Solution

CET25C1 SOLUTIONS

Class 12 - Chemistry

1.

(c) Pumice stone

Explanation: Pumice stone is example of gas in Solid.

2. **(a)** 40 mL

Explanation: H_3PO_3 is a dibasic acid.

$H_3PO_3 + 2KOH \rightarrow K_2HPO_3 + 2H_2O$

$\frac{M_A V_A}{n_A} = \frac{M_B V_B}{n_B}$

$\frac{0.1 \times 20}{1} = \frac{0.1 \times V_B}{2}$

V_B = 40 mL

3.

(d) equal to the rate of crystallisation

Explanation: At equilibrium, the rate of dissolution of solid solute is equal to the rate of crystallisation. As the number of solute particles going into the solution will equal to the solute particle separating out.

4. **(a)** High pressure

Explanation: High pressure increases the boiling point of water so it reduces the cooking time.

5.

(d) tripled

Explanation: tripled

6.

(d) Increases

Explanation: As pressure increases boiling point also increases.

7.

(c) Vapour pressure decreases on cooling

Explanation: The vapour pressure of ammonia at room temperature is very high and hence the ammonia will evaporate unless the vapour pressure is decreased. Cooling decreases the vapour pressure so that the liquid remains in the same state. Hence, the bottle is cooled before opening.

8.

(c) 0.6

Explanation: For acids, Normality = molarity × basicity

$N = M \times n_f$

$N = 0.3 \times 3 = 0.9$

9.

(b) Formic acid

Explanation: Formic acid (HCOOH) has the polar group -OH and can form H-bond with water. Thus, formic acid is highly soluble in water.

10.

(d) Swells up

Explanation: It swells up due to osmosis process and eventually burst.

11.

(b) Mercury in zinc

Explanation: Mercury in zinc amalgam is Liquid - solid binary solution.

12.

(d) shows large negative deviation from Raoult's law.

Explanation: shows large negative deviation from Raoult's law.

13. **(a)** shows a positive deviation from Raoult's law
Explanation: If the azeotropic solution has a lower boiling point than either of its two liquids then it shows positive deviation from Raoult's law.

14. **(a)** about three times
Explanation: 0.01 M solution of glucose does not ionize whereas 0.01 M $MgCl_2$ solution ionized in 3 ions (Mg^{2+} + $2Cl^-$) in the solution, hence the value of the colligative property for $MgCl_2$ solution is about 3 times.

15.
(c) Decrease the freezing point of water in the winter and increase the boiling point of water in the summer.
Explanation: Adding ethylene glycol to water reduces the freezing point of water. Water freezes at temperatures much less than 0 degrees Celsius when ethylene glycol is added to it. It is used as an anti-freeze. This practice was mostly practised in older radiators in cold weather conditions.
Another aspect of using glycols is that they have a higher boiling point(197 deg C) as compared to water. Hence, they don't get vapourised easily inside the radiator. They also have a higher specific heat capacity for which they are capable of transferring more heat from the engine as compared to water.

16.
(b) difference in solubility of carbon dioxide at different pressures.
Explanation: Soda water, like other carbonated beverages, contains carbon dioxide that has dissolved under pressure. When the pressure is released by opening the soda container, the liquid cannot hold as much carbon dioxide, so the excess bubbles out of the solution. If the soda is left open, additional carbon dioxide will slowly escape into the air. Under warm conditions, the carbon dioxide leaves the solution faster.

17.
(d) Acetone and ethanol
Explanation: (Solute- solute and > solute – solvent interactions Solvent – solvent)

18.
(b) shrivels as it loses water due to osmosis
Explanation: The concentrated salt solution will have higher osmotic pressure as compared to the fluid inside the cells of the cucumber. Hence, the cucumber shrivels when placed in a concentrated salt solution as it loses water due to osmosis.

19. **(a)** $0.02 \times 0.0821 \times 300\ atm$
Explanation: Given C = 0.02
R = 0.0821 Latm / K / mol
π=CRT
= $0.02 \times 0.0821 \times 300\ atm$

20.
(b) Osmotic pressure
Explanation: Osmotic pressure

21. **(a)** $C_6H_{12}O_6$
Explanation: $C_6H_{12}O_6$

22.
(c) proportional to the pressure of the gas over the liquid
Explanation: For the dissolution of gases in liquids, Henry's Law is applicable i.e. the mass of the gas dissolved in a given solvent at any temperature is proportional to the pressure of the gas above the solvent.

23.
(c) Osmotic pressure
Explanation: Osmotic pressure method is especially suitable for the determination of molecular masses of macromolecules such as protein & polymer because for these substances the value of other colligative properties

24.
(c) 0.25
Explanation: 0.25

25. **(a)** greater for gases with lower solubility.
Explanation: The higher the value of KH at a given temperature, the lower is the solubility of a gas in the liquid.

