

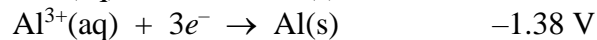
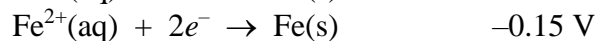
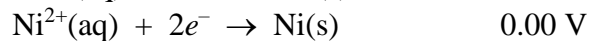
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Pre-Lab Assignment: Electrochemical Cells Experiment

Answer each of the following questions and place the responses on the lines provided.

1. The following data were measured using a nickel electrode as the standard:



A. Which ion is most easily reduced?

B. Which metal is most easily oxidized?

C. The copper and aluminum electrodes are connected in a battery.

1) Which is the anode? cathode?

Anode: _____ Cathode: _____

2) Which is oxidized? reduced?

Oxidized: _____ Reduced: _____

3) What will the battery voltage be?

4) Write a balanced net ionic equation for the reaction that takes place.

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Experiment

Part 1A: E° for: Zn | 1.0 M Zn⁺² || 1.0 M Cu⁺² | Cu

Theoretical: _____ V Experimental: _____ V

Part 1B: E_{cell} for: Zn | 0.10 M Zn⁺² || 1.0 M Cu⁺² | Cu

Theoretical: _____ V Experimental: _____ V

Part 1C: E_{cell} for: Zn | 1.0 M Zn⁺² || 0.10 M Cu⁺² | Cu

Theoretical: _____ V Experimental: _____ V

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Part 2: E° and K_{sp} for: $\text{Cu} | \text{Cu}(\text{OH})_2$ in $1.0 \text{ M OH}^- || 1.0 \text{ M Cu}^{2+} | \text{Cu}$

Experimental $E^\circ =$ _____ V

Calculate experimental K_{sp} using experimental E° and the Nernst equation at equilibrium.

Experimental $K_{sp} =$ _____

Calculate the theoretical E° using a literature value for $K_{sp} = 2.2 \times 10^{-20}$.

Theoretical $E^\circ =$ _____ V

Calculate the % error in E° .

% error in $E^\circ =$ _____

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Part 3: E° and K_f for: $\text{Cu} | \text{Cu}(\text{NH}_3)_4^{2+}$ in 1.0 M NH_3 || 1.0 M $\text{Cu}^{2+} | \text{Cu}$

Experimental $E^\circ =$ _____ V

Calculate experimental K_f using experimental E° and the Nernst equation at equilibrium.

Experimental $K_f =$ _____

Calculate the theoretical E° using a literature value for $K_f = 1.7 \times 10^{13}$.

Theoretical $E^\circ =$ _____ V

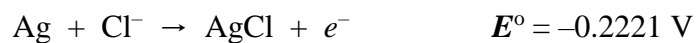
Calculate the % error in E° .

% error in $E^\circ =$ _____

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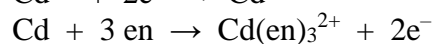
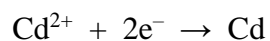
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4. Calculate the solubility product of silver chloride, an extremely insoluble salt, from the following oxidation potentials:



5. Construct a standard voltaic cell diagram that will enable you to determine the solubility product of AgCl from the half reactions given in the previous question.

6. A cell that has the following half reactions was constructed.



The measured E° at 25 °C was +0.38 V. Calculate the experimental K_f .