ARMY PUBLIC SCHOOL KALUCHAK

HOLIDAYS HOME WORK

SUBJECT- CHEMISTRY

CLASS XII (2022-23)

WORKSHEET- I **CHAPTER - SOLUTIONS**

Q1. Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type.

Q2. Define the terms, 'osmosis' and 'osmotic pressure'.
What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solutions?

Q3. A 1.00 molal aqueous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point. The solution has the boiling point of 100.18°C. Determine the van't Hoff factor for trichloroacetic acid. (K_b for water = 0.512 K kg mol^{-1}).

Q4. Explain why aquatic species are more comfortable in cold water rather than in warm water.

Q5. State Henry's law and mention two of its important applications.

Q6. Why do gases nearly always tend to be less soluble in liquids as the temperature is raised?

Q7. 18 g of glucose, $C_6H_{12}O_6$ (Molar mass – 180 g mol^{-1}) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil? (K_b for water = 0.52 K kg mol^{-1}, boiling point of pure water = 373.15 K)

Q8. 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 K kg mol^{-1}).

Q9. Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law? Given an example.

Q10. (i) On mixing liquid X and liquid Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y?
(ii) What happens when we place the blood cell in water (hypotonic solution)? Give reason.

Q11. Define osmotic pressure of a solution. How is the osmotic pressure related to the concentration of a solute in a solution?

Q12. 100 mg of a protein is dissolved in just enough water to make 10.0 mL of solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25°C, what is the molar mass of the protein?
(R = 0.0821 L atm mol^{-1} K^{-1} and 760 mm Hg = 1 atm.)

Q13. A solution of glycerol ($C_3H_8O_3$; molar mass = 92 g mol^{-1}) in water was prepared by dissolving some glycerol in 500 g of water. This solution has a boiling point of 100.42 °C. What mass of glycerol was dissolved to make this solution? Kb for water = 0.512 K kg mol^{-1}.

Q14. What mass of NaCl must be dissolved in 65.0 g of water to lower the freezing point of water by 7.5°C?

Q15. The freezing point depression constant (K_f) for water is 1.86°C/m. Assume van't Hoff factor for NaCl is 1.87. (Molar mass of NaCl = 58.5 g)

Q16. The vapour pressure of pure liquids A and B at 400 K are 450 and 700 mmHg respectively. Find out the composition of liquid mixture if total vapour pressure at this temperature is 600 mmHg.

Q17. A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25°C. Assuming the gene fragment is a non-electrolyte, determine its molar mass.

Q18. (a) 30 g of urea (M = 60 g mol^{-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.
(b) Write two differences between ideal solutions and non-ideal solutions.

Q19. Which type of deviation is shown by the solution formed by mixing cyclohexane and ethanol?

Q20. $AgNO_3$ reacts with NaCl in aqueous solution gives white ppt. If the two solutions are separated by a semipermeable membrane, will there be the appearance of a white ppt. in the side 'X' due to osmosis

0.1M $AgNO_3$ X	S P M	0.01M NaCl Y

Q21. Explain the following phenomena with the help of Henry's law.

(a) Painful condition known as bends.
(b) Feeling of weakness and discomfort in breathing at high attitude.
(c) Soda water bottles kept at room temperature fizzes on opening.

Q22. Why is the vapour pressure of an aqueous solution of glucose lower than that of water?

Q23. How does sprinkling of salt help in cleaning the snow covered roads in hilly areas? Explain the phenomenon involved in the process.

Q24. Calculate the molarity of pure water (Density of water = 1g/mL.

Q25. Give an example of a material used for making semipermeable membrane for carrying out reverse osmosis.

Q26. Why is the mass determined by measuring a colligative property in case of some solutes abnormal? Discuss it with the help of Vant's Hoff factor.

Q27. How can you remove the hard calcium carbonate layer of the egg without damaging its semipermeable membrane? Can this egg be inserted into a bottle with a narrow neck without distorting its shape? Explain the process involved.

Q28. When kept in water raisins swells in size. Name and explain the phenomenon involved with the help of a diagram. Give three applications of the phenomenon.

WORKSHEET -II **CHAPTER- ELECTROCHEMISTRY**

Q1. What is meant by 'limiting molar conductivity'?

Q2. Express the relation between conductivity and molar conductivity of a solution held in a cell.

Q3. What is the effect of catalyst on:
(i) Gibbs energy (ΔG) and
(ii) activation energy of a reaction?

Q4. Given that the standard electrode potentials (E°) of metals are :
K^+/K = -2.93 V, Ag^+/Ag = 0.80 V, Cu^{2+}/Cu = 0.34 V,
Mg^{2+}/Mg = -2.37 V, Cr^{3+}/Cr = -0.74 V, Fe^{2+}/Fe = -0.44 V.
Arrange these metals in increasing order of their reducing power.

Q5. Determine the values of equilibrium constant (K_c) and ΔG° for the following reaction :
$Ni(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$,
E° = 1.05 V
(1F = 96500 C mol^{-1})

Q6. The molar conductivity of a 1.5M solution of an electrolyte is found to be 138.9 Scm^2mol^{-1}. Calculate the conductivity of this solution.

Q7. A zinc rod is dipped in 0.1 M solution of $ZnSO_4$. The salt is 95% dissociated at this dilution at 298 K. Calculate the electrode potential.
[$E°_{Zn^{2+}/Zn}$ = – 0.76 V]

Q8. The conductivity of 0.20 M solution of KCl at 298 K is 0.025 S cm^{-1}. Calculate its molar conductivity.

