# ACTIVITY SERIES LAB (MICROSCALE)

**Purpose:** to study the chemical activity of common metals

**Safety Precautions**
*Wear goggles at all times.* Review precautions for handling acids. Since silver nitrate may stain skin and clothing, avoid contact.

**Procedure (Part I):**

1. Sketch out a matrix to record your data. Along the top of the matrix, you should list the six reagents you will be using in this part of the experiment: $KNO_3$, $Mg(NO_3)_2$, $Zn(NO_3)_2$, $CuSO_4$, $AgNO_3$, and distilled water. Along the side of the matrix, you should list the five metals used in this part of the experiment: copper, iron, magnesium, tin, and zinc.
2. Obtain a spot plate. In each of 6 wells put a small piece of copper. Add reagents according to the instructions below:

| | |
|---|---|
| Well 1: | add 5 drops of $KNO_3$ |
| Well 2: | add 5 drops of $Mg(NO_3)_2$ |
| Well 3: | add 5 drops of $Zn(NO_3)_2$ |
| Well 4: | add 5 drops of $CuSO_4$ |
| Well 5: | add 5 drops of $AgNO_3$ |
| Well 6: | add 5 drops of distilled water |

3. Observe the wells for a few minutes. Record your observations.
4. Discard the contents of the wells <u>in the waste beaker</u>, making sure to return any unreacted metal.
5. Repeat step one using each of the following metals: magnesium, zinc, and tin.

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**Procedure (Part II):**

1. Sketch out a matrix for this section of the experiment. There is one reagent (HCl) and five metals to be tested (copper, iron, magnesium, tin, and zinc).
2. To each of 5 wells, place one of the following metals: magnesium, zinc, tin, iron, and copper. To each of the wells, *carefully* add 5 drops of HCl. Observe the metals for several minutes and record your observations.
3. Discard the contents of the wells <u>in the waste beaker</u> and return any unreacted metal.

(over)

**Questions (to be answered in complete sentences):**

1. Which metal reacted with the most solutions?
2. Which metal reacted with the fewest solutions?
3. List the metals in order of their reactivity, starting with the most reactive metal. (The most reactive metal is the one that reacted with the most solutions, while the least reactive metal is the one that reacted with the fewest solutions). Such a ranking of elements is called an ***activity series.***
4. Based on your activity series, explain why the Statue of Liberty was made with copper instead of zinc.
5. Based on your activity series, which material might have been a better choice than copper for the Statue of Liberty? Why do you think it wasn't chosen?
6. Given your knowledge of relative chemical activity among these metals,
    a. Which metal is *most* likely to be found in an uncombined or "free" state in nature?
    b. Which metal would be *least* likely to be found uncombined with other elements?
7. Devise an experiment to investigate if Au is more reactive than Cu. Be specific. Use formulas in your answer.
8. Group 1A metals are more reactive than group 2A metals. Hence, you might suspect that elements become less reactive as atomic number increases in a period on the periodic table. Do the *transition metals* you studied in this experiment support this assumption? Be specific!

**Lab Checklist:**

- ❑ **Title Page (Title, Purpose, Name, Date, Period)**
- ❑ **Matrices for parts 1 and 2 (with detailed observations)**
- ❑ **Answers to questions <u>in complete sentences</u>**

# Activity Series Lab – Observations for Part 1

| | $KNO_3$ | $Mg(NO_3)_2$ | $Zn(NO_3)_2$ | $CuSO_4$ | $AgNO_3$ | Distilled $H_2O$ |
|---|---|---|---|---|---|---|
| **Copper** | | | | | | |
| **Iron** | | | | | | |
| **Magnesium** | | | | | | |
| **Tin** | | | | | | |
| **Zinc** | | | | | | |

# Activity Series Lab – Observations for Part 2

| | Reaction with HCl |
|---|---|
| **Copper** | |
| **Iron** | |
| **Magnesium** | |
| **Tin** | |
| **Zinc** | |