CHEMISTRY

BOOKS - JEEVITH PUBLICATIONS CHEMISTRY (KANNADA ENGLISH)

ELECTROCHEMISTRY

Answer The Following Questions

1. What is standard electrode potential?

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2. What is electrochemical cell?

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3. What is cell potentlal?

4. Explain with diagram the construction, cell reactions and symbolic representation of the Daniel cell.

5. Describe the construction and working of standard hydrogen electrode.

6. Draw a neat diagram of SHE and write its half cell reaction and E^0 value.

7. Draw a neat labeled diagram of Standard Hydrogen Electrode (SHE). Write its Half-Cell reaction.

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8. Draw the neat lableled diagram of SHE and write its symbolic representation.

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9. What is electrochemical series?

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10. Give the list of reduction potential of some important electrode systems.

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11. Write the Nernst equation for an electrode system to calculate standard reduciton potential.

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12. Write Nernst equation at 298K to calculate reduction potential.

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13. Write the Nernst equation for Daniel Cell.

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14. How E_{cell} of the Daniel cell affected by increasing the concentration of Cu^{2+} and Zn^{2+} ?

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15. Give Nerst equation to calculate electrode potential for any concentration of ions for the following electrochemical cell.

16. Give the relation between equilibrium constant of the reaction and standard potential of the cell.

17. Give relation between standard Gibbs energy of the reaction and equilibrium constant.

A. $\Delta_r G^\circ = -nFE^0_{cell}$

B. $\Delta_r G^\circ = nFE^0_{cell}$

C. $\Delta_r G^\circ = -nE^0_{cell}$

D. $\Delta_r G^\circ = -FE^0_{cell}$

Answer: A

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18. Among cell potential (E_{cell}) and Gibbs free energy of the reaction, which is extensive property.

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19. Give relation between standard Gibbs energy of the reaction and equilibrium constant.

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20. How electrical resistance varies along the length and area of cross section.

21. Define the term conductivity (specifie conductance). Give its unit.

22. What is electronic conduetanee. Name the factors on which this conductance depends?

23. What is electrolytic or ionic conductanee? Name the factors on which this conductance depends.

24. Mention any two factors which affects the conductivity of electrolytic solution.

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25. Give three differences between electronic and electrolytic conductance.

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26. Explain the measurement of the conductivity of an ionic solutions.

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27. What is molar conductivity? Give Its unit.

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28. What is the S.I unit of molar conductivity.

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29. Give the relation between conductivity and molar conductivity.

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30. What happens to molar conductivity when one mole of KCl dissolved in one litre is diluted to five litres?

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31. What is the effect of change in concentration of an electrolyte solution on conductivity and molar conductivity.

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32. What is limiting molar conductivity?

33. State Kohlrabusch law of independent migration of ions. Give mathematical form of the law.

34. State Kohlrausch law.

35. Write the mathematical expression for limiting molar conductivity of sodium chloride.

36. Mention any one application of Kohlrausch law.

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37. State Faraday's first law of electrolysis. Give its mathematical form.

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38. State Faraday's second law of electrolysis. Give its mathematieal form.

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39. How many columbs of electricity is required to oxidise one mole of Al to Al^{3+} ?

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40. State Farday's first law of electrolysis. For the electrode reaction $Zn^{+2} + 2e^- \rightarrow Zn_{(s)}$, what quantity of electricity in coloumbs is required to deposite one mole of zinc.

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41. What are the electrolysed product when molten sodium chloride is eloctrolysed?

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42. What are the electrolysed product when aqueous sodium chioride is electrolysed?

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43. Which gas is evolved at the cathode during the electrolysis of an aqueous solution.

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44. What is primary cell?

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45. With the diagram explain dry cell (leclanche cell).

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46. Describe Mercury cell.

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47. What is secondary cell?

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48. Describe lead storage battery

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49. What is secondary cell? Write the equation for the cathode reaction

of lead storage battery.

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50. Give the overall reaction in Nickel cadmium cell.

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51. What are the fuel cells?

