PRACTICE MCQs

CLASS 12 CHEMISTRY (TERM - I)

SOLUTIONS

BY

learn-o-hub
learning simplified

Question 1:

When 1 mole of benzene is mixed with 1 mole of toluene The vapour will contain: (Given: vapour of benzene = 12.8kPa and vapour pressure of toluene = 3.85 kPa).

(a) equal amount of benzene and toluene as it forms an ideal solution

(b) unequal amount of benzene and toluene as it forms a non-ideal solution

(c) higher percentage of benzene

(d) higher percentage of toluene

Answer: (c) higher percentage of benzene

Vapour pressure of benzene is higher than the vapour pressure of toluene. When 1 mole of benzene is mixed with 1 mole of toluene the vapour will contain higher percentage of benzene. As it is an ideal solution, it follows Raoult's law. As the mole fraction of both components is same, but the vapour pressure of benzene is higher than toluene, its percentage will be greater than in the vapour of the solution.

Question 2:

Identify the law which is stated as:

"For any solution, the partial vapour pressure of each volatile component in the solution is

directly proportional to its mole fraction."

(a) Henry's law

(b) Raoult's law

(c) Dalton's law

(d) Gay-Lussac's Law

Answer: (b) Raoult's law

For any solution, the partial vapour pressure of each volatile component in the solution is directly proportional to its mole fraction.

$p \propto x$ $p = p^\circ x$

where p = partial vapour pressure,

p° = Vapour pressure of pure component.

x = mole fraction.

Question 3:

Solubility of gases in liquids decreases with rise in temperature because dissolution is an:

(a) endothermic and reversible process

(b) exothermic and reversible process

(c) endothermic and irreversible process

(d) exothermic and irreversible process

Answer: (b) exothermic and reversible process

According to Le Chatelier's principle, dissolution of gas in the liquid is an exothermic process with increase in temperature solubility decreases.

Hence as the temperature increases, the solubility of a gas decreases.

Question 4:

How much ethyl alcohol must be added to 1 litre of water so that the solution will freeze at– 14°C? (K_f for water = 1.86°C/mol)

(a) 7.5 mol

(b) 8.5 mol

(c) 9.5 mol

(d) 10.5 mol

Answer: (a) 7.5 mol

$\Delta T_f = K_f\, m$

$\Delta T_f = K_f\, (n_2 \times 1000)/(W_1)$

$14 = 1.86\, (n_2 \times 1000)/\, (1000)$

$n_2 = 7.5$ mol

Question 5:

200 mL of water is added to 500 mL of 0.2 M solution. What is the molarity of the diluted solution?

(a) 0.5010 M

(b) 0.2897 M

(c) 0.7093 M

(d) 0.1428 M

Answer: (d) 0.1428 M

$M_1\, V_1 \equiv M_2\, V_2$

$M_1 = 0.2$ M

$V_1 = 500$ ml

$V_2 = (500 + 200) = 700$ mL

$M_1V_1 \equiv M_2V_2$

$0.2 \text{ M} \times 500 \equiv M_2 \times 700$

$0.2\text{M} \times 500 \equiv M_2 \times 700$

$M_2 = (0.2 \text{ M}) \times 500)/(700)$

$= 0.1428$ M

Question 6:

On dissolving sugar in water at room temperature solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid?

(a) sugar crystals in cold water

(b) sugar crystals in hot water

(c) Powdered sugar in cold water

(d) Powdered sugar in hot water

Answer: (d) Powdered sugar in hot water

Powdered sugar dissolves faster in hot water than it does in cold water because hot water has more energy than cold water. When water is heated, the molecules gain energy and, thus, move faster. As they move faster, they come into contact with the sugar more often, causing it to dissolve faster.

Question 7:

Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon.....

(a) temperature

(b) nature of solute

(c) pressure

(d) nature of solvent

Answer: (c) pressure

Maximum amount of solid that can be dissolved in a specified amount of a given solvent does not depend upon pressure. This is because solid and liquid are highly incompressible and practically remain unaffected by change in pressure.

Question 8:

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

Answer: (a) Methanol and acetone

In pure methanol, molecules are hydrogen bonded. On adding acetone, its molecules get in between the host molecules and break some of the hydrogen bonds between them. Therefore, the intermolecular attractive forces between the solute-solvent molecules are weaker than those between the solute-solute and solvent-solvent molecules. The other three remaining options will show negative deviation from Raoult's law where the intermolecular attractive forces between the solute-solvent molecules are stronger than those between the solute-solute and solvent-solvent molecules.

Question 9:

If the elevation in boiling point of a solution of 10 g of solute (molecular weight = 100) in 100 g of water is $\Delta T_b$the ebullioscopic constant of water is

(a) 10

(b) 100 ΔT_b

(c) ΔT_b

(d) (ΔT_b /10)

Answer: (c) ΔT_b

$\Delta T_b = (1000 \times K_b \times w)/(W \times M)$

Substituting the values,

$\Delta T_b = (1000 \times K_b \times w)/(W \times M)$

$\Delta T_b = (1000 \times K_b \times 10)/ (100 \times 100)$

$\Delta T_b = K_b$

Question 10:

How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3? The concentrated acid is 70% HNO_3.

