solvent} - 2.8)}{(p^{\circ}_{\text{solvent}} - 2.9)} = \frac{6}{5}$$

$$p^{\circ}_{\text{solvent}} = 3.4 \text{ k Pa}$$

(c) 1

$$\frac{(3.4 - 2.8)}{3.4} = \frac{6}{M_2}$$

$$\frac{0.6}{3.4} = \frac{6}{M_2}$$

$$M_2 = 34 \text{ g}$$

OR

(d) 1

(i) Nature of liquid

(ii) Temperature.

27	(a) A (b) $\pi = CRT$ (Volume of solution = 100 mL) $\pi = \frac{n}{V} RT$ $\pi = \frac{5}{60} \times \frac{0.0821 \times 300}{0.1}$ $\pi = 20.5$ atm. (½ mark may be deducted for no or incorrect unit) (c) $\Delta T_f(\text{urea}) = \Delta T_f(Z)$ $kf \times \frac{w\ urea}{Murea} \times \frac{1000}{w\ solvent} = kf \times \frac{wz}{Mz} \times \frac{1000}{Wsolvent}$ $\frac{7.5}{60} \times \frac{1000}{100} = \frac{42.75}{Mz} \times \frac{1000}{100}$ $Mz = \frac{42.75 \times 60}{7.50} = 342\ g/mol$ (or by any other correct method) (½ mark may be deducted for no or incorrect unit)	1 ½ ½ 1 ½ ½ 1
28	(A) $\Delta T_f = K_f\ m$ $1.5 = \frac{3.9 \times w_B}{176} \times \frac{1000}{75}$ Mass of ascorbic acid = 5.08 g. (B) $\frac{P_A^o - P_A}{P_{A^o}} = \frac{\frac{W_B}{M_B}}{\frac{W_B}{M_B} + \frac{W_A}{M_A}}$ $1 - \frac{P_A}{23{\cdot}8} = \frac{\frac{30}{60}}{\frac{846}{18}}$ or $1 - \frac{P_A}{23{\cdot}8} = \frac{\frac{30}{60}}{\frac{846}{18} + \frac{30}{60}}$ $P_A = \frac{46.5}{47} \times 23{\cdot}8 = 23{\cdot}5$ mm Hg or $P_A = \frac{47}{47.5} \times 23{\cdot}8 = 23{\cdot}5$ mm Hg (Full marks may be awarded if the student substitutes M_B for molar mass as the molar mass of urea is not given in the question).	1 1 1 ½ 1 ½

29	(a)(i)As $K_H \propto \frac{1}{\text{Solubility}}$ of Gas $\therefore O_2$ gas has higher K_H; because higher the K_H value, lower the solubility of gas in liquid. (ii) Blood cells shrink. (iii) $\Delta T_b = iK_b m$ $T_b - T_b^0 = i \times 0{\cdot}52\ K\ Kg\ mol^{-1} \times 1\ mol\ Kg^{-1}$ $\alpha = \frac{i-1}{n-1}$ n=5 $0{\cdot}6 = \frac{i-1}{5-1}$ i = 3·4 $T_b - 373\ K = 3{\cdot}4 \times 0{\cdot}52 \times 1$ $T_b = 1{\cdot}768 + 373\ K$ T_b=374.768K(If boiling point of water is 373.15K then T_b= 374.918K)	½ + ½ 1 ½ ½ 1 ½ ½
30	(b) (i) $P_T = p_A^{\ 0} x_A + p_B^{\ 0} x_B$ $P_T = 75 \times 0{\cdot}4 + 25 \times 0{\cdot}6$ P_T= 30 + 15 = 45 mm Hg In Vapour phase $p_B = y_B \times P_T$ $y_B = p_B / p_T = \frac{p_B^0 x_B}{p_T}$ $y_B = \frac{15}{45} = \frac{1}{3}$ = 0·33 mm Hg (ii)The property which depends upon the number of solute particles but not on the natureof solute. ; Osmotic pressure. (iii)Because sodium chloride undergoes dissociation (i=2) in water while glucose does not./ π= i C R T ; For NaCl , i=2 and for glucose i=1.	½ ½ ½ ½ 1,1 1
Reference: Sample Paper(CBSE 2025 -26): URL SQP : Chemistry-SQP.pdf MS : Chemistry-MS.pdf		

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