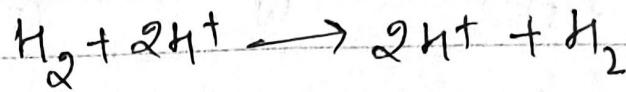
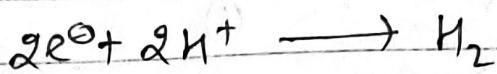
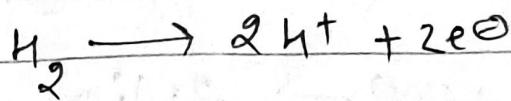


5-II (Leader)



$$\mathcal{E} = \frac{96}{2} - 0.059 \log \frac{[H^+]_{\text{anode}}^2}{[H^+]_{\text{cathode}}^2}$$

$$[H^+]_{\text{anode}} = \sqrt{K_a C} = \sqrt{1.8 \times 10^{-5} \times 10^1}$$

~~[H⁺]_{cathode}~~

$$[OH^-]_{\text{cathode}} = \sqrt{K_b C} = \sqrt{1.8 \times 10^{-5} \times 0.01}$$

$$[H^+]_{\text{cathode}} = \frac{10^{-14}}{\sqrt{1.8 \times 10^{-7}}}$$

$$\mathcal{E} = -0.059 \log \frac{[H^+]_{\text{anode}}}{[H^+]_{\text{cathode}}}$$

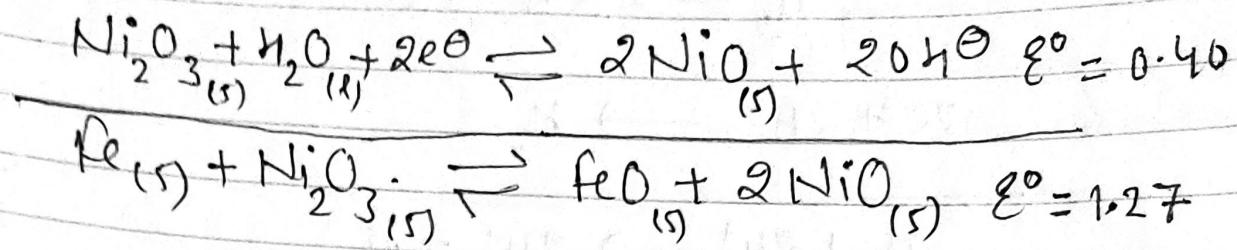
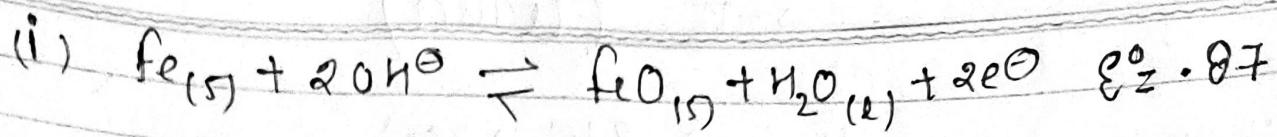
$$\mathcal{E} = -0.059 \log \frac{\sqrt{1.8 \times 10^{-6}}}{\frac{10^{-14}}{\sqrt{1.8 \times 10^{-7}}}}$$

$$\mathcal{E} = -0.059 \log \frac{1.8 \times 10^{-6} \times \sqrt{10^1}}{10^{-14}}$$

$$\mathcal{E} = -0.059 \log \frac{1.8}{\sqrt{10}} \times 10^{-8}$$

$$\mathcal{E} = -0.059 \left[-8 - \frac{1}{2} + \log(1.8) \right] = 0.46 \text{ volt}$$

Q.2



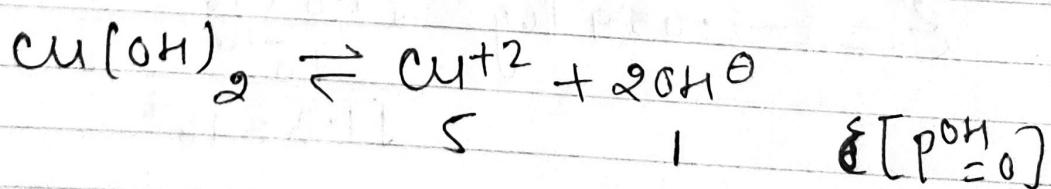
(ii) E.m.f of cell $\mathcal{E} = \mathcal{E}^\circ = 1.27$ because active mass of all the species is equal to 1. cell potential will not depend on concentration of KOH because it is not present in net cell reaction

(iii) maximum amount of electrical energy $\Rightarrow \Delta G = -nFE$

$$\Delta G = -\frac{2 \times 96500 \times 1.27}{1000} \text{ Joul.}$$

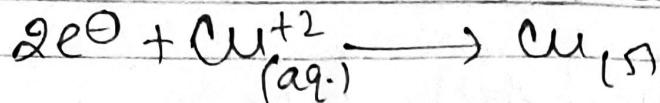
$$\Delta G = -245.11 \text{ Joul.}$$

3.



