Chemistry
Assignment No: 3
(Electrochemistry)

Q1. Express the relation between the conductivity and the molar conductivity of a solution.

Q2. Define "electrophoresis" briefly.

Q3. Explain why fluorine does not come out when chlorine is passed through a solution of sodium fluoride.

Q4. State Nernst equation for cell potential and calculate e.m.f. of the cell at 25^0C:
$Mg(s) \mid Mg^{2}+ (1.0X10^{-3}) \parallel Cu^{2+} (1.0X10^{-4}M) \mid Cu(s)$
($E^0\ Mg^{2+}/Mg$= -2.37V, $E^0\ Cu^{2+}/Cu$ = +0.34V)

Q5. Why does the conductivity of the solution decreases with dilution?

Q6. What type of cell is a lead storage battery? Write anode and cathode reactions of such a battery.

Q7. Two half cell reactions of an electrochemical cells are:
1) $MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)$, E^0=1.51V
2) $Sn^{2+}(aq) \rightarrow Sn^{4+}(aq) + 2e^-$, E^0=0.15V
Construct the redox equation from the two half cell reactions and predict if this reaction favours formation of reactants or products.

Q8. Give an example of a fuel cell. Write the anode and cathode reactions for it.

Q9. How does molar conductivity vary with concentration for :
1) weak electrolyte
2) strong electrolyte.
Give reasons for these variations.

Q10. $Mg(S) + 2Ag^+(0.0001M) \rightarrow Mg^{2+}(0.10M) + 2Ag(S)$
$E^0\ Mg^{2+}/Mg$ = - 2.36, $E^0\ Ag^+/Ag$=0.81V

For the above cell; Calculate /Write
a) E^0 Valve for electrode 2 Ag^+/Ag
b) Standard Cell Potential E^0 Cell
c) Symbolic representation of the above cell
d) Cell potential
e) Will the above cell reaction be spontaneous?

Q11. Write the reactions occurring during electrolysis of:
1) Suphuric acid at the anode
2) aq. $AgNO_3$ solution using Ag electrodes.

Q12. At 291K, molar conductivity at infinite dilution of NH_4Cl, NaOH and NaCl are 129.8, 217.4, 108.9 $ohm^{-1}cm^2$ respectively. If molar conductivity of centinormal solution of NH_4OH is 9.33 $ohm^{-1}cm^2$. What is the degree of dissociation of NH_4OH solution?

Q13. The standard reduction potential values of 3 metallic cations X,Y,Z, are 0.52,-3.03, -1.18V respectively. What will be the order of reducing power of the corresponding metals.

Q14. Calculate emf of :
$Mg(s) \mid Mg^{2+}(0.02M) \parallel Ag^+(1X10^{-3}\ M) \mid Ag(s)$
$E^0\ Ag^+/Ag$=0.80V, $E^0\ Mg^{2+}/Mg$ = -2.37 V

Q15. The E^0 Valves in respect of electrodes of Cr (Z=24), Mn (Z=25) and Fe (Z=26) are :
Cr^{3+}/Cr^{2+} = -0.4V, Mn^{3+}/Mn^{2+} = +1.5V, Fe^{3+}/Fe^{2+} = +0.8V
On the basis of the above information compare the feasibilities of further oxidation of their +2 states.

Q16. Explain kohlrausch's law of independent migration of ions. Mention one application of kohlrausch's law.

Q17. Suggest a way to determine the Λ^0 of H_20.

Q18. How much charge is required for the following reduction of:

1) 1 mol Al^{3+} to Al
2) 1 mol MnO_4^- to Mn^2+

Q19. Calculate the equilibrium constant for the reaction:
$Fe(s) + Cd^{2+}(aq) \rightarrow Fe^{2+}(aq) + Cd(s)$
$E^0\ Cd^{2+}/Cd$= -0.4V, $E^0\ Fe^{2+}/\ Fe$= -0.44V

Q20. A voltaic cell is set up at 25^0C with the following half cells:
Ag^+ (0.001M) |Ag and Cu^{2+} (0.10) | Cu
What would be the voltage of this cell?
(E^0Cell=0.46V)

Q21. State the relationship amongst cell constant of a cell, resistance of the solution in the cell, conductivity of the solution.

Q22. Explain why electrolysis of an aqueous solution of NaCl gives H_2 at cathode and Cl_2 at anode. Given:-
E^0Na^+/Na= -2.71 V, $E^0\ H_20/H_2$= - 0.83V,
$E^0Cl_2^+/2Cl^-$ = 1.36 V, $E^0\ _{2H}+/0.5O_2/H_20$=1.23V

Q23. Give reason: Rusting of iron is quicker in saline water than in ordinary water.

Q24. The measured resistance of a conductance cell containing $7.5X10^{-3}$ M solution of KCl at 25°C was 1005 ohms. Calculate:-

a) Specific Conductance.
b) Molar Conductance of the solution.
(Cell Constant=1.25cm^{-1})

Q25. Calculate standard free energy change for the reaction occurring in the cell.
$Zn(s)\ |\ Zn^{2+}$ (1M) $\|$ Cu^{2+}(1M) $|$ Cu(S)
$E^0\ Zn^{2+}/Zn$= -0.76V, $E^0\ Cu^{2+}/Cu$=0.34V, F=96500 C mol^{-1}