

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Block: \_\_\_\_\_

## Indicators of Chemical Change Lab

A chemical change occurs when a substance's composition is changed. In other words, chemical bonds are broken and/or new bonds are formed to create a new substance with a different chemical composition. There are four main indicators of chemical change. Sometimes only one indicator occurs while other times, multiple indicators will occur. When one or more indicators occur, a chemical change (reaction) has most likely happened.

In this lab, you will explore and observe various indicators of chemical change. All substances in this lab will react together when mixed, thus any observations made can be considered indicators of chemical change.

### **Safety:**

Safety goggles must be worn at all times. Hydrochloric acid (HCl) and sodium hydroxide (NaOH) are highly corrosive. They cause severe skin and eye burns and damage. All other solutions cause skin irritation. Immediately wash any solutions off your skin under lots of running water. Report all spills, exposures, and accidents to the instructor immediately.

### **Clean-up:**

Wash and return all materials as instructed. Thoroughly wash hands with soap and water at the conclusion of the lab.

### Part 1: Citric Acid Reaction

Never pour solutions back into the original stock container. Ensure all caps are returned to the appropriate bottle immediately after use.

### **Materials:**

- Small beaker
- Thermometer
- Balance
- Scoopula
- 10 mL graduated cylinder
- Citric acid
- Baking soda

### **Procedure:**

1. Obtain a clean small beaker, graduated cylinder, and thermometer.
2. Measure 5 mL of citric acid into the graduated cylinder.
3. Measure and record the initial temperature of the citric acid.
4. Measure about 3 grams of baking soda into the small beaker.
5. Carefully pour the citric acid into the beaker of baking soda.
6. Measure and record the final temperature of the contents in the beaker.
7. Record any other observations.
8. Discard the contents of the beaker down the sink.
9. Wash and return the beaker, graduated cylinder, and thermometer.

**Data:**

|   |  |
|---|--|
| Volume of citric acid                               |  |
| Initial temperature of citric acid                  |  |
| Mass of baking soda                                 |  |
| Final temperature of products                       |  |
| Other observations upon mixing of the two reactants |  |

**Data Analysis:**

Based on your observations, describe some possible chemical change indicators.

## Part 2: The Test Tube Reaction Series

A series of reactants will be added to the same test tube. It is important to follow the order outlined in the procedure below. Return and secure all dropper tops to the appropriate bottles to avoid cross contamination.

### **Materials:**

- Test tube
- Test tube rack
- 0.1 M  $\text{CuSO}_4$  (copper sulfate)
- 0.1 M  $\text{Na}_2\text{CO}_3$  (sodium carbonate)
- 1 M HCl (hydrochloric acid)
- 1 M NaOH (sodium hydroxide)

### **Procedure:**

1. Obtain a clean test tube and rack.
2. Add 10 drops of 0.1 M  $\text{CuSO}_4$  into the test tube.
3. Record the color and other observations of the contents of the test tube.
4. Add 10 drops of 0.1 M  $\text{Na}_2\text{CO}_3$  into the test tube.
5. Gently shake the test tube to thoroughly mix the reactants.
6. Record the color and other observations of the contents of the test tube.
7. Add 10 drops of 1 M HCl into the test tube.
8. Gently shake the test tube to thoroughly mix the reactants.
9. Record the color and other observations of the contents of the test tube.
10. Add 10 drops of 1 M NaOH into the test tube.
11. Gently shake the test tube to thoroughly mix the reactants.
12. Record the color and other observations of the contents of the test tube.
13. Discard the contents of the test tube down the sink.
14. Wash and return the test tube and rack.

**Data:**

| Reagent Added to Test Tube                     | Color After Addition | Other Observations |
|--|----------------------|--------------------|
| 10 drops 0.1 M CuSO <sub>4</sub>               |                      |                    |
| 10 drops 0.1 M Na <sub>2</sub> CO <sub>3</sub> |                      |                    |
| 10 drops 1 M HCl                               |                      |                    |
| 10 drops 1 M NaOH                              |                      |                    |

**Data Analysis:**

Based on your observations, describe some possible chemical change indicators.

**Conclusion:**

1. How would one be able to tell that a chemical change (reaction) has occurred? List the four main chemical change indicators.
  
  
  
  
  
  
  
  
  
  
2. When water is brought to a boil, the temperature rises. Based upon this observation and what you know about chemical and physical changes, can one assume that a chemical change has occurred when water boils? Explain your reasoning.