(a) 70.0 g conc. HNO_3

(b) 54.0 g conc. HNO_3

(c) 45.0 g conc. HNO_3

(d) 90.0 g conc. HNO_3

Answer: (c) 45.0 g conc. HNO_3

1000mL has 2 moles

250mL has (2)/ (1000) ×250

= 0.5 moles

n = (W/M)

⇒ W = n × M

= 0.5 × 63g

As 70g of HNO_3 is in 100g solution

So, 0.5 × 63g of HNO_3 is in

(100/70) × 0.5 × 63 = 45g

Question 11:

Pressure cooker reduces cooking time for food because

(a) Heat is more easily distributed

(b) Boiling point of the water inside is elevated

(c) The higher pressure inside the cooker crushes the food material

(d) Cooking involves chemical changes helped by a rise in temperature

Answer: (b) Boiling point of the water inside is elevated

The boiling point of water inside the cooker increases above 100^0C due to accumulation of steam and increase in pressure. Thus, making it possible to cook food faster.

Question 12:

Osmotic pressure of blood is 7.40 atm, at 27^0C. Number of moles of glucose to be used per litre for an intravenous injection that is to have same osmotic pressure of blood is:

(a) 0.3

(b) 0.2

(c) 0.1

(d) 0.4

Answer: (a) 0.3

$\pi = (n/V)\ RT$

$n = (\pi\ V)/(RT)$

$= (7.40 \times 1)/ (0.0821 \times 300)$

$= 0.3$

Question 13:

The unit of ebullioscopic constant is:

(a) K kg mol^{-1} or K $(molality)^{-1}$

(b) mol kg-1K^{-1}or K^{-1}(molality)

(c) kg $mol^{-1}K^{-1}$ or $K^{-1}(molality)^{-1}$

(d) K mol kg^{-1} or K (molality)

Answer: (a) K kg mol^{-1} or K $(molality)^{-1}$

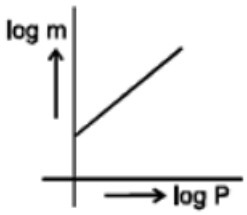
The unit of ebullioscopic constant, K_b = K kg mol^{-1} or $K(molality)^{-1}$

As $K_b = (\Delta T_f/m)$

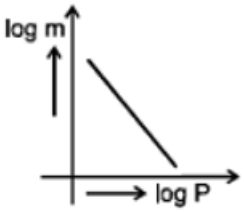
Question 14:

Which of the following curves represents the Henry's law?

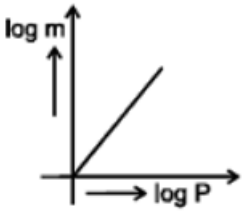
(A)



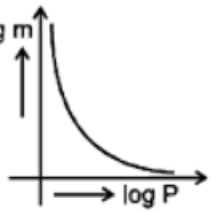
(C)



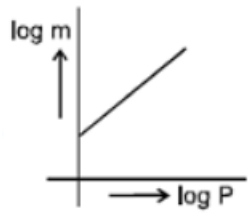
(B)



(D)



Answer: (A)



According to Henry's law,

P = Kx

where, P = pressure of gas

K = Henry's law constant

x = mole fraction of gas

A curve representing Henry's law is a straight-line graph of P vs x passing through the origin or a straight-line graph of log P vs log x with an intercept log K.

Assertion Reason Based Questions

In the following questions from 15 to 18 a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Question 15:

Assertion (A): Molarity of a solution changes with temperature.

Reason (R): Molarity is a colligative property.

Answer: (c) A is true but R is false.

Assertion: Molarity of a solution changes with temperature. (correct)

Reason: Molarity is a colligative property. (incorrect)

Molarity is a means to express concentration. It is not a physical property.

Question 16:

Assertion (A): One Molal aqueous solution of glucose contains 180g of glucose in 1 kg of water.

Reason (R): The solution containing one mole of solute in 1000 g of solvent is called one molal solution.

Answer: (a) Both A and R are true and R is the correct explanation of A

Molality = (No. of moles of solute)/(Wt. of solvent in Kg)

No. of moles = (Molecular mass)/(Wt of solvent)

=(180/180)

= 1

Therefore, Molality = (1/1) =1

Therefore, assertion and reason, both are correct, and reason is the correct explanation of assertion.

Question 17:

Assertion (A): When methyl alcohol is added to water, boiling point of water increases.

Reason (R): When a volatile solute is added to a volatile solvent elevation in boiling point is observed.

Answer: (d) A is false but R is true.

When methyl alcohol is added to water, boiling point of water decreases because when a volatile solute is added to a volatile solvent elevation in boiling point is observed.

Question 18:

Assertion (A): When NaCI is added to water a depression in freezing point is observed.

