Doon Public School, Bhuj
Holiday Homework

Dear Students,

"The hardest part of remote learning is that we aren't together. We want our students to know that even though we aren't together, you are still very much cared and everything we do is for you." It is now the time to take this task on as a lesson in space management, time management, and self-management. It is also time to embrace technology, make judicious use of it to plan and prepare for your academics.

This is your Holiday Homework which must be written in fair chemistry notebook. Make this time absolutely useful for you.

Class-XII **subject- Chemistry**

Chapter- Solutions

1. The molal depression constant depends upon

a. Vapour pressure of the solution b. Heat of solution of the solute in the solvent

c. Nature of the solvent d. Nature of the solute

2. Which among the following show negative deviation?

a. Chloroform and benzene b. Acetone and benzene

c. Methyl alcohol and water d. Carbon tetrachloride and chloroform

3. For ideal solution the volume of mixing of the pure components to form the solution is

a. ΔV_{mix}= -ve b. ΔV_{mix}= +ve c. ΔV_{mix}= 0 d. None of these

4. Which will form maximum boiling azeotrope?

a. $C_2H_5OH + H_2O$ b. None of these c. $HNO_3 + H_2O$ d. $C_6H_6 + C_6H_5CH_3$

5. When blood cells are placed in pure water, blood cells

a. Become white in colour b. Shrinks c. Diffuses in water d. Swells up

6. Which of the following solutions has the highest boiling point?

(a) 5.85% solution of NaCl (b) 18.0% solution of glucose

(c) 6.0% solution of urea (d) all have same boiling point

7 Two solutions of NaCl and KCl are prepared separately by dissolving same amount of the solute in water. Which of the following statements is true for these solutions

(a) KCl solution will have higher boiling point than NaCl solution

(b) both the solutions have same boiling point

(c) KCl and NaCl solutions possess same vapour pressure

8 Molarity of pure water is

(a) 1 (b) 18 (c) 55.5 (d) 6

9 Which one of the following solutions will have higher vapour pressure than that of water

(a) aqueous solution of CH_3OH (b) aqueous solution of H_2SO_4

(c) aqueous solution of sugar (d) aqueous solution of urea

10 The molar boiling point constant is the ratio of the elevation in boiling point to

(a) molarity (b) molality (c) mole fraction of solvent (d) less than that of water

11 An aqueous solution of methanol in water has vapour pressure

(a) equal to that of water (b) equation to that of methanol

(c) more than that of water (d) less than that of water

12 An ozeotropic mixture of two liquids boils at a lower temperature than either of them when

(a) it is saturated (b) it shows positive deviation from Raoult's law

(c) it shows negative deviation from Raoult's law (d) it is metastable

13 In azeotropic mixture showing positive deviation from Raoult's law, the volume of mixture is

(a) slightly more than the total volume of components

(b) slightly less than the total volume of the component

(c) equal to the total volume of the components

(d) none of these

14 A solution of glucose is 10%. The volume in which 1 gm mole of it is dissolved will be

(a) 1 dm3 (b) 1.8 dm3 (c) 200 cm3 (d) 900 cm3

15 Colligative properties are the properties of

(a) dilute solutions which behave as nearly ideal solutions

(b) concentrated solutions which behave as nearly non–ideal solutions

(c) both (i) and (ii)

(d) neither (i) nor (ii)

16 The freezing mixture used in ice cream machine consists of ice and

(a) NaCl (b) $CaCl_2$ (c) KNO_3 (d) both a & c

17 1 kg of sea water contains 4.96 x 10^{-3} gm of dissolved oxygen. The concentration of oxygen in sea water in ppm is

