Numerical Problems in Electrochemistry for JEE Main 2026

1. Calculate the standard EMF of the cell:
   $Zn \mid Zn^{2+}$ (0.01M) || Cu^{2+} (0.1M) | Cu
   Given:
   EZn2+/Zn◦=−0.76 VE^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76\,VEZn2+/Zn◦=−0.76V,
   ECu2+/Cu◦=+0.34 VE^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\,VECu2+/Cu◦=+0.34V.

2. For the half-cell reaction:
   $Fe^{3+} + e^- \rightarrow Fe^{2+}$, with E◦=0.77 VE^\circ = 0.77\,VE◦=0.77V,
   Calculate the cell potential when:
   $[Fe^{3+}] = 0.01$ M and $[Fe^{2+}] = 0.1$ M.

3. For the reaction:
   Cr2O72−+14H++6e−→2Cr3++7H2O\text{Cr}_2\text{O}_7^{2-} + 14 H^+ + 6 e^- → 2 Cr^{3+} + 7 H_2OCr2O72−+14H++6e−→2Cr3++7H2O,
   find the number of electrons transferred.

4. Calculate the electrode potential of a hydrogen electrode when the concentration of H+H^+H+ ions is 0.001 M at 25°C.

5. In an electrolytic cell, calculate the volume of oxygen gas liberated at STP when 5 Faradays of electricity are passed.

6. Calculate the pH of a solution if the cell potential for the H_2/H^+ half-cell is 0.059 V at 25°C.

7. Using the Nernst equation, find the EMF of the cell:
   $Ag \mid Ag^+$ (0.01M) || Cu | Cu^{2+} (0.1M)
   Given:
   EAg+/Ag◦=+0.80 VE^\circ_{\text{Ag}^+/\text{Ag}} = +0.80\,VEAg+/Ag◦=+0.80V,
   ECu2+/Cu◦=+0.34 VE^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\,VECu2+/Cu◦=+0.34V.

8. Calculate the time required to deposit 1 g of copper from a copper sulfate solution using a current of 5 A.
   (Atomic mass Cu = 63.5 g/mol, z = 2).

9. For a redox cell reaction at 25°C with a standard cell potential of 1.36 V, calculate the Gibbs free energy change ΔG◦\Delta G^\circΔG◦.

10. Determine the cell potential when the metal ion concentrations on the two electrodes of a concentration cell are 0.1 M and 0.001 M respectively at 25°C.

11. Calculate the mass of aluminum deposited when a current of 3 A is passed for 1 hour. (Atomic mass Al = 27 g/mol, z = 3).

12. Calculate the EMF of a concentration cell where the concentration of Zn^{2+} ions is 0.1 M on one side and 0.001 M on the other side at 25°C.