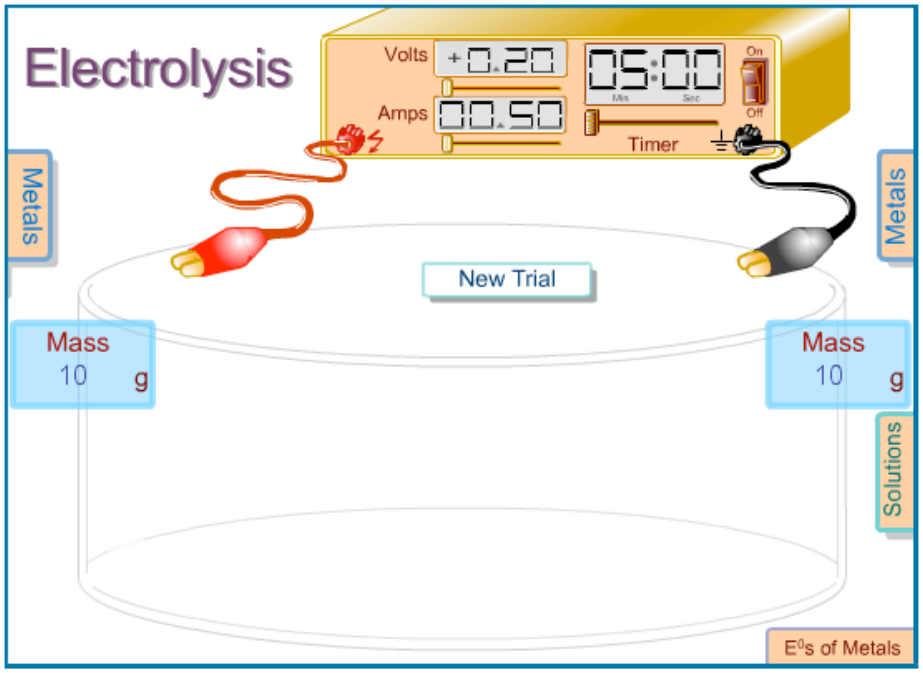
Electrolysis

Name_____ Lab Section_____

Problem Statement: How is electrical energy absorbed in a chemical reaction?

I. Data Collection:

A. Go to http://cheminfo.chem.ou.edu/~mra/home.html and open the Electrolysis Simulation. Your screen should look like the figure.



This simulation contains an apparatus for passing an electrical current through a solution. You can control the voltage and current (in amps). You can also measure the amount of time that electricity is passed through the solution.

B. Click on the right and left pop-out menu tabs for metals and select silver for each. Click on the solutions pop-out tab and select $AgNO_3$ (aq). Specify a voltage 0.20 volts and a current of 0.50 amps. Set the timer for the power source at 5 minutes 00 seconds. Record the starting conditions in the following table. Click the on/off switch to begin the reaction. Record your observation as the reaction proceeds. When the time has elapsed, record your final conditions in the following table.

Trial	Mass Ag (left) Before	Mass Ag (left) After	Mass Ag (right) Before	Mass Ag (right) After	Voltage (E)	Current (amps)	Time
1	10 g		10 g		0.20 v	0.50 amps	300 sec
2	10 g		10 g		0.20 v	0.50 amps	600 sec
3	10 g		10 g		0.20 v	1.00 amps	300 sec
4	10 g		10 g		0.40 v	0.50 amps	300 sec
5	10 g		10 g		0.20 v	1.50 amps	600 sec

C. Click on New Trial. Repeat the reaction with the conditions specified for the remaining trials in the previous table and record your data.

D. Using the same procedures as Section B., Collect data for the electrolysis of Zn in $Zn(NO_3)_2$ (aq) solution. Use the conditions specified in the following table. Record your data.

Trial	Mass Zn (left) Before	Mass Zn (left) After	Mass Zn (right) Before	Mass Zn (right) After	Voltage (E)	Current (amps)	Time
6	10 g		10 g		0.20 v	0.50 amps	300 sec

II. Data Analysis and Interpretation

A. Define current.

B. Write a balanced equation for the half reaction that occurs at the Ag (right) electrode in section I. B. How many electrons are transferred in the reaction per Ag^{+}?

C. Write a balanced equation for the half reaction that occurs at the Zn (right) electrode in section I. C. How many electrons are transferred in the reaction per Zn^{2+}?

D. Compare the amount (moles) of Ag plated out on the right electrode in trial 1 of section I. B. with the amount (moles) of Zn plated out on the right electrode in section I. D. How do you account for this relationship?

E. Using the data from sections I. B. C. and D., what factors control the moles of substance that is produced in these reactions? Write proportionality expressions that indicate how each of these factors is related to the amount.

F. Combine the factors you identified in the previous section into a single proportionality expression. Calculate the proportionality constant (call the Faraday) for the expression. What are the units for this constant?