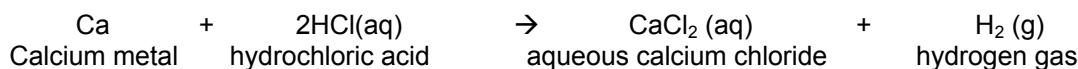


Single Replacement Reactions

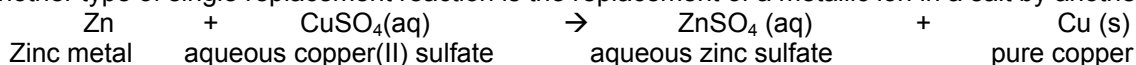
Reminder – Goggles must be worn at all times in the lab!

PRE-LAB DISCUSSION:

Single replacement reactions are reactions in which an element in pure form competes for a place with an ion or atom in a compound. One type of single replacement reaction is the replacement of hydrogen in acids by active metals, producing an aqueous salt and releasing hydrogen gas. For example:



Another type of single replacement reaction is the replacement of a metallic ion in a salt by another metal. For example:



There are several other types of single replacement reactions. These include halogens replacing other halide ions, and active metals replacing hydrogen in water. We will not be performing either of these types of reactions for safety reasons.

PURPOSE:

The purpose of the lab is to observe and rank the relative reactivity of various metals in single replacement reactions.

PROCEDURE

Part 1: Metals with Salts

1. These reactions are very often slow to develop, so we want to get them started first, and then return to them later to observe any changes. Take a depression (spot) plate from your lab drawer. Clean and thoroughly dry it before performing the reactions. Depression plates are often used to perform micro-scale reactions – reactions in which we will use only very small quantities of reactants.
2. The reactions are generally easier to observe against a white background, so place the plate on a blank white piece of paper. This also allows you to identify the contents of the depressions on the plate by writing on the paper.
3. Place one small sample of each of the following metals into SEPARATE depressions on the plate. Be sure to label which metal is in which spot on the plate.
Mg – magnesium Cu – Copper Zn – zinc Al - aluminum
4. Repeat step 2, placing a sample of each metal down a second row of the plate. Again, be sure to label which metal is in which spot on the plate.
5. To each depression in the first row of metals, add enough sodium chloride (NaCl) solution to completely cover the metal sample.
6. To each depression in the second row of metals, add enough silver nitrate (AgNO₃) solution to completely cover the metal sample.
7. Let the reactions sit while performing “Part 2”. Return to them afterward to record observations.

Part 2: Metals with an Acid

1. Take a second depression plate from your lab drawer (You should have two of them). Clean and thoroughly dry it before performing the reactions.
2. Place one small sample of each of the following metals into SEPARATE depressions on the plate. Be sure to label which metal is in which spot on the plate.
Mg – magnesium Cu – Copper Zn – zinc Al - aluminum
3. To each depression add just enough 1 M hydrochloric acid to cover the metal. Compare the reactivity of each metal. Record your observations.

Cleanup

1. **Keep your goggles on during cleanup.** Washing of glassware is when you are most likely to get chemicals splashing back on your face.
2. After you have recorded your data, CAREFULLY, with your forceps, place any pieces of un-reacted metal in the container provided by your instructor. No metal pieces should be washed down the sink! The remainder of the solutions can then be washed carefully down the sink with lots of water.
3. Wash and dry the spot plates, and return it to your lab drawer.

RESULTS

Part 1: Metals with Salts

	Reaction with Sodium Chloride (NaCl): Observations
Magnesium	
Copper	
Zinc	
Aluminum	

List which of the metals WERE able to replace sodium in NaCl:

	Reaction with Silver Nitrate (AgNO ₃): Observations
Magnesium	
Copper	
Zinc	
Aluminum	

List which of the metals WERE able to replace silver in AgNO₃:

Part 2: Metals with an Acid

	Observations
Magnesium	
Copper	
Zinc	
Aluminum	

List which of the metals WERE able to replace hydrogen in HCl:
