Chemistry 1210
Electrochemistry

Names of Both Students :_____ Date:_____

Part A

OBJECT: To verify the Nernst equation: $\varepsilon = \varepsilon^{o} - 2.303\ \frac{RT}{nF} \log Q$

PROCEDURE: As in the Chemistry 1210 lab manual, page 47-48.

OBSERVATIONS:
(Part A only)

DATA/CALCULATIONS:

$[Fe^{2+}]$: _____ $[Fe^{3+}]$: _____

	$V_i\ Fe^{2+}$	$V_f\ Fe^{2+}$	V_{added} $Fe^{2+\ (total)}$	$V_i\ Fe^{3+}$	$V_f\ Fe^{3+}$	V_{added} $Fe^{3+\ (total)}$	Cell Voltage	$\log\frac{[Fe^{2+}]}{[Fe^{3+}]}$
1	———	———						
2	———	———						
3	———	———						
4	———	———						
5	———	———		———	———			
6				———	———			
7				———	———			
8				———	———			
9				———	———			

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

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

RESULTS:

	Slope	Y-intercept
Predicted from Nernst Equation		
Observed		

DISCUSSION:

Part A: *Was the Nernst Equation verified by the experiment? Explain. Compare the values of the slope and intercept to the expected values. If one (or both) of the experimental values are not close to the expected values (i.e. differ by more than 5%), list source(s) of error and explain how they would lead to such differences.*

CONCLUSION:

Part B

OBJECT: To verify the stoichiometry of a reaction and to determine the Faraday Constant by electrolysis. $Cu(s) + 2H^+(aq) \rightarrow Cu^{2+}(aq) + H_2(g)$

PROCEDURE: As in the Chemistry 1210 lab manual, page 48-49.

OBSERVATIONS:

DATA:

Mass Cu anode	
Mass Cu anode after electrolysis	
Mass Cu consumed	
Barometric Pressure (show correction)	
Room 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 (sec)	
Average current passed through solution	

CALCULATIONS: *Verification of Stoichiometry of Equation*

$Cu(s) + 2H^+(aq) \rightarrow Cu^{2+}(aq) + H_2(g)$

Moles Cu consumed

Vapour pressure of H_2O at room temperature_____

Pressure of H_2 gas

Moles H_2 gas produced

Mole Ratio $\frac{Cu\ (consumed)}{H_2\ (produced)}$

CALCULATIONS: Determination of the Faraday Constant

Charge transferred

Moles of charge transferred (based on moles Cu consumed)

a) based on moles of Cu consumed

b) based on moles of H_2 produced

Experimental Value for the Faraday Constant

a) based on moles of Cu consumed

b) based on moles of H_2 produced

Experimental Value for Avogadro's Number

a) based on moles of Cu consumed

b) based on moles of H_2 produced

RESULTS:

Mole Ratio of Cu/H_2		Faraday Constant (accepted value)
F (based on moles of Cu)		
F (based on moles of H_2)		
		Avogadro's Number (accepted value)
N_A (based on moles of Cu)		
N_A (based on moles of H_2)		

DISCUSSION:

Part B: *Compare the values of the Faraday determined using (a) moles of copper consumed and (b) moles of hydrogen produced. Which of these is closer to the expected value? Suggest a source of error that would affect the value with the greater deviation from the accepted value. Remember that both values of the Faraday are based on the same amount of charge transferred. Was the stoichiometry of the reaction verified?*

CONCLUSION:

QUESTIONS: