



## INVESTIGATING TRENDS IN THE PERIODIC TABLE

Probably the most important item or piece of equipment to a chemist is the periodic table of elements. In the 19<sup>th</sup> century, chemists began to characterize elements according to similarities in their chemical and physical properties. The elements on the periodic table used today are organized based on their results. In this experiment you will be investigating the different chemical and physical properties of elements across period 3 of the periodic table to determine if there are any patterns or similarities.

### PRE-LAB (due before beginning the lab)

Read and understand the entire lab. Complete the following pre-lab questions in your science notebook.

1. What is the purpose of this lab?
2. What safety procedures should be followed?
3. Begin setting up the lab in your notebook:
  - a. Write the title and question.
  - b. Rewrite the procedures in your own words. Simply abbreviate and shorten the procedures so that they make sense to you.
  - c. Prepare the data tables you will need to record your data. Use one table for Part I and one table for Part II.

### SAFETY PRECAUTIONS

- Safety goggles should be worn at all times. Long hair should be tied back.
- Keep HCl off skin and clothing. If HCl comes in contact with skin or clothing be sure to rinse completely with water and inform your teacher immediately.
- When heating the contents of a test tube, always hold the open end away from you and others. Also, evenly heat all of the contents in the test tube by moving the entire length of the test tube back and forth through the flame.

### QUESTION

Are there any patterns or similarities in physical and chemical properties of the elements in period 3 on the periodic table?

### MATERIALS

8 test tubes	Test tube rack
Aluminum (Al)	Sulfur (S)
Silicon (Si)	Magnesium (Mg)
Bunsen burner	Test tube holder
Matches or flint striker	Labeling tape
3-M HCl (hydrochloric acid)	

### PROCEDURES

#### Part I: Physical Properties

1. Obtain samples of each of the elements listed in the Materials.
2. Make observations for each element and record the observations in a data table. Physical observations can include color, luster, malleability, and anything else outwardly distinguishable about the element.

#### Part II: Chemical Properties

1. Obtain 8 medium sized test tubes. Use labeling tape to label the 4 of the test tubes Al, Mg, Si, and S; indicate that these test tubes will contain distilled water. To the other 4 test tubes, label them with the same element names, but indicate that these test tubes will contain HCl.
2. To each of the 4 water-labeled test tubes add about 1 cm worth of distilled water. Carefully add the following to each appropriate test tube and observe:
  - 1 ribbon of magnesium
  - 1 strip of aluminum
  - 1 large chip or 2-3 small chips of silicon
  - 2-3 chips of sulfur
3. Record your observations from step #2 in a data table. Chemical observations can include color changes, gasses forming, temperature changes, and anything else dynamic that might occur.
4. To the remaining 4 acid-labeled test tubes, add about 1 cm worth of 3-M HCl. Then carefully add to the appropriate test tube the same samples as in step #2.
5. Record your observations from step #4 in a data table.
6. Using the test tubes that contain your samples with 3-M HCl, gently heat each test tube in a Bunsen burner flame just until the solution begins to bubble. As soon as the solution begins to bubble, quickly remove the test tube from the flame and place in a test

tube rack. **BE AWARE OF SAFETY PRECAUTIONS WHEN HEATING TEST TUBES!** Record observations in a data table.

7. When finished with all observations, dispose of chemicals and clean your lab station as follows:
    - A. **WATER FILLED TEST TUBES.** Pour water into the sink without losing the solids. Dispose of solids in the appropriate containers. Use a test tube brush to clean test tubes with warm water and soap. Rinse the test tubes thoroughly and dry on a rack.
    - B. **ACID FILLED TEST TUBES.** Add tap water to the test tubes slowly. Carefully pour liquid into the sink without losing the solids. Repeat 3 times. Dispose of solids in the appropriate containers. Use a test tube brush to clean test tubes with warm water and soap. Rinse the test tubes thoroughly and dry on a rack.
    - C. **LAB STATION.** Wipe down lab station with a paper towel. Organize supplies as neatly as you found them. Make sure the gas is turned off. **Check out with your teacher.**
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## **CONCLUSION**

Answer the original question from the beginning of the lab. Include supporting data from the lab in your answer and explain thoroughly what you've discovered.

## **ANALYSIS**

Answer the following questions in complete sentences in your science notebook.

1. In Part I of the lab, which elements observed are metals and which are nonmetals? Describe how you know that using physical properties.
2. When comparing the data from both parts of the lab, do you notice similarities between the physical and chemical properties of the different elements? If so, are these similarities consistent from element to element? Are there more differences than similarities? Explain each question thoroughly.
3. The elements you observed are all period 3 elements. Based on your data and observations from Parts I and II, what trends do you notice as you move across a period on the periodic table?