

**[MCQ'S – 1****FB – 1****3M – 3 (2T, 2NP)]****I. One Mark questions:**

1. What is an electrochemical cell?
2. What is an electrolytic cell?
3. Define Faraday.
4. What is the e.m.f of S.H.E?
5. Mention the unit of specific conductance.
6. What is the unit of molar conductance?
7. Define electrode potential.
8. Define standard electrode potential.
9. What are the products of electrolysis of  $\text{CuSO}_4$  solution using Cu electrodes?
10. Define e.m.f or cell potential.
11. Define molar conductance.
12. How molar conductivity varies with dilution?
13. Mention the S.I unit of molar conductivity.
14. What happens to molar conductivity when one mole of KCl is dissolved in one litre is diluted to five litres?
15. How many coulombs of electricity are required to oxidise one mole of Al to  $\text{Al}^{3+}$ ?
16. For the electrode reaction  $\text{Zn}^{2+} + 2\text{e}^- \longrightarrow \text{Zn}$ , what quantity of electricity in coulombs is required to deposit one mole of zinc.
17. Mention the concentration of  $\text{H}^+$  ions in S.H.E.
18. Give the relationship between molar conductance and specific conductivity.
19. Write Nernst equation for a half cell or cell.
20. What is faraday's constant?
21.  $E^0$  of  $\text{Cu}^{2+} = +0.34\text{V}$  and  $E^0$  of  $\text{Zn}^{2+} = -0.76\text{V}$  .Which of the two is a stronger reducing agent?
22. Out of Zn and Sn which one protects Fe better even after cracks develop in layer why?
23. Why Zn reacts with dil.  $\text{H}_2\text{SO}_4$  to give  $\text{H}_2$  gas but Cu does not?
24. What is a primary cell? OR What is a primary electrochemical cell?
25. What is a secondary cell?
26. Give one use of primary batteries.
27. Why does a secondary cell become dead even if it is not used?
28. Name any two metals that can be used for cathodic protection of Fe.
29. How can reduction potential of an electrode be increased?
30. Name the electrolyte used in fuel cell.
31. Why does an electrochemical cell stop working after some time?
32. Can  $E^0_{\text{cell}}$  or  $\Delta G^0$  of a cell be equal to zero?
33. Under what condition is  $E^0_{\text{cell}}$  or  $\Delta G^0$  of a cell becomes equal to zero.
34. Why is alternating current used for measuring resistance of an electrolytic solution?

35. Electrical potential of galvanic cell is 1.1 V. If an opposing potential of 1.1 V is applied to the cell. What will happen to the cell reaction and current flowing in cell?
36. Mercury cell has a constant cell potential throughout its life why?
37. Write the cell representation for the following cell reaction  $\text{Cu}_{(\text{aq})} + 2\text{Ag}^+_{(\text{aq})} \longrightarrow 2\text{Ag}_{(\text{aq})} + \text{Cu}^{2+}$ .  
Given  $E^0$ .
38.  $E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$ . What does the negative sign indicates?
39. Give relationship between free energy change and e.m.f of the cell.
40. What is S.H.E?

## II. THREE Mark questions:

1. Name the gases liberated at anode and cathode respectively when an aqueous solution of sodium chloride is electrolysed.
2. How is molar conductivity related to the conductivity of a solution? Which one of these has higher molar conductivity 0.1 M KCl or 0.01M KCl?
3. Mention two factors on which conductivity of an electrolytic solution depends.
4. Write the reactions of an oxygen- hydrogen fuel cell.
5. Write neat labeled diagram of standard hydrogen electrode and write the symbolic representation.
6. Write the symbolic representation of standard hydrogen electrode and give its standard potential value.
7. Write the anodic and cathodic half cell reactions taking place in Daniel cell.
8. Mention any two general methods of prevention of corrosion.
9. State Kohlrausch's law of independent migration of ions and give its mathematical representation.
10. Write any two applications of Kohlrausch's law of independent migration of ions.
11. What is limiting molar conductivity? Represent graphically the variation of molar conductivity with concentration for acetic acid.
12. What is corrosion? Mention a general method to prevent it.
13. A galvanic cell after use is recharged by passing current through it. What type of cell is it? Give an example.
14. What is molar conductivity? How is it related to conductivity of a solution whose concentration is  $C \text{ mol m}^{-3}$ ?
15. Calculate  $\Delta G^0$  for the following reaction  $\text{Fe}^{2+} + \text{Ag}^+ \longrightarrow \text{Fe}^{3+} + \text{Ag}_{(\text{s})}$  given  $E^0_{\text{cell}} = 0.03\text{V}$ .
16. Name the products of electrolysis of dil. $\text{H}_2\text{SO}_4$  with inert electrodes.
17. When iron nail is dipped in copper sulphate solution, copper is deposited on it why?
18. Can copper sulphate solution be stored in iron vessel? Give reason.
19. Can copper sulphate solution be stored in zinc vessel? Give reason.