26.
(b) $p = \mathrm{K_H} \cdot x$
Explanation: $p = \mathrm{K_H} \cdot x$

27. **(a)** They have the same specific rotation.
Explanation: They have the same specific rotation.

28.
(b) Solubility
Explanation: $P_{gas} = \ K_H \times \ X_{gas.} \quad X_{gas}$
is measure of solubility of gas.

29.
(c) molality
Explanation: It is independent of volume hence independent of Temperature.

30. **(a)** Molarity to decrease
Explanation: An increase in temperature increase the volume of solution and therefore it will result in its molarity to decrease.

31.
(c) osmotic pressure
Explanation: An isotonic solution refers to two solutions having the same osmotic pressure across a semipermeable membrane. This state allows for the free movement of water across the membrane without changing the concentration of solutes on either side.

32. **(a)** 0.016
Explanation: Molality = $\frac{n}{V}$ = 0.02 = $\frac{n}{4}$ or n = 0.08
$m = \frac{n}{\text{Mass of water in kg}} = \frac{0.08}{5}$ = 0.016

33. **(a)** n-hexane and n-heptane
Explanation: n-hexane and n-heptane will form an ideal solution as their intermolecular interactions (solute-solvent) after forming solution are similar to their intermolecular attractions (solute-solute, solvent-solvent) before mixing the components.

34.
(b) Nitric acid and Water
Explanation: Nitric acid and Water

35.
(b) 6 g
Explanation: Mass of NaOH = (1.5 $\times$ 0.1) $\times$ 40 = 6

36.
(b) More than that of water
Explanation: They show positive deviation.

37.
(c) HNO_3 + H_2O
Explanation: Negatively deviated non ideal solution.

38.
(d) molality
Explanation: Molality (m) is defined as the number of moles of the solute per kilogram (kg) of the solvent
molality $= \frac{\Delta T_f}{K_f}$

39.
(d) Temperature
Explanation: Temperature

40.

(b) Freezing point

Explanation: Elevation in boiling point, osmotic pressure, depression in vapour pressure, and depression in freezing point are colligative properties. Colligative properties are properties of a solution which depend on the number of particles present in the solution.

41. **(a)** 0.1 M $CaCl_2$

Explanation: Since,

$\Delta \mathrm{T}_b = im\,\mathrm{K}_b$

$\Delta \mathrm{T}_b = \mathrm{T}_b - \mathrm{T}_b^0$

So, $\Delta \mathrm{T}_b \propto i$

For NaCl, i = 2; For sucrose, i = 1

For $CaCl_2$, i = 3; For glucose, i = 1

Hence, 0.1 M $CaCl_2$ has highest boiling point at 1 atm.

42. **(a)** Osmotic pressure

Explanation: Osmotic pressure depends on number of solute particles irrespective of their nature relative to the total number of particles present in the solution.

π = CRT;

C = Molarity

43.

(b) Lower boiling point than both the components and ΔH_{mix} is negative

Explanation: A solution of two volatile liquids showing a large positive deviation from ideal behaviour have ΔH_{mixing} negative and lower boiling point than both the components.

44.

(c) $Ar < CO_2 < CH_4 < HCHO$

Explanation: The higher the value of K_H, the lower is the solubility of the gases in the liquid. Hence the order of increasing solubility of the gases will be very accordingly as $Ar < CO_2 < CH_4 < HCHO$.

45. **(a)** 0.5

Explanation: 0.5

46.

(c) Powdered salt in hot water

Explanation: 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.

47.

(d) Methanol and acetone.

Explanation: A mixture of Methanol and acetone shows positive deviation because methanol-methanol and acetone-acetone interactions are stronger than methanol-acetone. The more hydrogen bonds are broken the less number of new H-bonds are formed.

48. **(a)** 0.1 M glucose solution

Explanation: 0.1 M solution of urea, at a given temperature, is isotonic with 0.1 M glucose solution as both are non electrolytic.

49.

(b) Benzene and Toluene

Explanation: The intermolecular attractive forces between benzene-benzene and toluene-toluene are nearly equal to those between benzene-toluene, this leads to the formation of ideal solution.

50. **(a)** 1:1:2

Explanation: $\Delta T_f = iK_f m_{solute}$

$\Delta T_{f1} : \Delta T_{f2} : \Delta T_{f3} = i_1 : i_2 : i_3$

$i_1 = 1$

$i_2 = 1$

$i_3 = 2$

so $\Delta T_{f1} : \Delta T_{f2} : \Delta T_{f3}$ = 1:1:2

51.

(c) 0.25

Explanation: 0.25

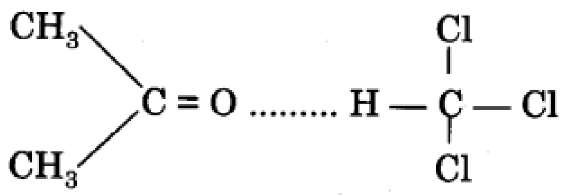
52. **(a)**

$\frac{\rho}{M} = \frac{1}{m} + \frac{Mass\ of\ solute}{1000}$

Explanation: m= moles of solute / mass of solvent. M= moles of solute / volume of solution.

