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Chapter End Test

(2019-20)

Date : __/__2019	Chemistry	Class
Duration: __ Min. Max. Marks: __	Topic : Solution	XII

1. Amount of sodium carbonate required to prepare 250 ml of 0.1 M solution is

(a) 0.7 g (b) 2.65 g

(c) 26. 5 g (d) 0.265 g

2. Moles of NaCl present in 250 ml of 0.5 M NaCl solution are

(a) 12.5 (b) 7.32

(c) 0.125 (d) 0.732

3. A student has 100 mL of 0.1 M KCl solution. To make it 0.2 M, he has to

(a) evaporate 50 mL of the solution (b) add 0.01 mole of KCl

(c) both (a) and (b) can be used (d) neither (a) nor (b) can be used

4. In which mode of expression, the concentration of solution remains independent of temperature?

(a) Molarity (b) Normality

(c) Formality (d) Molality

5. How many moles of Fe^{2+} ions are formed when excess iron is treated with 500 ml of 0.4 M HCl under inert atmosphere ? Assume no change in volume.

(a) 0.4 (b) 0.1

(c) 0.2 (d) 0.8

6. If an aqueous solution of glucose is allowed to freeze, then crystals of which will be separated out first ?

(a) glucose (b) water

(c) both of these (d) none of these

7. A pressure cooker reduces cooking time because :

(a) heat is more evenly distributed

(b) the higher pressure tenderises the food

(c) the boiling point of water inside the cooker is elevated

(d) the boiling point of water inside the cooker is depressed

8. Two liquids X and Y form an ideal solution. The mixture has a vapour pressure of 400 mm at 300 K when mixed in the molar ratio of 1 : 1 and a vapour pressure of 350 mm when mixed in the molar ratio of 1 : 2 at the same temperature. The vapour pressures of the two liquids X and Y respectively are

(a) 250 mm, 550 mm (b) 350 mm, 450 mm

(c) 350 mm, 700 mm (d) 550 mm, 250 mm

9. Calculate the amount of CO_2 dissolved at 4 atm in 1 dm^3 of water at 298K. The Henry's law constant for CO_2 at 298 K is 1.67×10^3 bar.

(a) 0.178 mol (b) 0.134 mol

(c) 1.34 mol (d) 1.78 mol

10. If x_1 and x_2 represent the mole fraction of a component A in the vapour phase and liquid mixture respectively and p_A° and p_B° represent vapours pressures of pure A and pure B, then total vapour pressure of the liquid mixture is

(a) $\frac{p_A^\circ x_1}{x_2}$ (b) $\frac{p_A^\circ x_2}{x_1}$

(c) $\frac{p_B^\circ x_1}{x_2}$ (d) $\frac{p_B^\circ x_2}{x_1}$

11. If two substances A and B have $p_A^\circ : p_B^\circ = 1 : 2$ and have mole fraction in solution 1 : 2, then mole fraction of A in vapours is

(a) 0.33 (b) 0.25

(c) 0.52 (d) 0.2

12. Negative deviation from Raoult's law is observed in which one of the following binary liquid mixtures?

(a) ethanol and acetone (b) benzene and toluene

(c) acetone and chloroform (d) chloroethane and bromoethane

13. Which will form maximum boiling azeotrope ?

(a) $HNO_3 + H_2O$ solution (b) $C_2H_5OH + H_2O$ solution

(c) $C_6H_6 + C_6H_5CH_3$ solution (d) none of these

14. Pure benzene freezes at 5.3°C. A solution of 0.223 g of phenylacetic acid ($C_6H_5CH_2COOH$) in 4.4 g of benzene (K_f = 5.12 K kg mol^{-1}) freezes at 4.47°C. From this observation, one can conclude that

(a) phenylacetic acid exists as such in benzene

(b) phenylacetic acid undergoes partial ionization in benzene

(c) phenylacetic acid undergoes complete ionization in benzene

(d) phenylacetic acid dimerizes in benzene

15. Benzoic acid undergoes dimerisation in benzene solution. The van't Hoff factor (i) is related to the degree of association '*x*' of the acid as

(a) $i = (1 - x)$ (b) $i = (1 + x)$

(c) $i = (1 - x/2)$ (d) $i = (1 + x\backslash 2)$

16. The vapour pressure of a solvent decreases by 10 mm of mercury when a non-volatile solute was added to the solvent. The mole fraction of the solute in the solution is 0.2. What should be the mole fraction of the solvent if the decreases in vapour is to be 20 mm of mercury ?

(a) 0.8 (b) 0.6

(c) 0.2 (d) 0.4

17. A solution of urea (mol. mass 56 g mol^{-1}) boils at 100.18°C at the atmospheric pressure. If K_f and K_b for water are 1.86 k kg mol^{-1} and 0.512 K kg mol^{-1} respectively, the above solution will freeze at

(a) – 6.54°C (b) – 0.654°C

(c) 6.54°C (d) 0.654°C

18. The molal freezing point constant of water is 1.86°C/M. Therefore the freezing point of 0.1 M NaCl solution in water is expected to be

(a) – 1.86°C (b) – 0.186°C

(c) – 0.372°C (d) + 0.372°C

19. Equal volumes of ethylene glycol (molar mass = 62) and water (molar mass = 18) are mixed. The depression in freezing point of water is (given K_f of water = 1.86 K mol^{-1} kg and specific gravity of ethylene glycol is 1.11)

(a) 0.0033 (b) 3.33

(c) 33.3 (d) 0.033

20. 0.1 M NaCl and 0.05 M $BaCl_2$ solutions are separated by a semi-permeable membrane in a container. For this system, choose the correct answer.