52. Draw a neat labelled diagram of $H_2 - O_2$ fuel cell. Write the reaction occurs at cathode of the cell.

53. What the cathode and anodic cell reaction of hydrogen oxygen fuel cell.

54. What is corrosion?

55. What is corrosion? Name a method to prevent it.

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56. Rusting of iron is an electrochemical phenomenon. Explain.
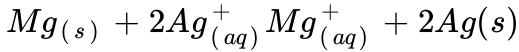
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Problem Section

1. $E^0_{cu} = 0.34$ and $E^0_{zn} = -0.76V$. Calculate E^0_{cell}.

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2. $E^0_{Cu} = +0.34V$ and $E^0_{Ag} = +0.8V$ calculate E^0_{cell}.

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3. Calculate the EMF of the cell for the reaction.

$$Mg_{(s)} + 2Ag^+_{(aq)} \longrightarrow Mg^+_{(aq)} + 2Ag(s)$$

Given: $E^\circ \, Mg^{2+} / Mg = -2.37V$

$E^\circ \, Ag^+ / Ag = 0.08V$

$[Mg^{2+}] = 0.001M, \; [Ag^+] = 0.0001M$

$\log 10^5 = 5$

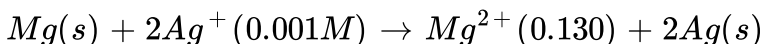> ▶ Watch Video Solution

4. Calculate the e.m.f. of the cell in which the following reaction takes place.

$$Ni_{(s)} + 2Ag^+_{(0.002M)} \rightarrow Ni^{2+}_{(0.160M)} + 2Ag_{(s)}, \text{Given } E^\circ_{cell} = 1.05V$$
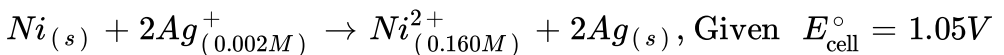
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5. Represent the cell in which the following reaction takes place

$$Mg(s) + 2Ag^+(0.001M) \rightarrow Mg^{2+}(0.130) + 2Ag(s)$$

Calculate E_{cell} if $E^0_{cell} = 3.17V$.

6. Calculate EMF of the cell represents below

$$Zn/Zn^{2+}(C=0.1M) \ | \ | \ Cu^{2+}(C=1M)/Cu \ \text{at} \ 25°C$$

Given $E^0_{Cu} = 0.34 E^0_{Zn} = 0.76v$
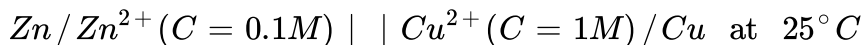
7. For the standard cell $Cu(s)|Cu^{2+}(aq)||Ag^+(aq)|Ag(s)$.

$$\left[E_{\frac{Cu^{2+}}{Cu}} = 0.3V \ \text{and} \ E^0_{\frac{Ag^+}{Ag}} = 0.80V \right]$$

Identify the cathode and the anode as the current is drawn from the cell.

8. For the standard cell $Cu(s)|Cu^{2+}(aq)||Ag^+(aq)|Ag(s)$.

$$\left[E_{\frac{Cu^{2+}}{Cu}} = 0.3V \ \text{and} \ E^0_{\frac{Ag^+}{Ag}} = 0.80V \right]$$

Write the reaction taking place at the electrodes.

9. Find the value of $AG°$ at $25°C$ for the following electrochemical cell.

$$Cu|Cu^{2+}(1M)||Ag^+(1M)|Ag$$
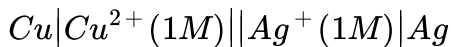
$$\left[Ec_u = +0.34V, E_{Ag}° = +0.8V\right]$$

$$F = 96487C$$

10. Calculate e.m.f. of cell for the reaction :

$$Mg_{(s)} + Cu^{2+}(0.0001 \text{ M}) \rightarrow Mg^{2+}(0.001 \text{ M}) + Cu_{(s)}$$
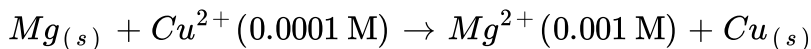
Given that : $E_{Mg^{2+}/Mg}° = -2.37V$

$$E_{Cu^{2+}/Cu}° = +0.34V$$

11. Calculate $\Delta_r G°$ for the following reactions:

$$Fe^{+2}(aq) + Ag^+(aq) \rightarrow Fe^{+3}(aq) + Ag(s)$$
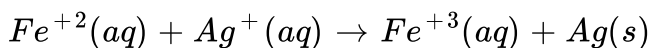
12. Find the value of $AG°$ at $25°C$ for the following electrochemical cell.