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

Answer: (a) Both A and R are true and R is the correct explanation of A

When NaCI is added to water a depression in freezing point is observed. This is due to lowering of vapour pressure of a solution. Lowering of vapour pressure is observed due to intermolecular interaction of solvent-solute particles.

Complete the following statements with an appropriate word /term to be filled in the blank space(s)

Question 19:

If Raoult's law is obeyed, the vapour pressure of the solvent in a solution is directly proportional to mole fraction of _____.

Answer: Solvent

If Raoult's law is obeyed, the vapour pressure of the solvent in a solution is directly proportional to mole fraction of **solvent**.

Question 20:

The normal boiling point of the solution is the temperature at which the vapour pressure of the solution is equal to ____ atm.

Answer: 1 atm

The normal boiling point of the solution is the temperature at which the vapour pressure of the solution is equal to 1 atm.

Boiling temperature is a temperature at which vapour pressure is equal to the atmospheric pressure when external pressure is equal to 1 atm.

Question 21:

Which of the following aqueous solution should have the highest boiling point?

(a) 1.0 M NaOH

(b) 1.0 M Na_2SO_4

(c) 1.0 M NH_4NO_3

(d) 1.0 M KNO_3

Answer: (b) 1.0 M Na_2SO_4

As we know greater the value of van't Hoff factor higher will be the elevation in boiling point and hence higher will be the boiling point of solution.

Solution	van't Hoff factor
1.0 M NaOH	2
1.0 M Na_2SO_4	3
1.0 M NH_4NO_3	2
1.0 M KNO_3	2

Hence, 1.0MNa_2SO_4 has highest value of boiling point.

Question 22:

An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because:

(a) it gains water due to osmosis

(b) it loses water due to reverse osmosis

(c) it gains water due to reverse osmosis

(d) it loses water due to osmosis

Answer: (d) it loses water due to osmosis

When an unripe mango is placed in a concentrated salt solution to prepare pickle then mango loose water due to osmosis and get shrivel.

Question 23:

Water retention or puffiness due to high salt intake occurs due to:

(a) diffusion

(b) vapour pressure difference

(c) osmosis

(d) reverse osmosis

Answer: (c) Osmosis

Osmosis is a process by which molecules of a solvent tend to pass through a semipermeable membrane from a less concentrated solution into a more concentrated one. Water retention or puffiness due to high salt intake occurs due to osmosis.

Question 24:

Which of the following fluoride is used as rat poison?

(a) CaF_2

(b) KF

(c) NaF

(d) MgF_2

Answer: (c) NaF

Sodium fluoride (NaF) is an inorganic compound with the formula NaF. It is used in trace amounts in the fluoridation of drinking water, in toothpaste, in metallurgy, and as a flux, and is also used in pesticides and rat poison.

Question 25:

When the solute is present in trace quantities the following expression is used:

(a) Gram per million

(b) Milligram percent

(c) Microgram percent

(d) Parts per million

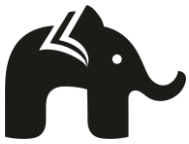
Answer: (d) Parts per million

When solute is present in trace quantities, concentration is expressed in parts per million (ppm).

Case-Study Based Questions

Question 26:

Boiling point or freezing point of 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 researches 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 freeze concentration of liquid food and to find 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 as a colligative property and it is proportional to the molar concentration of the solution (m), along with vapor pressure 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.

1. When a non-volatile solid is added to pure water 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

2. Colligative properties are:

(a) dependent only on the concentration of the solute and independent of the solvent's and solute's identity.

(b) dependent only on the identity of the solute and the concentration of the solute and independent of the solvent's identity.

(c) dependent on the identity of the solvent and solute and thus on the concentration of the solute.

(d) dependent only on the identity of the solvent and the concentration of the solute and independent of the solute's identity.

3. Assume three samples of juices A, B and C have glucose as the only sugar present in them. The concentration of sample A, B and C are 0.1M, .5M and 0.2 M respectively. Freezing point will be highest for the fruit juice:

(a) A

(b) B

(c) C

(d) All have same freezing point

4.Which one of the following aqueous solutions will exhibit highest boiling point?

(a) 0.015 M urea

(b) 0.01 M KNO_3

(c) 0.10MNa_2SO_4

(d) 0.015 m glucose

5. Identify which of the following is a colligative property:

(a) freezing point

(b) boiling point

(c) osmotic pressure

(d) all of the above

Answer:

1. (c) boil above 100°C and freeze below 0°C

When non-volatile solid is added to pure solvent the boiling point of solution increases and freezing point of solution decreases.

2. (d) dependent only on the identity of the solvent and the concentration of the solute and independent of the solute's identity.

3. (a) A

Since the concentration of sample, A is less, so it will show less depression in freezing point. Consequently, its freezing point will be higher than other solutions.

4. (c) 0.10MNa_2SO_4

Elevation in boiling point is a colligative property which depends upon the number of solute particles. Greater the number of solute particles in a solution higher the extent of elevation in boiling point.

$Na_2SO_4 \rightarrow 2Na^+ + SO_4^{2-}$

5. (c) osmotic pressure

Osmotic pressure is a colligative property.

****