(a) There is no movement of any solution across the membrane

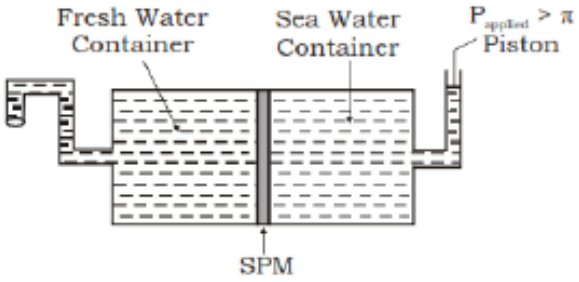
(b) Water flows from $BaCl_2$ solution towards NaCl solution

(c) Water flows from NaCl solution towards $BaCl_2$ solution

(d) Osmotic pressure of 0.1 M NaCl is lower than the osmotic pressure of $BaCl_2$ (Assume complete dissociation)

21. Why it is advised to add ethylene glycol to water in a car radiator while driving in a hill station? **[1]**

22. Given in the adjacent figure is the sketch of a plant for carrying out a process: $P_{applied} > p$.



(i) Name the process occurring in the above plant.

(ii) To which container does the net flow of solvent take place?

(iii) Name one SPM which can be used in this plant.

(iv) Give one practical use of the plant. **[2]**

23. Explain the following: **[3]**

(i) If vapour pressure of liquid A is greater than the vapour pressure of liquid B at 25°C, then the boiling point of liquid A is lower than the boiling point of liquid B.

(ii) A mixture of chlorobenzene and bromobenzene is nearly an ideal solution but a mixture of chloroform and acetone is not.

(iii) Aquatic species feel more comfortable in the lakes in winter than in summer. **[3]**

OR

A 5%solution by mass of cane sugar in water has freezing point of 271 K. Calculate the freezing point of 5% glucose in water if freezing point of pure water is 273.15 K. **[3]**

24. (a) Calculate the mass of a non-volatile solute (molar mass 40g) which should be dissolved in 114g octane to reduce its vapour pressure to 80%? **[2]**

(b) Define Henry's law and any one of its importance? **[2]**

(c) What would be the value of Vant hoff's factor for a dilute solution of K_2SO_4 in water? **[1]**

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Hints/Solution to Chapter End Test

(2019-20)

Date : __/__2019	Chemistry	Class
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1.	(b)	**2.**	(c)	**3.**	(c)	**4.**	(d)	**5.**	(b)
6.	(b)	**7.**	(c)	**8.**	(d)	**9.**	(b)	**10.**	(b)
11.	(d)	**12.**	(c)	**13.**	(a)	**14.**	(d)	**15.**	(c)
16.	(b)	**17.**	(b)	**18.**	(c)	**19.**	(c)	**20.**	(b)

21. Because it lowers the freezing point of water and hence it does not freeze in hill station

22. (i) Desalination (i.e., removal of salts from sea water) by reverse osmosis.
(ii) From sea water container to fresh water container.
(iii) Cellulose acetate placed over a suitable support.
(iv) To remove salts from sea water to obtain drinking water

23. (i) If vapour pressure of a liquid is high, less heating is required to make vapour pressure equal to external pressure (atmospheric pressure). Hence boiling point is lower.

(ii) Chlorobenzene and bromobenzene are structurally similar compounds. Hence, forces of interaction between them are same as in the pure components. However, when chloroform and acetone are mixed, stronger intermolecular forces (hydrogen bonding) come into play. As a result, it shows negative deviation.

(iii) Aquatic species need dissolved oxygen for breathing. As solubility of gases decreases with increase of temperature, less oxygen is available in summer in the lake. Hence, they feel more comfortable in winter (low temperature) when the solubility of oxygen in water is high.

OR

Mass of sugar in 5% (by mass) solution is 5g in 100g of solvent (water)

Molar mass of sugar = 342g mol^{-1}

Molality of sugar solution = $\frac{5\times1000}{342\times100}$ = 0·146 molal

$\therefore$ ΔT_f for sugar solution = 273·15 – 271 = 2·15°

$\Delta T_f = K_f \times m$

$\Delta T_f = K_f \times 1.46 \Rightarrow K_f = 2{\cdot}15/0{\cdot}146$

Molality of glucose solution = $\frac{5}{180}\times\frac{1000}{100}$ = 0.278 molal

(Molar mass of glucose = 180 g mol^{-1})

$\Delta T_f = K_f \times m = \frac{2.15}{0.145} \times 0{\cdot}278 = 4{\cdot}09°$ $\therefore$ Freezing point of glucose solution = 273.15 – 4.09 = 269.06k

24. (a) P_s = 80% of p°, p = 0.8p°

Solute $-\frac{w}{40}$ solvent $-\frac{114}{114}$

$$\frac{p^\circ - p_s}{p^\circ} x_2 \frac{p^\circ - 0.8p^\circ}{p^\circ} = \frac{w/40}{w/40+1}$$

$$0.2\left(\frac{w}{40}+1\right) = \frac{w}{40} \text{ or } \frac{0.8}{40} = 0.2\,;\ w = 10\text{g}.$$

(b) Solubility of a gas in liquid is directly proportional to its partial pressure over the liquid.
Application : soft drink bottles are packed under high pressure.

(c) i = 3

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