ELECTROCHEMISTRY

In part A of this experiment you will develop a table of standard reduction potentials based on the the arbitrary assignment of one half reaction (M_A) as having a potential of 0.00 V. You will come up with your own procedure for this portion of the experiment.

In part B of this experiment you will couple individual galvanic cells in series and measure the potential.

EQUIPMENT

You will have available, a LabQuest with a volmeter probe, a well plate, and string to use as a salt bridge.

With the LabQuest voltmeter, when the voltage reads positive, the red lead is at a higher potential (on the cathode where reduction is occurring) and the black lead is at a lower potential (on the anode where oxidation is occurring).

CHEMICALS

Seven metal electrodes each a different metal (metal A, metal B, etc.). A 1.0 M solution of KNO_3 (for your salt bridges) and 0.10 M solutions of salts of all of the metals.

WASTE DISPOSAL

All solutions should go in the provided waste containers.

DO NOT THROW OUT THE ELECTRODES. MAKE SURE TO PUT THE ELECTRODES BACK INTO THE CORRECT CONTAINERS.

SAFETY

Wear your goggles and gloves the entire time. Do not ingest any of the solutions used in this lab as they are toxic. If you get any of the solutions on your skin wash the affected area with soap and water.

PROCEDURE

Part A: Development of a Table of Standard Reduction Potentials Relative to M_A.

You will come up with your own procedure for this section of the laboratory. Your goal is to develop a procedure for determining the standard reduction potentials for the metals used in this lab with the M_A half reaction being assigned a potential of 0.00 V and the standard concentrations taken as 0.1 M (instead of 1 M). After completing this portion of the experiment you will be able to write your own table of standard reduction potentials.

Using the list of materials and chemicals write your own procedure which you will follow in lab.

Do not worry about describing how to set up a half-cell, making a salt bridge, or measure the voltage. Your professor will show you those things at the beginning of the lab. You need only describe which half-cells you will set up and measure the voltage of.

You may make modifications to your procedure, but document all changes. Your original procedure and modifications made will be submitted. You will then type up the final procedure you used.

As part of your procedure make sure you record each measured cell potential in your data table.

Part B: Galvanic Cells in Series

You will connect 2 cells in series (that means one after the other). Each cell will be based on the M_A and M_C half reactions.

To connect the cells in series connect the anode of one cell to the cathode of the other. Use an alligator clip to hold the anode of one cell with the cathode of the other.

Measure the cell potential. Record this in your data table.

Add a third cell to the series and measure the potential. Record this in your data table.

CALCULATIONS

Part A: Show the calculation of the potential of each half reaction based on the M_A half reaction being assigned a value of 0.00 V. Make your own table with your standard reduction potentials listed from most positive (on top) to most negative (on bottom). **List the metals and their potentials relative to metal A only!**

Part B: Calculate the voltages expected for the 2 cell and the 3 cell set-ups. For cells connected in series the overall voltage is just the sum of the individual voltages.

CONCLUSION

Part A:

Show your standard reduction potential table that you developed.

Part B:

Report your expected voltage and measured voltage for the 2 cell and the 3 cell set-up.