$$Cu|Cu^{2+}(1M)||Ag^{+}(1M)|Ag$$
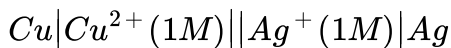
$$\left[Ec_u = +0.34V, E_{Ag}^{\circ} = +0.8V\right]$$

$$F = 96487C$$

13. (a) The electrode potential for the Daniell cell given below is 1.1 V.
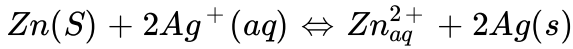
$$Zn(s)|Z_n^{2+}(aq)||Cu^{2+}(aq)|Cu(s)$$

Write overall cell reaction and calculate the standard Gibb's energy for the reaction. $[F96487c/mol]$

(b) Mention any two factors which affects the conductivity of electrolytic solution .

14. Calculate standard free energy change for reaction

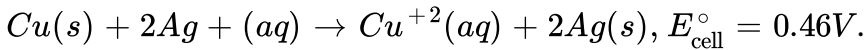$$Zn(S) + 2Ag^+(aq) \Leftrightarrow Zn_{aq}^{2+} + 2Ag(s)$$

$E_{cell}^0 = 1.56V:$ Given $1F = 96500Cmol^{-1}.$

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15. Calculate the equilibrium constant for the reaction

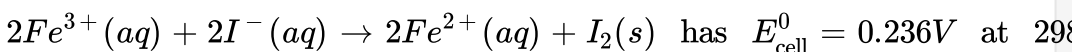$$Cu(s) + 2Ag + (aq) \rightarrow Cu^{+2}(aq) + 2Ag(s), E_{cell}^\circ = 0.46V.$$

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16. Calculate the equilibrium constant for the reaction

$$Cu(s) + 2Ag + (aq) \rightarrow Cu^{+2}(aq) + 2Ag(s), E_{cell}^\circ = 0.46V.$$
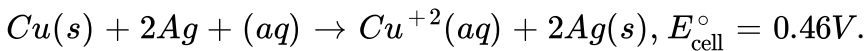
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17. The cell in which of the following reaction occurs:

$$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow 2Fe^{2+}(aq) + I_2(s) \text{ has } E_{cell}^0 = 0.236V \text{ at } 298$$

Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.

18. Resistance of a conductivity cell filled with 0.02 M KCl solution is 520 Ω. Calculate the conductivity and molar conductivity of that solution. [Cell constant of the cell $= 1.29 cm^{-1}$].

19. The resistance of solution of a salt occupying a volume between two platinum electrode 1.8cm apart and $5.4 cm^2$ in area was found to be 30 ohm. Calculate the conductivity of the solutions.

20. c) Resistance of a conductivity cell containing 0.1 M KCl solution is 100Ω. Cell constant of the cell is 1.29/cm. Calculate the conductivity of the solution at the same temperature.

21. Calculate Λ_m^0 for $CaCl_2$ and $MgSO_4$.

$$\lambda_{Ca^{2+}}^0 = 119.0 Scm^2 \ mol^{-1} \lambda_{Cl^-}^0 = 76.3 Scm^2 mol^{-1}$$

$$\lambda_{Mg^{2+}}^0 = 106 Scm^2 mol^{-1} \lambda_{SO_4^{2-}}^0 = 160 Scm^2 mol^{-1}$$

22. λ_m° for $NaCl, HCl$ and CH_3COONa are 126.4,425.9 and 91.0 S cm^2/mol respectively. Calculate λ_m° for CH_3COOH.

23. Calculate the $\overset{\circ}{\Lambda}_m$ for $MgCl_2$. The limiting molar conductivities of Mg^{2+} and Cl^{-1} ions are 106.0 S cm^2 mol^{-1} and 76.3 S cm^2mol^{-1} respectively.

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24. A current of 0.2ampere is passes through a solution of $CuSO_4$ for 10 minutes calculate the man of Cu deposited on the cathode.

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25. If a current of 0.5 ampere flows through a metallic wire for 2 hours then how many electrons would flow through the wire.

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