

Endothermic and Exothermic Reaction Lab

Introduction:

Many chemical reactions release energy in the form of heat, light, or sound. These are exothermic reactions. Exothermic reactions may occur spontaneously. They are denoted by a negative heat flow (heat is lost to the surroundings). In the lab, exothermic reactions produce heat or may even be explosive. Other chemical reactions absorb energy in order to proceed, these are endothermic reactions. Endothermic reactions cannot occur spontaneously. Work must be done in order to get these reactions to occur. When endothermic reactions absorb energy, a temperature drop is measured during the reaction. Endothermic reactions are characterized by positive heat flow (into the reaction). This lab allows students evaluate an endothermic and an exothermic reaction.

Part 1: Endothermic Reaction

Materials

- Thermometer
- Small Styrofoam Cup
- 500mL Beaker
- 25mL 0.5 M Citric Acid Solution
- 15g of Baking Soda
- Stirring Rod
- Elastic Gloves
- Paper Towels
- Safety Goggles

Procedure:

1. Place the Styrofoam cup within the beaker.
2. Add the 25mL of citric acid to the cup.
3. Record the temperature of the fluids in the cup. Complete this step two additional times, and then calculate the average value.
4. Mix the 15g of baking soda to the cup using the stirring rod.
5. Record the temperature 30 seconds after the mixture is made. Complete this step two additional times, and then calculate the average value.
6. Record any observations made during the experiment.

Data:

Data Table:

	Trial 1	Trial 2	Trial 3	Average
Temperature Before Mixture				
Temperature After Mixture				
Temperature Change				

Observations:

Analysis:

1. Create a hypothesis for this reaction.
2. What are common uses for citric acids?
3. What is the word formula of the reaction?
4. What is the chemical reaction of the reaction? Balance the reaction.
5. What type of reaction was witnessed?
6. Why was the mixture stirred?
7. What was the temperature change in the reaction?
8. Explain why the temperature changed.
9. Why was the Styrofoam cup used?
10. What other examples of this reaction have you observed before?

Part 2: Exothermic Reaction

Materials

- Thermometer
- 50mL Beaker
- Sucrose, 10g
- Water, 1mL
- Sulfuric Acid 18M, 10mL
- Stirring Rod
- Elastic Gloves
- Paper Towels
- Safety Goggles

Procedure:

1. Place 10g of sucrose in the glass beaker.
2. Add 1mL of water and stir.
3. Record the temperature of the fluids in the cup.
4. Complete this step two additional times, and then calculate the average value.
5. Pour 10mL of sulfuric acid onto the sugar mixture.
6. Stir quickly then back away from the reaction.
7. After the reaction is completed, wait 30 seconds, and then record the temperature.
8. Complete this step two additional times, and then calculate the average value.
9. Record any observations made during the experiment.

Safety:

- Sulfuric acid is severely corrosive to eyes, skin and other tissue extremely hazardous in contact with finely divided materials, carbides, chlorates, nitrates, and other combustible materials. Wear a chemical-resistant apron and chemical-resistant gloves.
- Use tongs to handle the carbon product. The carbon product will contain unreacted sulfuric acid. Neutralize acid spills and the carbon product with sodium carbonate.
- The steam produced by the reaction can cause burns. Do not stand over the reaction vessel or inhale the steam produced. Perform this experiment in a fume hood.

Data:

Data Table:

	Trial 1	Trial 2	Trial 3	Average
Temperature Before Mixture				
Temperature After Mixture				
Temperature Change				

Observations:

Analysis:

1. Create a hypothesis for this reaction.

2. Describe the product of the reaction. Predict the composition of the product.
3. Predict the gasses being released.
4. What is the word formula of the reaction?
5. What is the chemical reaction of the reaction? Balance the reaction.
6. What type of reaction was witnessed?
7. Why was the mixture stirred?
8. What was the temperature change in the reaction? Explain why the temperature changed.
9. What other examples of this reaction have you observed before?
10. What are common uses for sulfuric acid?

Part 3: Write an essay describing the two experiments. Compare and contrast the data collected, type of experiment, products formed, and real-life applications. Essay should be at least ____ sentences and include ____ citations.