Metal or Nonmetal: Physical and Chemical Properties of Elements

Geology 1P Mr. Traeger

Name: _____ Period: _____ Date: _____

Purpose

The purpose of this lab is to investigate both the physical and chemical properties of eight unknown elements. Knowing the properties of these elements will aid in classifying them as metals, nonmetals, or metalloids. This lab is adapted from *ChemCom: Chemistry in the Community*, Second Edition, 1993.

Materials

- 8 unknown element samples, lettered a to h
- small hammer
- wood block
- forceps (2)
- plastic sampling trays (2)
- aqueous 0.1 M copper(II) chloride ($CuCl_2$)
- 1.0 M hydrochloric acid (HCl)
- Periodic Table on pages 698-699 in your textbook

Procedure

Testing for Physical Properties

1. *Appearance:* Look at each element and record its observable physical properties in the data table. You should be looking for properties such as color, luster (dull, shiny, glassy, earthy, etc.), and its physical form.

2. *Malleability:* Using the forceps, take a small sample of each element and place it on your wood block. **Put your safety goggles on!** *Gently* rap the element with your hammer to determine if the sample is ***malleable*** (flattens without breaking) or ***brittle*** (breaks into smaller pieces). Record either ***malleable*** or ***brittle*** in your data table.

3. *Conductivity*: At the end of the lab, the teacher will test each element for conductivity by running an electric current through each element. If the material conducts electricity, then it is said to be a ***conductor***. If it does not conduct electricity, then it is said to be a ***nonconductor***. Record either ***conductor*** or ***nonconductor*** in your data table.

Testing for Chemical Properties with Hydrochloric Acid (HCl)

1. **Put your safety goggles on!** Hydrochloric acid will burn and Copper(II) Chloride is toxic if ingested or splashed in the eyes. Make sure to wash your hands afterwards.

2. Test each sample for reactivity with Hydrochloric Acid (HCl). Using the forceps, take a small sample of each element and place it into one of the spots in your sampling tray. Make sure to keep track of the letter of the element.

3. Place 1 to 4 drops of acid on each sample. *Do not* mix the samples! If the sample reacts with the acid, it will fizz. If it fizzes, record ***yes*** in your data table under ñreacts with acid.òIf it does not fizz, then you will record ***no*** in the same place on your table.

4. After you are done, dispose of your samples in the tray marked ***waste***. *Do not* pour them in the trash or throw them down the sink! Rinse your tray under running water and then dry it for the next step.

Testing for Chemical Properties with Copper(II) Chloride ($CuCl_2$)

1. Test each sample for reactivity with Copper(II) Chloride ($CuCl_2$). Using the forceps, take a small sample of each element and place it into one of the spots in your sampling tray. Make sure to keep track of the letter of the element.

2. Place 1 to 4 drops of Copper(II) Chloride on each sample. *Do not* mix the samples! If the sample reacts with Copper(II) Chloride, it will change appearance. Changes may be slow, so you will have to observe your sample for up to 5 minutes. If the sample reacts, put ***yes*** under ñreacts with $CuCl_2$òin your data table. If it does not react, then put ***no***.

3. After you are done, dispose of your samples in the tray marked ***waste***. *Do not* pour them in the trash or throw them down the sink! Rinse your tray under running water. Dry the tray and put it back with the lab kit. Wash your hands before leaving the lab.

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Data/Data Analysis/Questions

Element	Appearance	Malleability	Conductivity	Reacts with acid	Reacts with $CuCl_2$
a					
b					
c					
d					
e					
f					
g					
h					

Now, answer the following questions based upon your data table:

1. By looking at the similarities in each element sample, try to sort your elements into groups. Place the letter of your unknown element in the chart below. Using the following information, classify each element as metal, nonmetal, or metalloid:

- Metals have shiny luster, are malleable, and conduct electricity (physical properties).
- Some metals react with acid and copper(II) chloride (chemical properties).
- Non-metals usually are dull, brittle, and do not conduct electricity.
- Most non-metals do not react chemically.
- Elements with shared properties of metals and non-metals are called metalloids.

Metal	Non-metal	Metalloid

2. Make an attempt to identify what each element is using the periodic chart. Record this in the data table above next to the letter of each unknown element.

3. How do physical and chemical properties aid in the identification of each element?

4. How do you think this lab might be helpful for identifying minerals in our lab next week?

Conclusion