

Class XII

CHAPTERWISE QUESTION CHEMISTRY SOLUTIONS

Time : 1½ hrs.

Marks : 35

SET - A

SECTION A - OBJECTIVE TYPE QUESTIONS

7 × 1 = 7

- Which condition is not satisfied by an ideal solution?
a) $\Delta H_{\text{mix}=0}$ b) $\Delta V_{\text{mix}=0}$ c) $\Delta P_{\text{mix}=0}$ d) $\Delta S_{\text{mix}=0}$
- 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) Molarity
- 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
- If molality of dilute solution is doubled, the value of molal depression constant (K_f) will be
a) halved b) tripled c) unchanged d) doubled
- Define an ideal solution and write one of its characteristics.
- Two liquids x and y boil at 380 K and 400 K respectively, which of them is more volatile?
- What do you understand by the term that K_f for water is $1.86 \text{ K} \cdot \text{Kg} \cdot \text{mol}^{-1}$?

SECTION B - COMPETITIVE BASED QUESTIONS

- 8. Read the following passage and answer any four questions .** **4 × 1 = 4**

Scuba divers must cope with high concentrations of dissolved gases while breathing air at high pressure underwater. Increased pressure increases the solubility of atmospheric gases in blood. When the divers come towards surface, the pressure gradually decreases. This releases the dissolved gases and leads to the formation of bubbles of nitrogen in the blood. This blocks capillaries and creates a medical condition known as bends, which are painful and dangerous to life. To avoid bends, as well as the toxic effects of high concentrations of nitrogen in the blood, the tanks used by scuba divers are filled with air diluted with helium, nitrogen, and oxygen.

- i) 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

- ii) The people living longer at high altitudes suitably suffer from the disease known as
- a) High blood pressure b) Breathlessness
c) Suffocation d) Anoxia
- iii) 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
- iv) 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
- v) 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
9. Which of the following liquid pairs shows a positive deviation from Raoult's law? **1**
- a) Water - Nitric acid b) Benzene - Methanol
c) Water - Hydrochloric acid d) Acetone - Chloroform
10. On the basis of information given below mark the correct option.

Information

- i) In bromoethane and chloroethane mixture intermolecular interactions of A - A and B - B type are nearly same as A - B type interactions.
- ii) In ethanol and acetone mixture A - A or B - B type intermolecular interactions are stronger than A - B type interactions.
- iii) In chloroform and acetone mixture A - A or B - B type intermolecular interactions are weaker than A - B type interactions. **1**
- a) Solution (ii) and (iii) will follow Raoult's law
b) Solution (i) will follow Raoult's law
c) Solution (ii) will show negative deviation from Raoult's law
d) Solution (iii) will show positive deviation from Raoult's law

11. Inter molecular forces between two benzene molecules are nearly of same strength as those between two toluene molecules. For a mixture of benzene and toluene, which of the following are not true? 1

i) $\Delta_{\text{mix}}H = \text{zero}$ ii) $\Delta_{\text{mix}}V = \text{zero}$

iii) These will form minimum boiling azeotrope

iv) These will not form ideal solution

a) i and iii b) iii and iv iii) i and ii d) ii and iv

Question number 12 - 14 are Assertion - Reason type.

In the following questions there are two statements marked as Assertion Type (A) and other is Reason Type (R). Read the following statements and choose the correct option.

a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.

b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.

c) If the assertion is true but the reason is false.

d) If the assertion is false but reason is true.

12. Assertion : The boiling point of solution is higher than pure liquid.

Reason : This is due to increase in vapour pressure. 1

13. Assertion : When NaCl is added to water a depression in freezing point is observed.

Reason : The lowering of vapour pressure of a solution causes depression in the freezing point. 1

14. Assertion : Molarity of a solution in liquid state changes with temperature.

Reason : The volume of a solution changes with change in temperature. 1

SECTION C - SHORT & LONG ANSWER QUESTIONS

15. The vapour pressure of pure liquids A and B are 450 and 700 mm Hg respectively at 350 K. Calculate the composition of liquid mixture if total pressure is 600 mm of Hg. 2

OR

A solution was prepared by dissolving 5g of solute in 95 g of water. Vapour pressure of solution was 23.375 mm of Hg at K. Calculate the molar of solute.

[$P_A^\circ = 23.75$ mm of Hg]

16. State Raoult's law for a solution containing volatile components. How does Raoult's law become a special case of Henry's law? **2**

17. Define osmotic pressure of a solution. How is the osmotic pressure related to the concentration of a solute in a solution? **3**

OR

An aqueous solution of 3.12g of BaCl_2 in 250 g of water is found to boil at 100.0832°C . Calculate the degree of dissociation of BaCl_2 [$K_b(\text{H}_2\text{O}) = 0.52 \text{ k/m}$].

18. A solution containing 30g of non-volatile solute exactly in 90g of water has a vapour pressure of 2.8 KPa at 298 K. Further 18g of water is added to this solution. The new vapour pressure becomes 2.9 KPa at 298 K. Calculate

i) The molecular mass of solute and

ii) Vapour pressure of water at 298 k. **3**

19. Concentration terms such as mass percentage, ppm, mole fraction and molality are independent of temperature, however molarity is a function of temperature. Explain. **3**

20. Explain the terms ideal and non-ideal solution in the light of forces of interactions operating between molecules in liquid solutions. **5**

OR

Why is the mass determined by measuring a colligative property in case of some solutes abnormal? Discuss it with the help of Van't Hoff factor.