53. **(a)** Acetone and chloroform

Explanation: Acetone and chloroform will show a negative deviation due to their association after mixing.



54.

(c) 0.07

Explanation: $M_1v_1 = M_2v_2$

$N = M \times n_f$

$35 \times 0.1 = 2 \times M_2 \times 25$

Therefore, $M_{Ba(OH)2}$ = 0.07

55. **(a)** supersaturated

Explanation: When a small amount of solute is added to its solution and it does not dissolve and get precipitated then this solution is supersaturated solution. The supersaturated solution usually contains more of the dissolved material .

56. **(a)** 0.1 molal sugar solution

Explanation: Sugar solution has i=1 so ΔTf minimum so Tf will be maximum.

57.

(c) the number of solute particles in solution.

Explanation: Colligative properties depend upon the number of solute particles in the solution and independent of its nature relative to the total number of particles present in the solution.

58.

(c) hypertonic solution

Explanation: The plant cell will shrink when placed in a hypertonic solution.

Hypertonic solutions are more concentrated than the plant cell. The water from inside the cytoplasm of the cell diffuses out and the plant cell is said to have become flaccid. The cytoplasm has also shrunk and pulled away from the cell wall. This phenomenon is called plasmolysis.

59.

(d) 400

Explanation: $\frac{0.2 \times 10^6}{500} = ppm = 400$

60.

(b) 3

Explanation: A compound $CaCl_2 \cdot 6H_2O$ undergoes complete dissociation in water. The Van't Hoff factor **i** is: 3

61.

(b) shows negative deviation.

Explanation: shows negative deviation.

62. **(a)** Osmosis

Explanation: Raw mango shrink in salt solution due to net transfer of water molecules from mango to salt solution due to phenomenon of osmosis.

63. **(a)** 0.08

Explanation: Mole fraction of gas X in solution

= 0.04

Pressure = 2.5 bar

Let $P_1 = P_0X_1$

$2.5 = 0.04\ P_0$ ...(i)

Let pressure be doubled, then P_2

$5.0 = X_2P_0$ ...(ii)

Dividing Eqn ii by eqn I, we get

$\frac{5.0}{2.5} = \frac{X_2}{0.04}$

$2 \times 0.04 = X_2$

$X_2 = 0.08$

64.

(c) 0.1 molal $BaCl_2$ solution

Explanation: i=3 so ΔT_b will be maximum and hence Tb will be maximum.

65. **(a)** mole fraction

Explanation: Mole fraction is useful in relating vapour pressure with a concentration of the solution. According to Raoult's law, the

partial vapour pressure of each component in the solution is directly proportional to its mole fraction present in solution.

A is one component.

$\mathrm{p_A} \propto \mathrm{x_A}, \mathrm{x_A} = \frac{\mathrm{n_A}}{\mathrm{n_A}+\mathrm{n_B}}$

66.

(d) b.p

Explanation: liquid starts to boil.

67.

(d) equimolar concentrations

Explanation: Isotonic solutions **contain** equal concentrations of impermeable solutes on either side of the membrane and so the cell neither swells nor shrinks.

68.

(c) 2.0 M KCl

Explanation: 2.0 M KCl

69. **(a)** Helium

Explanation: Size of Helium is small so does not causes “Bents” to divers when the dive back to surface. As it is less soluble.

70. **(a)** 2.0 M

Explanation: Since the solution contains 6.02×10^{22} molecules.

The no. of moles of glucose = $\frac{6.02\times10^{22}}{N(\text{avogadro})}$

= $\frac{6.02\times10^{22}}{6.022\times10^{23}}$ = 0.1 moles

volume of solution = 50 ml = 0.05 L

Therefore, the concentration of the solution in terms of molarity

Molarity = $\frac{\text{no. of moles of solute}}{\text{volume of solution (in litres)}}$

= $\frac{0.1}{0.05}$ = 2M

71. **(a)** increases with increase in temperature.

Explanation: Value of Henry's law constant increases with an increase in temperature.

72.

(c) is elevated

Explanation: When a non volatile solute is added the elevation in BP takes place with decrease in vapour pressure.

73. **(a)** low atmospheric pressure

Explanation: Low concentration of oxygen in the blood and tissues of people living at high altitude is due to low atmospheric pressure. Because at high altitude, the partial pressure of oxygen is less than at the ground level.

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

Explanation: $K_b = \frac{\Delta T_b}{m} = \frac{K}{molkg^{-1}}$ or K $(molality)^{-1}$

The unit of Boiling point elevation constant or Molal elevation constant (Ebullioscopic constant) is K kg mol^{-1} or K $(molality)^{-1}$.

75.

(d) Gas in solid

Explanation: Hydrogen (solute, gas) and solvent is palladium (solid).