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Class 12 - Chemistry

ELECTROCHEMISTRY

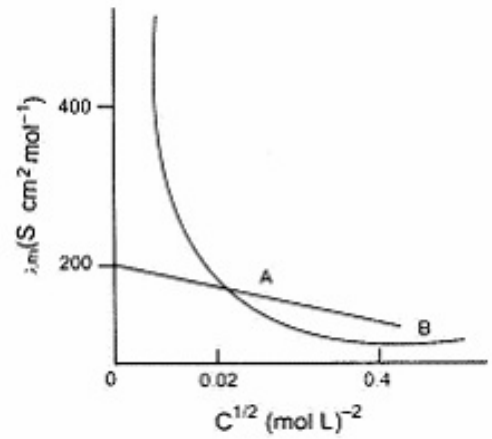
Maximum Marks: 60 **Time Allowed: 2 hours**

Section A

1. Suggest a list of metals that are extrated electrolytically. **1**
2. Arrange the following metals in the order in which they displace each other from the solution of their salts. Al, Cu, Fe, Mg and Zn. **1**
3. Rusting of iron is quicker in saline water than in ordinary water. **1**
4. Define Molar conductivity (Λ_m). **1**
5. Write an expression to relate molar conductivity of an electrolyte to its degree of dissociation. **1**
6. Suggest two materials other than hydrogen that can be used as fuels in fuel cells. **1**
7. How is molar conductance related to conductivity of an electrolyte? **1**
8. What is the standard electrode potential of NHE? **1**
9. Write Nernst equation for the electrode reaction: **1**
   $M^{n+}(aq) + ne^- \rightarrow M(s)$
10. What do you understand by corrosion? **1**
11. What is meant by limiting molar conductivity? **2**
12. What does the standard electrode potential of a metal being negative $\left(E^0_{Zn^2+/Zn} = -0.7632\right)$ indicate. **2**
13. HCl does not give an acidic solution in benzene why? **2**
14. Derive an expression for the pH of electrolyte in the following half cell. **2**
    $PtH_2(1atm)|H^+(aq)$. The reduction potential is - 0.30 V.
15. How Nernst equation can be applied in the calculation of equilibrium constant of any cell reaction? **2**
16. What is the overall electrochemical reaction takes place in rusting? **2**
17. The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 ohm.What is the cell constant if conductivity of 0.001 M KCl solution at 298 K **2**

is 0.146×10^{-3} S cm^{-1}?

18. The following curve is obtained when molar conductivity λ_m (y-axis) is plotted against the square root of concentration $C^{1/2}$ (x-axis) for two electrolytes A and B. **2**



   a. What can you say about the nature of the two electrolytes A and B?
   b. How do you account for the increase in molar conductivity λ_m for the electrolytes A and B on dilution?

19. State two advantages of H_2 - O_2 fuel cell over ordinary cells. **2**

20. $Sn^{2+} + 2MnO_4^- \rightarrow 2Mn^{2+} + Sn^{4+}$ **2**

    $E^0_{(Mn^{-4}/Mn^{2+})} = 1.51V$

    $E^0_{(Sn^{+4}/Sn^{+2})}$ = - 0.15 V

    Will the reaction will proceed?

21. Define conductivity and molar conductivity for the solution of an electrolyte. **2**
22. Explain rusting of iron. **2**
23. Why is chromium used for coating iron? **2**
24. Can you store copper sulphate solutions in a zinc pot? **2**
25. Why is it impossible to obtain the electrode potential for a single electrode? **2**
26. Arrange the given elements with increasing order of their reducing power: **2**

    Ag, Cu, Fe, K, Mg, Cr

    (Given: $E^{\Theta}_{(Ag^+/Ag)} = 0.80\ V$, $E^{\Theta}_{(Cu^{2+}/Cu)} = 0.34\ V$, $E^{\Theta}_{(Fe^{2+}/Fe)} = 0.44\ V$, $E^{\Theta}_{(K^+/K)} = -2.93\ V$, $E^{\Theta}_{(Mg^{2+}/Mg)} = -2.36\ V$, $E^{\Theta}_{(Cr^{3+}/Cr)} = -0.74\ V$)

27. Calculate the emf of the cell in which the following reaction takes place. **2**

    $Ni(s) + 2Ag^+(0.002M) \rightarrow Ni^{2+}(0.160M) + 2Ag(s)$

    Given that $E^0_{cell} = 1.05V$

28. Why zinc reacts with dilute H_2SO_4 to give the gas but copper does not? **2**

29. The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1}. Calculate its molar conductivity. **2**

30. Write the relation between cell potential and equilibrium constant. **2**

31. How can you increase the reduction potential of an electrode? **2**

32. State Faraday's laws of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu^{2+} to Cu. **2**

33. Why does the conductivity of a solution decrease with dilution? **2**

34. State two advantages of H_2 - O_2 fuel cell over ordinary cell. **2**

35. Conductivity of 0.001 M acetic acid is $4 \times 10^{-5} S cm^{-1}$. Calculate its molar conductivity? if its molar conductivity at infinite dilution is 390 S cm^2 mol^{-1}, what is its dissociation constant? **2**