20. Write the cell reactions for lead storage battery.
21. Why does zinc displaces hydrogen from dil.  $\text{H}_2\text{SO}_4$  while silver does not?
22. Represent lead storage battery symbolically.
23. What is inert electrode? Give example.
24. Which factors can increase the voltage of a cell having cell reaction of
- $$\text{Cu}_{(s)} + 2 \text{Ag}^+_{(aq)} \rightleftharpoons \text{Cu}^{2+}_{(aq)} + 2 \text{Ag}_{(s)}$$
25. Give any two differences between primary cell and secondary cell.
26. Give any two advantages of hydrogen – oxygen fuel cell.
27. Give any two differences between strong and weak electrolytes.
28. Define Faradays I law. Give its mathematical representation.
29. Define Faradays II law. Give its mathematical representation.
30. Give any two differences between electrolytic cell and electrochemical cell.
31. Write any two disadvantages or demerits of S.H.E.
32. Calculate the limiting molar conductivity of  $\text{CaSO}_4$  when  $\lambda_m^0$  of  $\text{Ca}^{2+}$  and  $\text{SO}_4^{2-}$  are 119.0 and 160.0  $\text{Scm}^2 \text{mol}^{-1}$  respectively.
33. Specific conductance of 0.1 M NaCl solution at 298 K is 1.1  $\text{Sm}^{-1}$ . Calculate its molar conductivity.
34.  $\lambda_m^0$  of NaCl, LiBr, LiCl are 126.0, 165.0 and 170.0  $\text{Sm}^2 \text{mol}^{-1}$  respectively. Calculate  $\lambda_m^0$  for NaBr.
35. Calculate the quantity of current required for deposition of 9 g of Al.
36. Calculate the mass of aluminium deposited at cathode when 193 C of current is passed through molten electrolyte containing dissolved alumina. Given molar mass of Al = 27  $\text{gmol}^{-1}$ ,  $1F = 96500\text{C}$ .
37. Same quantity of current is passed through  $\text{AgNO}_3$  and HCl solutions. 1.08 g of Ag is deposited at cathode in first case. What volume of  $\text{H}_2$  gas is evolved at S.T.P in the second case? Given atomic mass of Ag = 108.
38. Same quantity of current is passed through Cu and Ag voltameters connected in series. Anode of Cu voltammeter was found to weigh 0.08g less after electrolysis. What mass of Ag is deposited when atomic mass of Cu and Ag are 63.5 and 107.8  $\text{gmol}^{-1}$  respectively?
39. For a cell reaction involving two electron changes, the standard e.m.f of cell is 0.295V at 25°C. Calculate equilibrium constant for the reaction at 25°C.
40. Calculate the equilibrium constant for the cell reaction  $\text{M}_{(s)} \longrightarrow \text{M}^{2+} + 2\text{e}^-$ . The standard e.m.f is 1.56V.
41. Calculate the reduction potential for the following half cell reaction at 298 K
- $$\text{Ag}^+ + \text{e}^- \longrightarrow \text{Ag} . \text{Given, } [\text{Ag}^+] = 0.1 \text{ M and } E^0_{\text{Ag}^+/\text{Ag}} = + 0.80 \text{ V} .$$
42. The cell reaction is  $\text{Mg}_{(s)} + 2 \text{Ag}^+ (0.0001\text{M}) \longrightarrow \text{Mg}^{2+} (0.130\text{M}) + 2 \text{Ag}_{(s)}$  if  $E^0_{\text{cell}} = 3.17\text{V}$ . Calculate its  $E_{\text{cell}}$ .

