Name: Per: Date done:
lab partner(s):

Lab: Metal or Nonmetal

Purpose: The purpose of this activity is to decide if an element is a metal, nonmetal, or metalloid after investigating its chemical and physical properties.

Safety: You must wear lab goggles throughout this experiment. 0.5M HCl (hydrochloric acid) can chemically attack skin if allowed to remain in contact for a long time. Notify your teacher of spills and wash the affected area immediately with tap water.

Procedure

1. For the first three properties (appearance, conductivity, malleability), place a small amount of material on a paper towel and make your observations.

2. *Appearance*. Observe and record the appearance of each element, including physical properties such as color, luster, and form. You may record the form as crystalline (like table salt), noncrystalline (like flour), or metallic (like aluminum foil).

3. *Conductivity*. Touch the conductivity tester electrodes to the sample. If the light bulb lights, even dimly, electricity is flowing through the sample, and the material is a conductor. If the bulb doesn't light, the material is a nonconductor.

4. *Crushing*. Try to bend the sample; a malleable material, <u>if it's not too thick</u>, bends. If the material does not bend, place a small sample on a piece of paper, set on ringstand base, and gently tap with an iron ring. A malleable material will flatten without shattering, whereas a brittle material shatters into pieces.

5. *Reactivity with Acid and Copper(II) nitrate*
   a. Orient a clean well plate so you have 6 wells down the side. Carbon goes in the first row, Cu in the second, Mg in the third, etc.
   b. Load a match head size sample of each element in the first three wells of each row. Use tweezers to pick up small pieces or a wooden splint as a spatula for powders.
   c. To the first column, add 15 drops distilled water. None of these materials react with water, so this is the control.
   d. To the second column, add about 15 drops of 0.5M HCl to each sample well.
   e. To the third column, add about 15 drops of 0.1M $Cu(NO_3)_2$.
   f. Observe each system for **<u>5 minutes</u>** and record each result. The formation of gas bubbles, a precipitate, and/or a change in appearance of the sample may indicate a chemical reaction.
   g. Discard samples in dishpan by sink. Rinse well plate with tap water.

6. Wash your hands with soap and water before leaving the lab.

Prelab Question

Classify each property tested as either a physical (P) or a chemical (C) property.

Appearance	Reactivity with acid
Malleability	Reactivity with $Cu(NO_3)_2$
Conductivity	

Metal or Nonmetal Data Table

Element	**Appearance** (color; shiny/dull; crystalline/noncrystal-line/metallic)	**Conductivity** (Y/N)	**Crushing** (**M**alleable/ **B**rittle)	**Reaction with Acid** (Y/N)	**Reaction with $Cu(NO_3)_2(aq)$** (Y/N)
C					
Cu					
Mg					
S					
Si					
Zn					

Questions

1. Here are some physical and chemical properties of metals, nonmetals, and metalloids.
   a. Metals have a luster, are malleable, and conduct electricity
   b. Many (but not all) metals react with acids; many metals also react with Cu^{2+} solution.
   c. Nonmetals are usually dull in appearance, are brittle, and do not conduct electricity
   d. Metalloids have some properties of both metals and nonmetals.
2. Using your data, classify each element testes as a metal, nonmetal, or metalloid as best you can. Which element or elements could fit into two categories? Explain.

Metals	**Nonmetals**	**Metalloids**