(a) 4.96 x 10–2 (b) 0.496 (c) 4.96 (d) 49.6

18 A solution of sucrose is 34.2%. The volume of solution containing one mole of solute

(a) 500 cm3 (b) 1000 cm3 (c) 342 cm3 (d) 3420 cm3

19 Salt of a weak acid with strong base when dissolved in water gives

(a) acidic solution (b) basic solution

(c) neutral solution (d) none

20 Mole fraction of 10% urea is

(a) 0.042 (b) 0.023 (c) 0.032 (d) 0.072

21 Which of the following mixtures of liquids show negative deviation

(a) ethyl alcohol ether (b) HCl and water

(c) phenol – water (d) chlorobenzene – bromobenzene

22 The term cryoscopy is used

(a) depression of freezing point (b) elevation in boiling point

(c) lowering of vapour pressure (d) osmotic pressure

23 The term ebullioscopy is used

(a) depression of freezing point (b) elevation in boiling point

(c) lower of vapour pressure (d) none of above

24 Azeotropic mixture

(a) obey Henry's law (b) obey Raoult's law (c) do not obey Raoult's law (d) obey Dalton's law

25 Hydrolysis of potassium acetate produce

(a) acidic solution (b) neutral solution (c) basic solution (d) none of these

Very Short Type(1 Mark)

1. Why melting point of a substance is used as a criterion for testing the purity of the substance?

Ans. A pure compound has a sharp melting point. Impurities present if any, lower the melting point of the compound (just because depression in freezing point takes place).

2. Name two ways by which vapour pressure of a liquid can be lowered.

Ans. The two ways by which vapour pressure can be lowered are – i. By decreasing the temperature. ii. By adding a non- volatile solute

3. Define the term osmotic pressure.

Ans. Osmotic pressure is the hydrostatic pressure applied on solution which just prevents the flow of solvent molecules through semipermeable membrane. It may be also defined as the excess pressure which must be applied to a solution to prevent the passage of solvent into it through a semipermeable membrane.

4. Define cryoscopic constant?

Ans. When 1 mole of a solute (that neither dissociates nor associates) is dissolved in 1 kg of solvent, the depression in freezing point is called cryoscopic constant.

5 Why is osmotic pressure considered to be a colligative property?

Ans Osmotic pressure is given as$\pi = CRT \; or \; \pi = \frac{n}{v}RT$

Osmotic pressure depends only on the number of moles 'n' of the solute present in a definite volume of the solution V and there is no factor involving the nature of the solute. Also, osmotic pressure depends upon the molar concentration of solution. Hence, it is a colligative property.

6. Why is ether not miscible in water?

Ans. Ether is not miscible in water because it cannot form H-bonds with water. However lower members of ethers are soluble in water. The solubility of ethers decreases from lower members to higher members due to increase in size of alkyl group which decreases the formation of hydrogen bonds with water.

7. Mixture of alcohol and water can be separated by_____.

Ans. fractional distillation

8 what is the nature of solution of KCl

Ans. neutral

9 The no. of water of crystallization of $MgCl_2$ is

Ans 2

10. When does the measurement of colligative property leads to abnormal molecular mass?

Ans. When the solute undergoes either association or disassociation abnormal molar mass is obtained.

11. When is the value of i less then unity?

Ans. When the solute under goes association in solution, I is less then unity.

12. What happens when red blood cells are placed in 0.1% NaCl solution?

Ans. Water from NaCl solution passes into cells &they swell. Finally they will burst.

13 Why is the boiling point elevated when a non – volatile solute is dissolved in a liquid?

Ans. When a non – volatile solute is added the vapour pressure decreases and the solution is heated to a higher temperature, increasing the boiling point.

14. How much urea (molar mass 60 g/mol) should be dissolved in 50g of water so that its vapour pressure at room temperature is reduced by 25%?

Ans. 41.7 g .

15. What are the possible deviations from ideal behaviors?

Ans. There are two types of deviation from ideal behaviour – positive and negative deviations.

<u>Short Type (2 Marks)</u>

1. Carbon tetrachloride and water are immiscible whereas alcohol and water are miscible. Explain on the basis of molecular structures of there compounds.

Ans.Carbon tetrachloride is a non-polar compound whereas water is a polar compound. They do not interact with each other and carbon tetrachloride cannot dissolve in water whereas alcohol and water are completely miscible due to high polarity.

2. Why do mountaineers carry oxygen cylinder while climbing mountains?

Ans. At high attitudes the partial pressure of oxygen is less than that of the ground level which decreases the concentration of oxygen in blood and tissues. Low blood oxygen causes climbers to become weak and unable to think clearly & they suffer from anoxia. To avoid such situations, mountaineers carry oxygen cylinder while climbing.

