

Name: _____ Date: _____

Title: Oxidation-Reduction Reactions

Introduction: Reactions involving oxidation and reduction processes are very important in our everyday world. They make batteries work and cause metals to corrode (or help to prevent their corrosion). They enable us to obtain heat by burning fuels--in factories and in our bodies.

Substances that lose electrons during a chemical reaction are said to be **oxidized** and are called **reducing agents**. Those that gain electrons are said to be **reduced** and are called **oxidizing agents**. If one reactant gains electrons, another must lose an equal number. Thus oxidation and reduction reactions must occur simultaneously and to a comparable degree. The stronger the tendency of an oxidizing agent to gain electrons, the greater its strength. The weaker the tendency for a reducing agent to hold electrons, the greater its strength as a reducing agent.

Displacement reactions involve an **element**, and a **compound** containing a "similar" element. "Similar" can mean both metals, or it can simply mean both + or both -. In any case, the general rule that applies is *like displaces like*.

Copper and lead are both metals (both positive in compounds) and are both used for in common everyday objects such as coins, jewelry, and piping. So what will happen if a drop of solution containing lead ions is placed on a piece of copper metal? What will happen if a drop of solution containing copper ions is placed on a piece of silver metal?

Your task is to answer questions like these about the substances available during this experiment.

Materials:

1. strips of copper, magnesium and zinc metal
2. sand paper for cleaning the metal strips (DO NOT WET THIS)
3. 1 M solutions of $\text{Cu}(\text{NO}_3)_2$, $\text{Mg}(\text{NO}_3)_2$, $\text{Zn}(\text{NO}_3)_2$, HCl
4. hand lens

Procedure:

1. Design an experiment that will enable you to decide which metals will displace each other from solution and which will displace hydrogen from acid solution. Write the steps below:

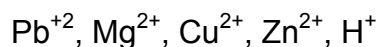
2. Create a data table to record your findings:

3. Answer this question: What evidence will you look for to determine if a reaction is occurring?

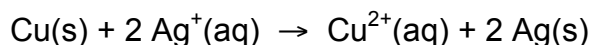
Analysis:

1. Write the equations for the reactions you think occurred:

2. Rank the following ions in terms of their ability to act as oxidizing agents (that is – be reduced) placing the strongest first:



3. Copper is oxidized in the presence of silver ions. The net ionic reaction is:



To write the equation you need to decide which of the 2 metals needs to be written as the metal and which need to be written as the ion for a reaction to occur. Using the above equation as an example, write the net ionic reactions for:

(a) copper and zinc,

(b) lead and zinc,

(c) copper and magnesium,

(d) magnesium and zinc

Conclusion