43. Calculate standard free energy change for Daniel cell reaction at 298K. If the S.R.P values of Zn and Cu are -0.763 V and +0.337V respectively.
44. Calculate equilibrium constant for the cell reaction  $\text{Mg}_{(s)} + 2 \text{Ag}^+_{(aq)} \longrightarrow \text{Mg}^{2+}_{(aq)} + 2 \text{Ag}_{(s)}$  if  $E^0_{\text{cell}} = + 3.17\text{V}$ .
45. Calculate e.m.f of cell  $\text{Zn}/\text{Zn}^{2+}(0.1\text{M}) // \text{Cu}^{2+}(1\text{M})/\text{Cu}$  at  $25^\circ\text{C}$  if  $E^0_{\text{Zn}^{2+}/\text{Zn}} = +0.34\text{V}$  and if  $E^0_{\text{Cu}^{2+}/\text{Cu}} = -0.76\text{V}$ .
46. Calculate the standard free energy change for the reaction  $\text{Zn}_{(s)} + 2 \text{Ag}^+_{(aq)} \longrightarrow \text{Zn}^{2+}_{(aq)} + 2 \text{Ag}_{(s)}$   $E^0_{\text{cell}} = + 1.56\text{V}$ . If  $1 \text{ F} = 96500\text{C}$ .
47. The resistance of a salt solution occupying a volume between two platinum electrodes separated by a distance of 1.8 cm apart and  $5.4 \text{ cm}^2$  in area was found to be 32 ohms. Calculate the conductivity of the solution
48. The resistance of M/10 solution is found to be  $2.5 \times 10^3$  ohms. Calculate molar conductance. Given cell constant =  $1.15 \text{ cm}^{-1}$ .
49. Standard EMF of the cell  $\text{Cu} / \text{Cu}^{2+}(1\text{M}) // \text{Ag}^+ (1\text{M}) / \text{Ag}$  at  $25^\circ\text{C}$  is 0.46V. Calculate the standard free energy change for the reaction that occurs in the cell.
50. Calculate the e.m.f of the cell in which the following cell reaction takes place  $\text{Ni} + \text{Ni}_{(s)} + 2 \text{Ag}^+ (0.002\text{M}) \longrightarrow 2 \text{Ag} + \text{Ni}^{2+} (0.160\text{M})$  Given that  $E^0_{\text{cell}} = 1.05\text{V}$ .
51. Calculate the standard free energy change for the following reaction occurring in the galvanic cell  $3 \text{Mg}_{(s)} + 2 \text{Al}^{3+}_{(aq)} \longrightarrow 3 \text{Mg}^{2+}_{(aq)} + 2 \text{Al}_{(s)}$  Given that  $E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.37\text{V}$  and  $E^0_{\text{Al}^{3+}/\text{Al}} = -1.66\text{V}$ .
52. Calculate the EMF of the cell for the reaction  $\text{Mg}_{(s)} + 2 \text{Ag}^+_{(aq)} \longrightarrow \text{Mg}^{2+}_{(aq)} + 2 \text{Ag}_{(s)}$  Given that  $E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.37\text{V}$  and  $E^0_{\text{Ag}^+/\text{Ag}} = 0.80\text{V}$ ,  $[\text{Mg}^{2+}] = 0.001\text{M}$ ,  $[\text{Ag}^+] = 0.0001\text{M}$ .
53. The S.R.P of Cu and Ag are 0.34 V and 0.80 V respectively. Construct a galvanic cell using these electrodes. a) calculate its e.m.f b) write its cell reaction c) write its cell notation.
54. Predict the products of electrolysis in Aq. Solution  $\text{AgNO}_3$  (i) with Ag electrode (ii) with pt electrodes.
55. Describe working and construction of S.H.E. OR Explain construction and working of S.H.E

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