CHAPTERWISE QUESTIONS

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CHEMISTRY

SOLUTIONS

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SET - B

SECTION A - OBJECTIVE TYPE QUESTIONS

7 × 1 = 7

- Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon
 - Temperature
 - Nature of solvent
 - Nature of solute
 - Pressure
- A solute when dissolve in water
 - Increases the vapour pressure of water
 - Decreases the boiling point of water
 - Decreases the freezing point of water
 - All of these
- Which of the following binary mixtures will have same composition in liquid and vapour phase?
 - Benzene-toluene
 - Water-nitric acid
 - Water-ethanol
 - n-hexane-n-heptane
- Out of 1m solution of following dissolved in water. Which one will have lowest freezing point (assuming all are fuel, ionised)
 - Urea
 - NaCl
 - Na₂SO₄
 - Al₂(SO₄)₃
- Give an example of gaseous solution and liquid solution each.
- How does the molarity of a solution change with temperature?
- Under what condition non ideal solutions show negative deviation?

SECTION B - COMPETING BASED QUESTIONS

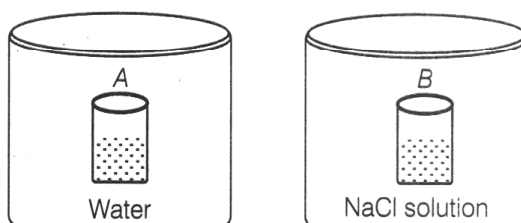
8. Read the following passage and answer any four questions . 4 × 1 = 4

Solutions are homogeneous mixture of two or more substances. Ideal solution follow Raoult's law. The vapour pressure of each component is directly proportional to their mole fraction if both solute and solvent are volatile. The relative lowering of vapour pressure is equal to mole fraction of solute if only solvent is volatile. Non-ideal solution form azeotropes which cannot be separated by fractional distillation. Henry's law is special case of Raoult's law applicable to gases dissolved in liquids. Colligative properties depend upon number of particles of solute. Relative lowering of vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure are colligative properties which depend upon mole fraction of solute, molality and molarity of solutions.

- i) 50 ml of an aqueous solution of glucose (Molar mass 180 g/mol) contains 6.02×10^{22} molecules. What is its molarity?
- ii) Identify which liquid has lower vapour pressure at 90°C if boiling point of liquid 'A' and 'B' are 140°C and 180° respectively.
- iii) What type of azeotropes formed by non-ideal solution showing negative deviation from Raoult's law?
- iv) Why meat is preserved for longer time by salting?
- v) For a 5% solution of urea (molar mass 60 g/mol), calculate the osmotic pressure at 300 K ($R = 0.0821 \text{ L atm K}^{-1}$).
9. The molarity of the solution containing 7.1 g of Na_2SO_4 in 100 ml of aqueous solution is
 a) 2 M b) 0.5 M c) 1 M d) 0.05 M **1**
10. On the basis of 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 will form 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. **1**
11. Two beakers of capacity 500 mL were taken. One of these beakers, labelled as "A", was filled with 400 mL water whereas the beaker labelled 'B' was filled with 400 mL of 2M solution of NaCl. At the same temperature both the beakers were placed in closed containers of same material and same capacity as shown in figure.



At a given temperature, which of the following statement is correct about the vapour pressure of pure water and that of NaCl solution?

- a) Vapour pressure in container (A) is more than that in container (B).

- b) Vapour pressure in container (A) is less than that in container (B).
 c) Vapour pressure is equal in both the containers.
 d) Vapour pressure in container (B) is twice the vapour pressure in container (A). **1**

Question number 12 - 14 are Assertion - Reason type.

In the following questions there are two statements marked as Assertion Type (A) and other is Reason Type (R). Read the following statements and choose the correct option.

- a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.
 b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.
 c) If the assertion is true but the reason is false.
 d) If the assertion is false but reason is true.
12. Assertion : When a solution is separated from the pure solvent by a semi permeable membrane, the solvent molecules pass through it from pure solvent side to the solution side.
 Reason : Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution. **1**
13. Assertion : When methyl alcohol is added to water, boiling point of water increases.
 Reason : When a volatile solute is added to a volatile solvent elevation in boiling point is observed. **1**
14. Assertion : 1 M solution of glucose and 1 M solution of urea have the same osmotic pressure at same temperature, are isotonic.
 Reason : Those solutions which have concentration more than body fluids are called hypertonic solution. **1**

SECTION C - SHORT & LONG ANSWER QUESTIONS

15. An electrolyte AB is 50% ionised in aqueous solution. Calculate the freezing point of 1 molal aqueous solution. **2**

OR

Calculate the mass of compound (Molar mass = 256 g mol⁻¹) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K ($K_f = 5.12 \text{ K Kg mol}^{-1}$).

16. Determine the osmotic pressure of a solution prepared by dissolving 25mg of K₂SO₄ in 2 litre of water at 25°C assuming that it is completely dissociated. **2**
17. Derive expression for Raoult's Law when the solute is non-volatile. **3**

OR

What is Van't Hoff factor? What types of values can it have if in forming the solution the solute molecules undergo

i) Dissociation

ii) Association

18. How does mole fraction of HCl gas in its solution in cyclohexane varies with partial pressure of HCl_(g)? Show with the help of graph. How can we calculate K_H with the help of graph? Name two factors affect the value of K_H ? **3**

19. 45 g ethylene glycol (C₂H₆O₂) is mixed with 600g of water calculate.

i) The freezing point depression and

ii) The freezing point of the solution (Given K_f of water = 1.86 k Kgmol⁻¹) **3**

20. a) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property? Explain.

b) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250.0 g of water.

(K_b for water = 0.512 k kgmol⁻¹, molar mass of NaCl = 58.44 g) **5**

OR

a) Write two differences between ideal solutions and non-ideal solutions.

b) 30 g of urea (M = 60gmol⁻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.