3. Give the characteristics of ideal solution?

Ans. An ideal solution is formed from two liquids only when –

a) They obey Raoult's Law

b) Δ Hmix = 0

c) ΔVmix = 0

4. A mixture of chlorobenzene and bromobenzene is a nearly an ideal solution but a mixture of chloroform and acetone is not Explain?

Ans. Chlorobezene & bromobenzene both have similar structure and polarity. Therefore the various interactions (solute – solute, solvent – solvent & solute – solvent) are same whereas in chloroform and acetone initially there is no hydrogen bonding but after mixing solute solvent interactions (H –bond) become stronger and solution deviates from ideal behaviour.

5. Calculate the volume of water which could be added to 20 ml of 0.65 m HCl to dilute the solution to 0.2 m? Ans. For dilution

$M_1V_1=M_2V_2$

$V2=M_1V_1/M_2$

$$= 0.65M \times \frac{20mL}{0.2M}$$

=65 mL

–Vol of water to be added to 20 ml =V2-V1 = 65ml – 20ml = 45 ml.

6. A solution is prepared by dissolving 11g glucose in 200cm^{3}water at 30^{0}C . What is the mass Percentage of glucose in solution? The density of water at 30^{0}C is 0.996glcm^3?

Ans . density= Mass/ volume

=0.996glcm^3

0.996glcm^3= mass/200cm^3

mass= 0.996 x 200= 199.2g

mass% $of\ glucose = \frac{massof\ volume}{massof\ water + mass\ of\ glucose} \times 100$

$= \frac{11}{199.2 + 11}\ 100 = 5.23\%$

7. How are the various colligative properties modified after consideration of van't Hoff factor?

Ans a) $\frac{p° - p1}{p°1} = i\ X2$

b) $\Delta T_b = iK_f m$

c) $\Delta T_f = I\ K_f m$

d) $\pi = iCRT$

8. Give an example of solid solution in which the solute is a gas.

Ans. In case a solid solution is formed between two substances (one having very large particles and the other having very small particles), an interstitial solid solution will be formed. For example, a solution of hydrogen in palladium is a solid solution in which the solute is a gas.

<u>Short Type (3 marks)</u>

1. What type of mixtures of two liquids distill over at one temperature and why?

Ans. Two types of liquid mixtures distil over at one temperature. Such mixtures are called azeotropic mixtures or constant boiling mixture.

i. Those which show positive deviation from Raoult's law and have the mole fraction corresponding to which the vapour pressure is maximum.

ii. Those which show negative deviation from Raoult's law and have the mole fraction corresponding to which the vapour pressure is lowest.. Hence for one of the intermediate composition, the total vapour pressure of such a solution will be highest and the boiling point will be lowest. At this point the composition of liquid and vapour phase is same and the liquid mixture boils at constant temperature and remains unchanged in composition. Therefore, this liquid mixture distills over as if it is a pure liquid. Solution acquires the property of boiling at constant temperature and remains unchanged in composition.

2. Find the molality and molarity of a 15% solution of when its density is 1.10 & molar mass = 98 amu.

Ans. Volume= Mass/density

$== \frac{100g}{1.10glcm3} = 90.9cm$

M= $\% \times density\ \times \frac{10}{molar}$

$Mass\ of\ solute = 15 \times 1.1 \times \frac{10}{98} = 1.68M$

M= W of H_2SO_4/vol. of solution X 1000

$\frac{\frac{15}{98}}{85g} \times 1000 = 1.8M$

3. Calculate the molality of a solution containing 20.7 g of potassium carbonate dissolute in 500 ml of solution, assume density of solution =

Ans. Molar mass of K_2CO_3 = 138

Amount of solute (K_2CO_3) w_2 =20.7g

Amount of water mass of solvent = 500 - 20.7 = 479.3 g

$M = \frac{W2 \times 1000}{M2 \times W1}$

$= \frac{20.7 \times 1000}{138 \times 479.3}$

= 0.313 m

4. Define the term solution. How many types of solutions are formed? Write briefly about each type with an example.

Ans. Homogeneous mixtures of two or more than two components are known as solutions.

