

## Chemistry Honors – Metal Reactivities Lab

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

Date: \_\_\_\_\_ Period: \_\_\_\_\_

Do all chemicals react with each other? Can chemical reactions be predictable? Are some metals more reactive than others? In this lab, you will make initial observations of 4 metals, and solutions of these metals' ions. Then, the metals will be added to the solutions, and you will observe whether or not a reaction occurs. Your observations will be used to compare metal reactivities, and to form an "activity series" of metals.

### Procedure:

Go to the following website:

<http://www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/animationsindex.htm>

Scroll down to the Electrochemistry heading, and click on click here to work the activity series.

Click **Start**, and then **OK** to the pop-up box.

Click on **Activity 1**.

1. Write down observations (colors) of the solutions in the data table.
2. Choose one metal, write down initial observations (color of the metal), and then immerse them into the solutions. Remove the metals from the solutions, and record the results (both the changes in the metals *and* the changes in the solutions). Write NR for no reaction, if nothing happens.
3. Repeat the step above with the other 3 metals.

Click on **Activity 2**, and follow the same procedures with the new metals and solutions.

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To get an idea of what type of chemical reaction occurred, and why the metals seemed to "grow thicker" when a reaction occurred, go back to Activity 1, and choose the molecular scale reaction button, place the Mg metal in the  $\text{Cu}(\text{NO}_3)_2$  solution, and click start.

**Metal Reactivities Lab – DATA**

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

**Activity 1**

Observations of solutions →					
		Mg(NO <sub>3</sub> ) <sub>2</sub>	Zn(NO <sub>3</sub> ) <sub>2</sub>	Cu(NO <sub>3</sub> ) <sub>2</sub>	AgNO <sub>3</sub>
Observations of Metals ↓	Cu				
	Mg				
	Zn				
	Ag				

**Activity 2**

Observations of solutions →					
		Fe(NO <sub>3</sub> ) <sub>2</sub>	Zn(NO <sub>3</sub> ) <sub>2</sub>	Cu(NO <sub>3</sub> ) <sub>2</sub>	Pb(NO <sub>3</sub> ) <sub>2</sub>
Metal Observations ↓	Fe				
	Zn				
	Cu				
	Pb				

**Question:** Why do the metals seem to “grow” when a reaction occurs? Write answer below.

**Analysis Questions.**

**Name:** \_\_\_\_\_

1. Which metal reacted with the most solutions in Activity 1? In Activity 2?
2. Which metal reacted with the fewest solutions in Activity 1? In Activity 2?
3. List the four metal elements from each experiment in order of most to least reactive. You will make two lists here – one from Activity 1 and another from Activity 2.

Activity 1

Activity 2

- |    |    |
|----|----|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |

4. The above lists represent two “Activity Series of Metals”. We want to combine our results from both activities, into a single Activity Series of Metals.

*Hint: In an Activity Series, if element A is listed above element B, then A will react with a solution of B's ions.*

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

5. The Statue of Liberty was constructed of copper metal. Based on your observations from this lab, explain why copper was chosen, and also suggest a better choice. Why do you think this “better choice” wasn’t chosen?
6. Which metals in this lab, would be most likely found in a “free” or elemental state in nature?