**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**LAB: Metal, Non-Metal, or Metalloid?**

**PURPOSE:** To determine if 8 different elements are metals, non-metals, or metalloids.

**BACKGROUND INFORMATION:**

We have studied the different properties of metals, non-metals, and metalloids. It is important to note that although elements can be categorized and generalizations can be made, each element has its own unique properties. Thus, there are many exceptions to the rules for classifying elements.

Below is a chart summarizing the general properties of metals and nonmetals :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **State of Matter?** | **Color?** | **Luster?** | **Malleable?** | **Conducts Electricity?** | **Reacts with Acid?** |
| **Metal** | Solid (except Hg) | Silver-gray (except Cu & Au) | Shiny | Yes (can be easily flattened) | Yes | Yes |
| **Non-Metal** | Solid or Gas (except Br is liquid) | Varies | Not Shiny | No (breaks when try to hammer) | No | No |
| **Metalloid** | These elements show some properties of metals, and some properties of nonmetals |

**MATERIALS:**

*Chemicals*

Elements, two small pieces of each:

 Aluminum

 Carbon

 Copper

 Iodine

 Magnesium

 Silicon

 Sulfur

 Zinc

HCl solution, 1M, 5 mL per group

*Equipment*

Pipets, 2

Block of wood

Nail

White paper

Spatula

Test tubes

Well Palte

Test Tube Rack

Conductivity Tester

**PROCEDURE:**

1. On a sheet of white paper, draw a large table with 2 rows and 4 columns. Label each square with one of the elements you will be testing. You only need 1 per lab group
2. At your lab station, there is a test tube rack with 8 tubes labeled with the element present.
3. At your lab station, empty the samples onto your piece of white paper you made by inverting each test tube over the appropriately-labeled square

Part I: Physical Properties:

1. Observe and record the color of each element in the Data table on the next page. Be very specific in recording color.
2. Observe and record the luster of each element (it is shiny, slightly shiny, dull)
3. Record any other physical properties observed for each element. (smell, rough, smooth, rocky, crystalline (like salt crystals), etc)
4. Determine whether each element is brittle or malleable. To do this, position a nail on the sample and gently tap the nail with the block of wood. A sample is brittle if it shatters or cracks when struck, A material is malleable if it flattens or bends without shattering.
5. Test the conductivity of each element. Wipe the conductivity meter with a damp paper towel and then dry in between each element test. If it does not light, it does not conduct electricity. If it lights brightly, it conducts electricity. If it is dimly light, it is a weak conductor of electricity.

Part II: Chemical Properties:

1. Use a spatula to place one small piece or a few crystals of each element into a different well of your well plate. You should put it in the same order of your white paper to not get confused.
2. Determine the reactivity with acid of each sample by adding one pipetful of 1 M HCl that is on your lab table. (Note: evidence for a chemical reaction may be in the formation of gas bubbles and/or discoloration of the surface of the element. Be patient)
3. Observe each well plate for approximately 3 minutes and record results in the data table

Clean Up:

1. If there are pieces of metal left in your well plates, carefully remove with tweezers and put in the container labeled: SOLID WASTE
2. Rinse well plate and dispose of the acid down the sink with water.

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**LAB: Metal, Nonmetal, or Metalloid**

**Data, Analysis, and Questions**

**DATA TABLE:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Color?** | **Color?** | **Other Properties?** | **Malleable?** | **Conducts Electricity?** | **Reacts with Acid?** |
| **Aluminum** |  |  |  |  |  |  |
| **Carbon** |  |  |  |  |  |  |
| **Copper** |  |  |  |  |  |  |
| **Iodine** |  |  |  |  |  |  |
| **Magnesium** |  |  |  |  |  |  |
| **Silicon** |  |  |  |  |  |  |
| **Sulfur** |  |  |  |  |  |  |
| **Zinc** |  |  |  |  |  |  |

**ANALYSIS**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Metal, Nonmetal, Metalloid?** | **Color?** | **Metal, Nonmetal, Metalloid?** |
| **Aluminum** |  | **Magnesium** |  |
| **Carbon** |  | **Silicon** |  |
| **Copper** |  | **Sulfur** |  |
| **Iodine** |  | **Zinc** |  |

**QUESTIONS:**

1. Which of the elements were metals?
2. Which of the elements were non-metals?
3. Which elements did not fit into the 2 categories?
4. Look at the location on the periodic table of each of the 8 elements tested in this lab. How do the properties of these elements compare to their general location on the periodic table? Make generalizations about the location of metals, non-metals, and metalloids on the periodic table

METALS ARE LOCATED:

NONMETALS ARE LOCATED:

METALLOIDS ARE LOCATED:

1. Predict the physical and chemical properties of the following elements that were not tested in this lab:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Color?** | **Color?** | **Other Properties?** | **Malleable?** | **Conducts Electricity?** | **Reacts with Acid?** |
| **Selenium** |  |  |  |  |  |  |
| **Calcium** |  |  |  |  |  |  |
| **Cobalt** |  |  |  |  |  |  |

|  |  |
| --- | --- |
|  | **Metal, Nonmetal, Metalloid?** |
| **Selenium** |  |
| **Calcium** |  |
| **Cobalt** |  |