(i) Gaseous solution: The solution in which the solvent is a gas is called a gaseous solution. In these solutions, the solute may be liquid, solid, or gas. For example, a mixture of oxygen and nitrogen gas is a gaseous solution.

(ii) Liquid solution: The solution in which the solvent is a liquid is known as a liquid solution. The solute in these solutions may be gas, liquid, or solid. For example, a solution of ethanol in water is a liquid solution.

(iii) Solid solution: The solution in which the solvent is a solid is known as a solid solution. The solute may be gas, liquid or solid. For example, a solution of copper in gold is a solid solution.

Long Type (5 mark)

1. The vapour pressure of CS_2 at $500^0 C$ is 854 mm Hg .A solution of 2.0g sulphur in 100g of CS_2 has a vapour pressure of 848.9 mm Hg .Calculate the formula of sulphur molecule.

Ans. $P_A^0 = 854 \text{ mm } P_A = 848.m, W_B = 2.0g,$

$W_A = 100\ g\ M_B = ?$

$M_A = 12 + 2(32) = 76\ g/mol\ /CS^2)$

$$\frac{P_A^0 - P_A}{P_A^0} = X_B = \frac{W_B}{M_B} / \frac{W_A}{M_A}$$

$$= M_B = W_B \times \frac{W_A}{M_A} \times \frac{P_A^0}{P_A - P_A}$$

$$= 2 \times \frac{100}{76} \times \frac{854}{854 - 848.9}$$

= 254.5 g/mol.

Let the formula = Sx

$$X \times 32 = 254.5\ g/mol$$

$$X = \frac{254.5}{32}$$

= 7.95

=8 thus formula = S_8

2. Calculate the mass percentage of benzene (C_6H_6) and carbon tetrachloride (CCl_4) if 22 g of benzene is dissolved in 122 g of carbon tetrachloride.

Ans. Mass percentage of $C_6H_6 = \frac{\text{Mass of } C_6H_6}{\text{Total mass of the solution}} \times 100\%$

$$= \frac{\text{Mass of } C_6H_6}{\text{Mass of } C_6H_6 + \text{Mass of } CCl_4} \times 100\%$$

$$= \frac{22}{22+122} \times 100\%$$

= 15.28%

Mass percentage of $CCl_4 = \frac{\text{Mass of } CCl_4}{\text{Total mass of the solution}} \times 100\%$

$$= \frac{\text{Mass of } CCl_4}{\text{Mass of } C_6H_6 + \text{Mass of } CCl_4}$$

$$= \frac{122}{22+122} \times 100\%$$

=84.72%

Alternatively,

Mass percentage of CCl_4 = (100 - 15.28)%

= 84.72%

3. Two elements A and B form compounds having formula AB2 and AB4. When dissolved in 20 g of benzene, 1 g of lowers the freezing point by 2.3 K whereas 1.0 g of lowers it by 1.3 K. The molar depression constant for benzene is 5.1 Kkgmol^{-1} . Calculate atomic masses of A and B.

Ans. We know that

$$M2 = \frac{1000 \times w2 \times kf}{\Delta Tf \times w1}$$

Then $M_{AB2} = \frac{1000 \times 1 \times 5.1}{2.3 \times 20}$

=110.87gmol^{-1}

$M_{AB4} = \frac{1000 \times 1 \times 5.1}{1.3 \times 20}$

= 196.15 gmol^{-1}

Now, we have the molar masses of AB2 and AB4 and as 110.87gmol-1 and 196.15gmo-1 respectively.

Let the atomic masses of A and B be x and y respectively.

Now, we can write:

$x + 2y = 110.87 \ldots\ldots\ldots\ldots (i)$

$x + 4y = 196.15 \ldots\ldots\ldots\ldots (ii)$

Subtracting equation (i) from (ii), we have

2y = 85.28

y= 42.64

Putting the value of y=42.64 in equation (1), we have

x + 2X42.64= 110.87

Thus x= 25.59

Hence, the atomic masses of A and B are 25.59 u and 42.64 u respectively.