INDIAN SCHOOL MUSCAT

SENIOR SECTION
DEPARTMENT OF CHEMISTRY
CLASS XII
ELECTROCHEMISTRY
Worksheet -6

1. What is meant by limiting molar conductivity?

2. The E° values of Cu and Zn are 0.34V and – 0.76V respectively. Which of the two is a stronger reducing agent?

3. Calculate the potential of hydrogen electrode in contact with a solution having pH value 10.

4. How many Faradays are required to produce 2.4g of Mg?

5. How much charge is needed to oxidize one mole of FeO to Fe_2O_3?

6. Write Nerst equation and calculate the emf of following cell at 298 K:
$Mg_{(s)}|Mg^{2+}_{(0.001\,M)}||Cu^{2+}_{(0.0001\,M)}|Cu_{(s)}$ .Given E^0_{cell}= 2.71 V.

7. Define and express the relationship between conductivity and molar conductivity for the solution of an electrolyte.

8. Electrolytic specific conductance of 0.25M solution of KCl at 25^0C is 2.56 x 10^{-2}S/cm, calculate the molar conductance.

9. Describe the reactions which occur at the electrodes in a fuel cell that causes H_2 and O_2 to produce electricity.

10. How many hours does it take to reduce 3 moles of Fe^{3+} to Fe^{2+} with a current of 2 amperes?

11. Account for the following:
    a) Alkaline medium inhibits the rusting of iron.
    b) Iron does not rust even if the zinc coating is broken in a galvanized iron pipe.

12. Calculate the time to deposit 1.5 g of silver at cathode when a current of 1.5 A was passed through the solution of $AgNO_3$. (Molar mass of Ag = 108 g mol^{-1}, 1 F = 96500 C mol^{-1})

13. Three electrolytic cells A, B, C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$, respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited?

14. Conductivity of 0.00241 M acetic acid is 7.896×10^{-5} S cm^{-1}. Calculate its molar conductivity and if λ^0_m for acetic acid is 390.5Scm^2 mol^{-1}, what is its dissociation constant?

15. Calculate the equilibrium constant and ΔG^0 for the following reaction at 25^0C.
$Ni(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$,
Given that the cell potential at 25^0C is 1.05V. (1F = 96500 C mol^{-1})

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

17. A conductivity cell with cell constant $3cm^{-1}$ is filled with 0.1M acetic acid solution. The resistance is found to be 4000 ohms. Find
a] molar conductance of 0.1M acetic acid
b] Degree of dissociation of acetic acid given that Λ^0 (CH_3COOH) = 400 S cm^2 mol^{-1}.

18. a) State Kohlrausch's law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch's law.
b) Calculate λ^0_m for acetic acid.
Given that λ^0_m (HCl) = 426 Scm^2mol^{-1} and
λ^0_m (CH_3COONa) = 91 Scm^2mol^{-1}

19. Calculate E_{cell} and ΔG for the following reaction. Given E^0_{Cell} = 1.81 V

$$\mathbf{Al/Al^{3+}_{(aq)}(10^{-4}M)||Sn^{4+}_{(aq)(10^{-2}M)}|Sn^{2+}_{(aq)(10^{-2}M)}}$$

20. Explain the electrochemical theory of rusting.

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