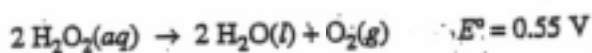


2. Answer the following questions that relate to electrochemical reactions.

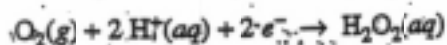
(a) Under standard conditions at 25°C, $\text{Zn}(s)$ reacts with $\text{Co}^{2+}(aq)$ to produce $\text{Co}(s)$.

- Write the balanced equation for the oxidation half reaction.
- Write the balanced net-ionic equation for the overall reaction.
- Calculate the standard potential, E° , for the overall reaction at 25°C.

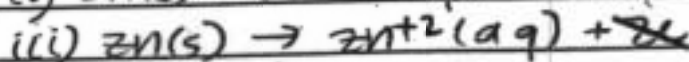
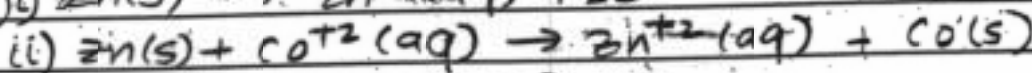
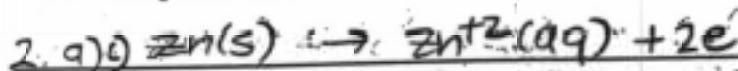
(b) At 25°C, H_2O_2 decomposes according to the following equation.



- Determine the value of the standard free energy change, ΔG° , for the reaction at 25°C.
- Determine the value of the equilibrium constant, K_{eq} , for the reaction at 25°C.
- The standard reduction potential, E° , for the half reaction $\text{O}_2(g) + 4 \text{H}^+(aq) + 4 e^- \rightarrow 2 \text{H}_2\text{O}(l)$ has a value of 1.23 V. Using this information in addition to the information given above, determine the value of the standard reduction potential, E° , for the half reaction below.



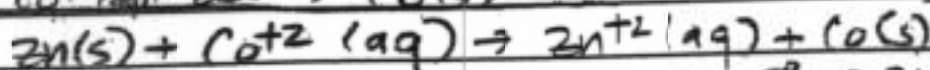
(c) In an electrolytic cell, $\text{Cu}(s)$ is produced by the electrolysis of $\text{CuSO}_4(aq)$. Calculate the maximum mass of $\text{Cu}(s)$ that can be deposited by a direct current of 100. amperes passed through 5.00 L of 2.00 M $\text{CuSO}_4(aq)$ for a period of 1.00 hour.



0.76 V



-0.28 V



$E^\circ = 0.76 \text{ V} + (-0.28 \text{ V})$

$E^\circ = 0.48 \text{ V}$

b) $\Delta G^\circ = -nFE^\circ$

↳ number of moles of electrons transferred

$\Delta G^\circ = -(2 \text{ moles electrons}) (96,500 \frac{\text{C}}{\text{mol}}) (0.55 \text{ V}) = -1.1 \times 10^5 \text{ J}$

GO ON TO THE NEXT PAGE.