$$10^{-9} = S(I)^2$$

$$S = 10^{-9} = [\text{Cu}^{+2}]$$



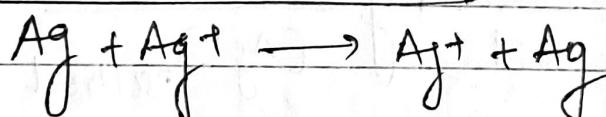
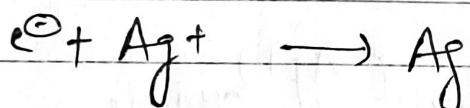
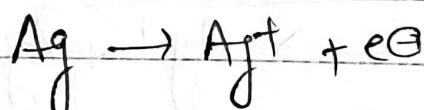
$$\mathcal{E} = 0.34 - \frac{0.059}{2} \log \frac{1}{[Cu^{+2}]}$$

$$\mathcal{E} = 0.34 - \frac{0.059}{2} \log 10^{19}$$

$$\mathcal{E} = 0.34 - \frac{0.059}{2} \times 19$$

$$\mathcal{E} = -0.2205 \text{ Volt}$$

4.



$$\mathcal{E} = 0 - \frac{0.059}{T} \log \frac{[Ag^+]_{anode}}{0.05}$$

$$0.788 = -0.059 \log \frac{(Ag^+)_{anode}}{0.05}$$

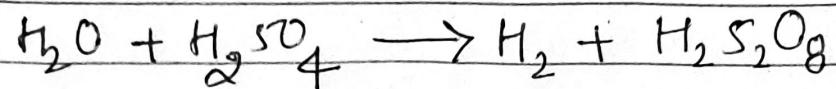
$$4.4 \times 10^{-14} = \frac{(Ag^+)_{anode}}{0.05}$$

$$2.2 \times 10^{-15} = (Ag^+)_{anode}$$

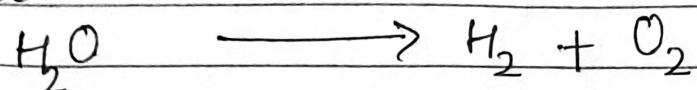
$$K_{sp}(AgI) = [Ag^+] [I\ominus]$$

$$= 2.2 \times 10^{-15} \times 0.05 = 1.1 \times 10^{-16}$$

Q.5 Two parallel reaction are going in the cell



and



$$\text{Ep.}(H_2) = \text{Ep.}(O_2) + \text{Ep.}(H_2S_2O_8)$$

$$\frac{9.722}{22.7} \times 2 = \frac{2.35}{22.7} \times 4 + n_{H_2S_2O_8} \times 2$$

$$0.8565 = 0.4140 + n_{H_2S_2O_8} \times 2$$

$$n_{H_2S_2O_8} = 0.22125 \text{ mole}$$

$$\text{mass of } H_2S_2O_8 = 0.22125 \times 194 = 42.92 \text{ gm.}$$

Q.6 Let percentage efficiency = $\pi\%$.

$$\text{Ep.}(Cu^{+2}) = \frac{It}{96500} \times \frac{\pi}{100}$$

$$\frac{3}{63.5} \times 2 = \frac{3 \times 2 \times 3600}{96500} \times \left(\frac{\pi}{100}\right)$$

$$\pi = 42.21\%$$

$$2 Q.7 \quad \lambda_{eq} = \frac{k \times 1000}{N}$$

$$97.1 = \frac{k \times 1000}{0.1}$$

$$k = 0.00971 \text{ mho cm}^{-1}$$

$$\frac{1}{R} \cdot \frac{l}{A} = 0.00971$$

$$\frac{1}{R} \times \frac{0.5}{1.5} = 0.00971$$

$$\frac{1}{R} = 0.02913 \text{ ohm.}$$

$$I = \frac{V}{R} = 5 \times 0.02913 = 0.14565 \text{ Ampere}$$

$$3 Q.8 \quad k = \frac{1}{R} \cdot \frac{l}{A}$$

$$1.342 = \frac{1}{170.5} \times \frac{l}{1.86 \times 10^4}$$

$$l = 0.0424 \text{ meter}$$

Q. 9.

$$E = 0 - \frac{0.0591}{2} \log \frac{C_2}{C_1}$$

$$E = - \frac{0.0591}{2} \log \gamma_{10}$$

$$E = 0.0295 \text{ volt}$$

Q. 10. volume of Ag layer = $80 \times 5 \times 10^6 \times 100 \text{ cm}^3$
 $= 4 \times 10^2 \text{ cm}^3$

mass of Ag layer = $4 \times 10^2 \times 10.8$
 $= 432 \text{ gm}$

$$\text{Eq. Ag} = \frac{It}{96500}$$

$$\frac{4.32}{108} \times 10^2 \times t = \frac{2 \times t}{96500}$$

$$t = 193 \text{ sec.}$$