

Chemistry 1210 Electrochemistry

Names of Both Partners: _____ **Date:** _____

OBJECT: Part A: To verify the Nernst equation: $\varepsilon = \varepsilon^{\circ} - 2.303 \frac{RT}{nF} \log Q$
 Part B: To verify the stoichiometry of a reaction and to measure the Faraday Constant and thereby determine Avogadro's number $\text{Cu}(s) + 2\text{H}^+(aq) \rightarrow \text{Cu}^{2+}(aq) + \text{H}_2(g)$

PROCEDURE: As in the Chemistry 1210 lab manual, pages _____.

OBSERVATIONS: (Part A and B)

DATA:

Part A: Verifying the Nernst Equation
 [Fe²⁺] _____ [Fe³⁺] _____ Temperature of Solutions _____

	V _i Fe ²⁺	V _f Fe ²⁺	Total V _{added} Fe ²⁺	V _i Fe ³⁺	V _f Fe ³⁺	Total V _{added} Fe ³⁺	Cell Voltage
1							
2							
3							
4							
5							
6							
7							
8							
9							

CALCULATIONS AND GRAPH:

	[Fe ²⁺]	[Fe ³⁺]	$\log \frac{[Fe^{2+}]}{[Fe^{3+}]}$
1			
2			
3			
4			
5			
6			
7			
8			
9			

Show a sample calculation for [Fe²⁺], and $\log \frac{[Fe^{2+}]}{[Fe^{3+}]}$.

Attach a graph of Cell Voltage versus $\log \frac{[Fe^{2+}]}{[Fe^{3+}]}$.

Calculate the slope and the y-intercept predicted according to the Nernst equation.

RESULTS:

	Slope	Y-intercept	Correlation Factor (R)
Predicted by Nernst Equation			-1.00
Observed			
% Difference			

DISCUSSION:

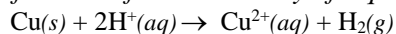
Compare the values of the slope and intercept to the expected values. List source(s) of error and explain if they would increase or decrease the observed values.

CONCLUSION:

Based on the experimental values for slope, y-intercept and correlation factor (if determined), has the data verified the Nernst Equation?

Part B**DATA:****Part B: Verifying Stoichiometry and the Measuring the Faraday Constant**

Mass Cu anode	
Mass Cu anode after electrolysis	
Mass Cu consumed	
Barometric Pressure	
Solution temperature	
Volume of unmarked part of buret between the 50 mL mark & the stopcock	
Volume reading at top of inverted buret	50.00 mL
Volume reading of solution in buret at end of reaction	
Total volume of gas in buret	
Time for reaction	
Average current passed through solution	

CALCULATIONS: *Verification of Stoichiometry of Equation*

Moles Cu consumed

Vapour pressure of H₂O at your solution temperature _____

Pressure of H₂ gas

Moles H₂ gas produced

$$\text{Mole Ratio } \frac{\text{Cu (consumed)}}{\text{H}_2 \text{ (produced)}}$$

Charge transferred

Moles of charge transferred (based on moles Cu consumed)

Experimental Value for the Faraday Constant

Experimental Value for the Avogadro's Number

RESULTS:

	Mole Ratio of Equation	Faraday Constant	Avogadro's Number
Observed Value			
Accepted Value			
% Difference			

DISCUSSION: Suggest a source(s) of experimental error that could cause deviation from the accepted values for mole ratio and for Faraday constant.

CONCLUSION:

Was the stoichiometry of the reaction verified? Were the values for the Faraday Constant and Avogadro's Number reasonably close (i.e. within 10%) to the true value?

QUESTIONS: