

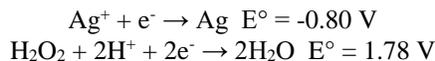
Exercise 18.8

Non-Standard Potentials & Electrolysis

Name: _____

Date: _____ Per: _____

1. A galvanic cell is based on the following half-reactions at 25°C:



- a. Write the balanced equation and determine E°_{cell} :

Predict whether E_{cell} is larger or smaller than E°_{cell} for the following cases.

- b. $[\text{Ag}^+] = 1.0 \text{ M}$, $[\text{H}_2\text{O}_2] = 2.0 \text{ M}$, $[\text{H}^+] = 2.0 \text{ M}$

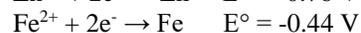
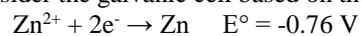
- c. $[\text{Ag}^+] = 2.0 \text{ M}$, $[\text{H}_2\text{O}_2] = 1.0 \text{ M}$, $[\text{H}^+] = 1.0 \times 10^{-7} \text{ M}$

2. The overall reaction in the lead storage battery is



Calculate E_{cell} at 25°C for this battery when $[\text{H}_2\text{SO}_4] = 4.5 \text{ M}$, that is $[\text{H}^+] = [\text{HSO}_4^-] = 4.5 \text{ M}$. At 25°C, $E^\circ_{\text{cell}} = 2.04 \text{ V}$ for the lead storage battery.

3. Consider the galvanic cell based on the following half-reactions:



- a. Determine the overall cell reactions and calculate E°_{cell} .

- b. Calculate ΔG° and K for the cell reaction at 25°C.

- c. Calculate E_{cell} at 25°C when $[\text{Zn}^{2+}] = 0.10 \text{ M}$ and $[\text{Fe}^{2+}] = 1.0 \times 10^{-5} \text{ M}$.

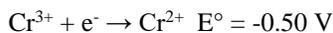
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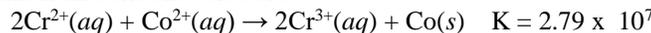
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4. Consider the following galvanic cell at 25°C:



The overall reaction and equilibrium constant value are



Calculate the cell potential, E_{cell} , for this galvanic cell and ΔG for the cell reaction at these conditions.

5. An unknown metal M is electrolyzed. It took 74.1 seconds for a current of 2.00 A to plate out 0.107 g of the metal from a solution containing $\text{M}(\text{NO}_3)_3$. Identify the metal.

6. It took 2.30 min using a current of 2.00 A to plate out all the silver from 0.250 L of a solution containing Ag^{+} . What was the original concentration of Ag^{+} in the solution?

7. What reactions take place at the cathode and the anode when each of the following is electrolyzed? (Assume standard conditions)

a. molten NiBr_2

b. molten AlF_3

c. molten MgI_2

8. What reactions take place at the cathode and the anode when each of the following is electrolyzed? (Assume standard conditions)

a. 1.0 M NiBr_2 solution

b. 1.0 M $\text{Al}(\text{NO}_3)_3$ solution

c. 1.0 M MgI_2 solution