Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

LAB 21: Electrochemical Cells

**Purpose:** To investigate properties of electrochemical cells

**Materials**: Electrochemical cell apparatus, various metals, 0.5M solutions of Al2(SO4)3 , CuSO4 , FeSO4 , NiSO4, Pb(NO3)2 , ZnSO4. Voltmeter, graduated cylinders

**Procedure:**

1. Pour 80 ml of 0.5M NiSO4 into the large cup. Clamp the Ni metal strip so that it dips in to the solution.
2. Pour 20 ml of 0.5 Al2(SO4)3 into the small cylinder. Place the cylinder with the solution into the large cup with the NiSO4 solution.
3. Place the Al metal strip into the small cylinder and clamp it down.
4. Measure the voltage (dial set at 20 V) by touching a red lead to one metal and a black lead to the other metal. If you have a negative reading, flip the leads so that they touch the opposite metals. Record the voltage reading and which metals are touching which lead (red or black)
5. Discard the Al2(SO4)3 solution into a waste container and thoroughly rinse the small cylinder and Al metal strip.
6. Repeat steps 2-5 for the solution CuSO4 metal strip Cu.
7. Repeat steps 2-5 for the solution FeSO4 metal strip Fe.
8. Repeat steps 2-5 for the solution Pb(NO3)2 metal strip Pb.
9. Repeat steps 2-5 for the solution ZnSO4 metal strip Zn.

**Data Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| Metals | Voltage (V) | Metal touching red lead (+) | Metal touching black lead (-) |
| Al and Ni |  |  |  |
| Cu and Ni |  |  |  |
| Fe and Ni |  |  |  |
| Pb and Ni |  |  |  |
| Zn and Ni |  |  |  |

**Analysis/Conclusion:**

1. An electrochemical cell is basically a battery. Both have a positive and negative side. The metal that the **red lead touched was the positive** **side**, and the metal that **the black lead touched was the negative side**.
	1. Look at table J and record which metal was higher up on the table.

|  |  |
| --- | --- |
| Metal Pairs | Which metal was higher up on Table J |
| Al and Ni |  |
| Cu and Ni |  |
| Fe and Ni |  |
| Pb and Ni |  |
| Zn and Ni |  |

* 1. Was the metal in the pair that was on the positive side higher or lower on the table?
1. Obtain the actual voltage values for 2 of your electrochemical cells and determine the percent errors for both of them (show the equation both times and all calculations.)
Actual value for metals \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Actual value for metals \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. List one source of error and 1 improvement you could make to this investigation. Be Specific!

Answer the following questions using Table J in your Reference tables.