Q9. The standard electrode potential (E°) for Daniel cell is +1.1 V. Calculate the ΔG° for the reaction
$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$
(1 F = 96500 C mol^{-1}).

Q10. State Kohlrausch law of independent migration of ions. Why does the conductivity of a solution decrease with dilution?

Q11. Calculate the emf of the following cell at 25°C : $Ag(s) | Ag^+ (10^{-3} M) || Cu^{2+} (10^{-1} M) | Cu(s)$ Given E^0_{cell} = +0.46 V and log 10^n = n.

Q12. The resistance of 0.01 M NaCl solution at 25° C is 200 Ω. The cell constant of the conductivity cell used is unity. Calculate the molar conductivity of the solution.

Q13. Calculate emf of the following cell at 25°C :
$Fe | Fe^{2+} (0.001 M) || H^+ (0.01 M) | H_2(g) (1 bar) | Pt(s)$
$E^0(Fe^{2+} | Fe)$ = -0.44 V $E^0(H^+ | H_2)$ = 0.00V

Q14. Calculate e.m.f. of the following cell at 298 K: $2Cr(s) + 3Fe^{2+} (0.1 M) \rightarrow 2Cr^{3+} (0.01 M) + 3 Fe(s)$
Given: $E^0(Cr^{3+}| Cr)$ = -0.74 V $E^0(Fe^{2+} | Fe)$ = -0.44 V

Q15. Why an electrochemical cell stop working after some time? The reduction potential of an electrode depends upon the concentration of solution with which it is in contact.

Q16. Accounts for the following
(i) Rusting of iron is quicker in saline water than in ordinary water.
(ii) Blocks of magnesium are straped to the steel hubs of ocean going ships.

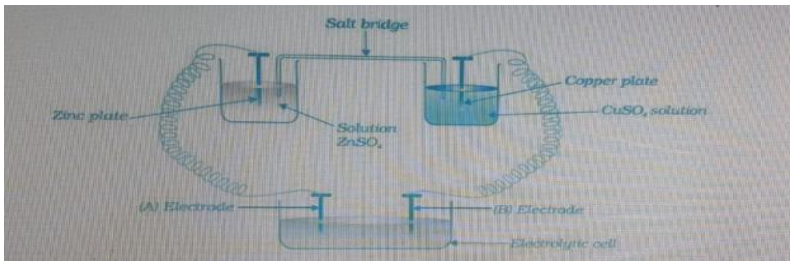
Q17. Calculate the time to deposit 1.27 g of copper at cathode when a current of 2 A was passed through the solution of CuS04.
(Molar mass of Cu = 63.5 g mol^{-1}, 1 F = 96500 C mol^{-1})

Q18. Calculate E°cell for the following reaction at 25 °C:
$A + B^{2+}$ (0.001 M) ———> A^{2+} (0.0001 M) + B
Given : E_{cell} = 2.6805 V, 1 F = 96500 C mol^{-1}

Q19. Conductivity of 2.5 X 10^{-4}M methanoic acid is 5.25 X 10^{-5} S cm^{-1} Calculate its molar conductivity and degree of dissociation.
Given: $\lambda°(H^+)$ = 349.5 S cm^2 mol^{-1} and $\lambda°(HCOO^-)$ = 50.5 S cm^2

Q20. What type of a battery is lead storage battery? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of a lead storage battery.

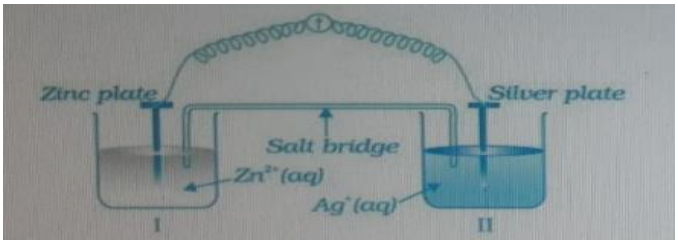
Q21. Consider the following diagram in which an electrochemical cell is coupled to an electrolytic cell. What will be the polarity of electrodes 'A' and 'B' in the electrolytic cell?



Q22. How will the pH of brine (aq. NaCl solution) be affected when it is electrolysed?

Q23. Unlike dry cell, the mercury cell has a constant cell has a constant cell potential throughout its useful life. Why?

Q24. Consider Fig. and answer the questions (i) to (vi) given below.



(i) Is silver plate the anode or cathode?
(ii) What will happen if salt bridge is removed?
(iii) When will the cell stop functioning?
(iv) How will the concentration of Zn^{2+} ions and Ag^+ ions be affected when the cell functions?

Q25. What does the negative sign in the expression $E^0_{Zn2+/Zn}$ = – 0.76 V means?

Q26. Which reference electrode is used to measure the electrode potential of other electrodes ?

Q27. State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for reduction of 1 mole of Cu^{2+} ions to Cu?

Q28. State Kohlrausch's law. How does the law help in calculating Λ^0_∞ CH_3COOH ?

Q29. Match the items of Column I and Column II.

Column I	Column II
(a) Lead storage battery	(i) maximum efficiency
(b) Mercury cell	(ii) prevented by galvanisation
(c) Fuel cell	(iii) gives steady potential
(d) Rusting	(iv) Pb is anode, PbO_2 is cathode

Q30. Match the items of Column I and Column II.

Column I	Column II
(a) κ	(i) I x t
(b) Λ_m	(ii) Λ_m / Λ^0_m
(c) α	(iii) κ/c
(d) Q	(iv) G*/R