

Endothermic vs. Exothermic Lab

PRE-LAB DISCUSSION

All chemical reactions release or absorb energy. In fact, all chemical reactions release and absorb energy when bonds between atoms are broken and bonds are made.

PRE-LAB QUESTIONS

1. What is an endothermic reaction?
2. What is an exothermic reaction?
3. When an endothermic reaction takes place what will happen to the temperature of a thermometer nearby the reaction?
4. When an exothermic reaction takes place what will happen to the temperature of a thermometer nearby the reaction?

PURPOSE

After examining each reaction in the laboratory, you should be able to classify each reaction as exothermic or endothermic.

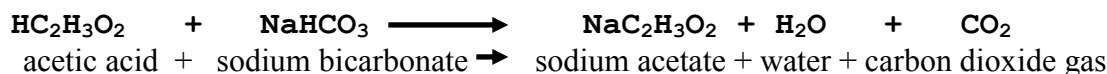


SAFETY

The chemicals can be toxic, please treat with respect and care. Rinse skin immediately upon contact. You **MUST** wear your goggles and apron at all times. Be sure to rinse and dry your thermometer after each use.

PROCEDURE

In Part I, you will study the reaction between acetic acid and sodium bicarbonate (baking soda). An equation for the reaction is:



Step 1: Add approximately 5 ml of acetic acid to a large test tube.

Step 2: Record the temperature of the acetic acid.

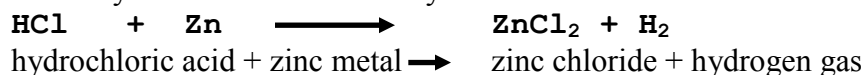
Step 3: Add a small scoop of sodium bicarbonate to the acetic acid. Quickly recover the container with the sodium bicarbonate.

Step 4: Gently stir (with the thermometer) until all sodium bicarbonate has been dissolved. Observe the temperature, record any temperature change and other observations.

Step 5: Discard the solution into the correct area and clean your equipment with soap and water. Dry it also.



In Part 2, you will study the reaction between hydrochloric acid and zinc metal. An equation for the reaction is



Step 1: Add approximately 5 ml of hydrochloric acid to a large test tube.

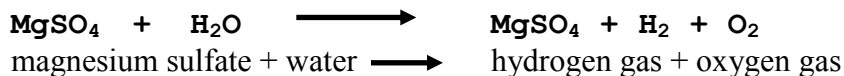
Step 2: Record the temperature of the hydrochloric acid.

Step 3: Add a small piece of zinc to the hydrochloric acid.

Step 4: Gently stir (with the thermometer) until all zinc has been dissolved.
Observe the temperature, record any temperature change and other observations.

Step 5: Discard the solution into the correct area and clean your equipment with soap and water. Dry it also.

In Part 3, you will study the reaction between magnesium sulfate (Epsom salt) and water. An equation for the reaction is:



Step 1: Add approximately 10 ml of water to a large test tube.

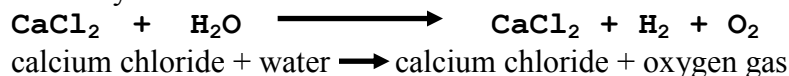
Step 2: Record the temperature of the water.

Step 3: Add a small scoop of magnesium sulfate to the water. Quickly recover the container with the magnesium sulfate.

Step 4: Gently stir (with the thermometer) until all magnesium sulfate has been dissolved.
Observe the temperature, record any temperature change and other observations.

Step 5: Discard the solution into the correct area and clean your equipment with soap and water. Dry it also.

In Part 4, you will study the reaction between calcium chloride and water. An equation for the reaction is:



Step 1: Add approximately 10 ml of water to a large test tube.

Step 2: Record the temperature of the water

Step 3: Add a small scoop of calcium chloride to the water. Quickly recover the container with the calcium chloride.

Step 4: Gently stir (with the thermometer) until all calcium chloride has been dissolved.
Observe the temperature, record any temperature change and other observations.

Step 5: Discard the solution into the correct area and clean your equipment with soap and water. Dry it also.



OBSERVATIONS

Example Data Table

	Reactants*	Products*	Initial Temperature	Final Temperature	Detailed Observations
Part 1					
Part 2					
Part 3					
Part 4					

*Be sure to balance the equations first!



ANALYSIS

1. The reaction of sodium bicarbonate and acetic acid is exothermic or endothermic? What evidence do you have?
2. The reaction of zinc metal and hydrochloric acid is exothermic or endothermic? What evidence do you have?
3. The reaction of magnesium sulfate and water is exothermic or endothermic? What evidence do you have?
4. The reaction of calcium chloride and water is exothermic or endothermic? What evidence do you have?

APPLICATION

5. Calcium chloride is as an ice-melting compound on sidewalks and city streets. Explain what is happening (use one of the terms-exothermic or endothermic in your explanation).
6. Does the energy go from the surrounding to the chemicals or from the chemicals to the surroundings in an exothermic reaction?
7. Classify each of the following as an exothermic or endothermic process.

Melting ice cubes _____

Baking Bread _____

Burning a candle _____

Splitting a gas molecule apart _____

Evaporation of water _____

Formation of snow in clouds _____