

Lab #6: Determination of an Electrochemical  
Series Lab Exercise

Chemistry II  
10 points

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

Date: \_\_\_\_\_ Hr: \_\_\_\_\_

Partner: \_\_\_\_\_

Goal:

The goal of this lab is to rank six common metals from most reactive to least reactive.

Research:

1) What is an activity series? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2) What happens during an oxidation-reduction reaction? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3) What happens during oxidation? \_\_\_\_\_

\_\_\_\_\_

4) What happens during reduction? \_\_\_\_\_

\_\_\_\_\_

5) What is an oxidizing agent? \_\_\_\_\_

\_\_\_\_\_

6) What is a reducing agent? \_\_\_\_\_

\_\_\_\_\_

7) For this lab, you will need to make up 100 mL of 0.2 M copper (II) sulfate solution using a volumetric flask.

(a) Describe how to make up an aqueous solution with a solid solute using a volumetric flask.

- (b) Calculate the number of grams of copper (II) sulfate needed to make up 100 mL of 0.2 M copper (II) sulfate. [Record your answer in the materials section as well.]

Hypothesis:

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Materials:

|                             |   |
|-----------------------------|---|
| 1 100 mL volumetric flask   | 1 medium scoop                          |
| 1 cg balance                | 1 microscop                             |
| 1 massing cup               | 1 30 mL beaker                          |
| 1 piece aluminum            | 1 piece lead                            |
| 1 piece tin                 | 1 piece zinc                            |
| 1 piece magnesium           | 1 small iron nail                       |
| 6 25x150 mm test tubes      | 1 six-hole white plastic test tube rack |
| 1 test tube brush           | 1 permanent marker                      |
| 1 small piece of steel wool | 1 stopwatch                             |

\_\_\_\_\_ g copper (II) sulfate      \_\_\_\_\_

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Hazards:

The student safety contract applies. \_\_\_\_\_

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Procedure:

1. Physically and chemically clean the test tubes, beaker, scoops, and volumetric flask.
2. Label the 30 mL beaker copper (II) sulfate and initials.
3. Obtain the copper (II) sulfate in the 30 mL beaker
4. Mass out the needed copper (II) sulfate in the massing cup
5. Use the volumetric flask to prepare 100 mL of 0.2 M copper (II) sulfate solution  
[see research question 7a for details]
6. Label each test tube (aluminum, tin, magnesium, iron, lead, zinc [or use their symbols!])
7. Pour approximately the same amount of copper (II) sulfate solution into each test tube.
8. Obtain one of each of the metal pieces ONE AT A TIME. Don't get them confused!
9. Use steel wool to clean the metal samples OVER PAPER TOWEL.
10. Add the metal samples to their labeled test tubes.
11. Record observations of the metals for 10 minutes.
12. Clean up.
  - a. Dispose of the metals and cupric sulfate in the waste container.
  - b. Physically clean and de-label the glassware

Data:

Post-lab questions (no need for a conclusion):

- 1) Rank the six metals from most reactive to least reactive.
- 2) Write balanced net ionic equations for all the reactions that occurred with the metals.
- 3) Write half-reactions for each of the net ionic equations. Indicate whether oxidation or reduction occurred in each.
- 4) Compare your results to an actual activity series found in the literature. How does it compare?
- 5) Compare your activity series to a table of standard reduction potentials. How do they compare?
- 6) Predict what would happen in the following situations and give a reason for your prediction:
  - a) a piece of zinc is added to a solution of magnesium sulfate
  - b) a piece of aluminum is added to a solution of silver nitrate
  - c) a piece of copper is added to a solution of iron (II) sulfate
  - d) a piece of zinc is added to a solution of lead (II) sulfate
- 7) Do metals prefer to be oxidized or reduced? Explain your answer.

Lab handout based on the experiment “Corrosion Experiment #2: Mr. Copper and Miss Sulfate” in cKit: Experiments: The Teacher’s Guide to Corrosion Experiments, published by the NACE Foundation, and based on an experiment by Ms. Debbie Goodwin, science teacher (and materials science master teacher) at Chillicothe High School in Chillicothe, Missouri