Solution

SOLUTIONS WS 1

Class 12 - Chemistry

1.
   (d) Swells up
   Explanation: It swells up due to osmosis process and eventually burst.
2. **(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.
   $p_A \propto x_A, x_A = \frac{n_A}{n_A+n_B}$
3.
   (b) 4.01
   Explanation: Mass of solution = mass of solute + solvent = 196+1000= 1196g Volume of solution $= \frac{1196}{1.2} = 996.66ml$
   $M = \frac{2000}{996.66} = 2.006\ M\ N = M \times 2 = 4.01N$ = 1196/1.2=996.66 ml M=2000/996.66 = 2.006 M N= M × 2 = 4.01N
4.
   (c) is elevated
   Explanation: When a non volatile solute is added the elevation in BP takes place with decrease in vapour pressure.
5.
   (d) Increases
   Explanation: As pressure increases boiling point also increases.
6.
   (b) Nitric acid and Water
   Explanation: Nitric acid and Water
7. **(a)** $C_6H_{12}O_6$
   Explanation: $C_6H_{12}O_6$
8.
   (c) 0.25
   Explanation: 0.25
9.
   (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.
10. **(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 .
11. **(a)** High pressure
    Explanation: High pressure increases the boiling point of water so it reduces the cooking time.
12. **(a)** ΔH_{mix} is positive
    Explanation: ΔH_{mix} is positive
13.
    (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.

14.

(d) osmotic pressure

Explanation: osmotic pressure, as it depends upon number of particles(moles).

15.

(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.

16. **(a)** They have the same specific rotation.

Explanation: They have the same specific rotation.

17.

(d) Acetone and ethanol

Explanation: (Solute- solute and > solute – solvent interactions Solvent – solvent)

18.

(c) 0.1 molal $BaCl_2$ solution

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

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

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

20.

(d) Gas in solid

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

21.

(c) molality

Explanation: It is independent of volume hence independent of Temperature.

22.

(b) $p = \mathrm{K_H} \cdot x$

Explanation: $p = \mathrm{K_H} \cdot x$

23.

(b) shows negative deviation.

Explanation: shows negative deviation.

24.

(b) Solubility

Explanation: $P_{gas} = \ K_H \times \ X_{gas.} \quad X_{gas}$

is measure of solubility of gas.

25.

(b) 3

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

26.

(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.

27. **(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

28. **(a)** $0.02 \times 0.0821 \times 300\ atm$

Explanation: Given C = 0.02

R = 0.0821 Latm / K / mol

π=CRT

= $0.02 \times 0.0821 \times 300\ atm$

29. **(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.

30.

(c) 55.55 M

Explanation: Density of water = 1g/mL

Volume of 900g of water = 900mL

Moles of water = Given mass/Molecular mass = 900/18 = 50mol

Molarity of water = 50/900×1000 = 55.55M

31. **(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.

32.

(c) 2.0 M KCl

Explanation: 2.0 M KCl

33.

(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.

34.

(d) tripled

Explanation: tripled

35.

(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.

36.

(b) Mercury in zinc

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

37.

(c) 0.6

Explanation: For acids, Normality = molarity × basicity

$N = M \times n_f$

$N = 0.3 \times 3 = 0.9$

38.

(b) Osmotic pressure

Explanation: Osmotic pressure

39.

(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.

40. **(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.

41. **(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

42.

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

43.

(d) Temperature

Explanation: Temperature

44. **(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.

45.

(c) $HNO_3 + H_2O$

Explanation: Negatively deviated non ideal solution.

46.

(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.

47. **(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.

48.

(b) 0.0821 atm

Explanation: since

$\pi = cRT$

R = 0.0821L $atmK^{-1}mol^{-1}$

$C = 0.3 \times 10^{-2}$

T = 300K

on substituting the value we get,

$= 0.3 \times 10^{-2} \times 0.0821 \times 300$ = 0.0821atm

49. **(a)** molar mass of solute (M)

Explanation: Boiling Point Elevation is inversely proportional to the molar mass of the solute.

50. **(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.

51. **(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

52.

(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.

53.

(d) 100.104^{o}C

Explanation: Molality of solution = 0.2 m

K_b of water = 0.52 K kg mol^{-1}

Boiling Point Elevation

$\Delta T_b = K_b \times m \times i$

For most non-electrolytes dissolved in water, the van't Hoff factor is essentially 1.

Hence, Elevation in Boiling point = 0.52 $\times$ 0.2 = $0.104C^{o}$

Therefore, Boiling point = 100 + 0.104 = $100.104C^{o}$

54.

(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.

55.

(c) Pumice stone

Explanation: Pumice stone is example of gas in Solid.

56.

(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.

57.

(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.

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

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

59.

(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.

60.

(b) More than that of water

Explanation: They show positive deviation.

61.

(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.

62.

(b) 6 g

Explanation: Mass of NaOH = (1.5 $\times$ 0.1) $\times$ 40 = 6

63. **(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

64.

(d) molality

Explanation: Molality (m) is defined as the number of moles of the solute per kilogram (kg) of the solvent

molality $= \frac{\Delta T_f}{K_f}$

65.

(b) 32.05

Explanation: $M = \frac{(1.17 * 1000)}{(36.5)}$ = 32.054

66. **(a)** 40 mL

Explanation: H_3PO_3 is a dibasic acid.

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

$\frac{M_AV_A}{n_A} = \frac{M_BV_B}{n_B}$

$\frac{0.1\times20}{1} = \frac{0.1\times V_B}{2}$

V_B = 40 mL

67. **(a)** 0.5

Explanation: 0.5

68.

(c) 0.25

Explanation: 0.25

69.

(d) b.p

Explanation: liquid starts to boil.

70.

(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.

71. **(a)** same osmotic pressure

Explanation: same osmotic pressure

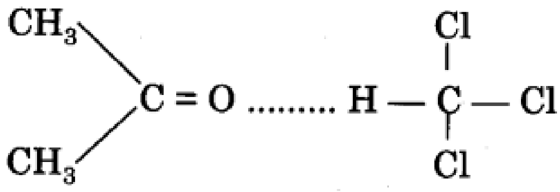
72.

(b) Exchange of gases in lungs

Explanation: Exchanges of gases is an example of diffusion.

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

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



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. **(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.