

Lab - Metal or Nonmetal?

Purpose: To distinguish between chemical and physical properties and changes.
To determine whether unknown elements are metals, nonmetals or metalloids.

Procedure:

- 1) *Appearance:* Observe and record in the table below the appearance of each element, including physical properties such as color, luster and form. Form can be crystalline (like salt), powder (like baking soda), or metallic (like iron).
- 2) *Conductivity:* Using a conductivity tester, touch both electrodes to the element sample, but do not allow the electrodes to touch one another. If the bulbs light, even dimly, then electricity is flowing through the sample. Such a material is termed a conductor. If the bulb fails to light, the substance is an insulator.
- 3) *Crushing:* Gently tap each element with a hammer. Do not raise the hammer above shoulder height from the table. Decide whether the sample is malleable, where it flattens upon striking, or brittle, which shatters into pieces.
- 4) *Reactivity with acid:*
 - a) In a test tube, place a sample of the element. All pieces should be smaller than a pencil eraser.
 - b) Add enough 0.5 M HCl to the sample to completely submerge the element piece.
 - c) Observe and record your result. Decide whether the element chemically reacted with the acid by a color change, bubbles formed or the like. Record the result.
 - d) Dispose of the combination in the waste container.
 - e) Repeat the process for each of the other elements.
- 5) *Reactivity with copper (II) chloride:*
 - a) In a test tube, place a sample of the element. All pieces should be smaller than a pencil eraser.
 - b) Add enough 0.1 M CuCl_2 to the sample to completely submerge the element piece.
 - c) Observe and record your result. Decide whether the element chemically reacted with the acid by a color change, bubbles formed or the like. Record the result.
 - d) Dispose of the combination in the waste container.
 - e) Repeat the process for each of the other elements.
 - 6) Wash your hands after cleaning up.

Data Table:

| Element | Appearance | Conductivity | Result of Crushing | Reaction with acid | Reaction with CuCl_2 (aq) |
|---------|------------|--------------|--------------------|--------------------|------------------------------------|
| A. | | | | | |
| B. | | | | | |
| C. | | | | | |
| D. | | | | | |
| E. | | | | | |
| F. | | | | | |
| G. | | | | | |

Analysis Questions:

- 1) Classify each property tested in this activity as either a physical or chemical property.

2) Sort the seven coded elements into two groups based on similarities in their physical and chemical properties.

3) Of the elements tested, are there any elements that could fit into either group? Why?

Conclusion:

Based on your knowledge of the properties of metals, nonmetals and metalloids, classify each element in one of these categories.