



## Endothermic and Exothermic Reactions

### Standard/Benchmarks:

- Use mathematical expressions and techniques to explain data and observations and to communicate findings
- Know the forms and properties of matter and how matter interacts
- Explain the physical processes involved in the transfer, change, and conservation of energy
- Know that scientific knowledge is built on questions posed as testable hypotheses, which are tested until the results are accepted by peers

### Objective:

Observe both endothermic and exothermic reactions, and describe them in both qualitative and quantitative terms

### Prerequisite Learning:

Lab safety

Using a thermometer

Understanding how a chemical reaction occurs

### Skills/Concepts Introduced:

Heat is a form of energy

Energy is required to break bonds in reactants, and energy is also released by products

### Activity Overview:

The students are asked to perform two chemical reactions, and determine which is exothermic and which is endothermic

### Preparation:

provide materials listed below

**Time Allotment:** ~90 minutes



## Complete lab: Exothermic and Endothermic Reactions

Today, your group will perform both an endothermic and exothermic reaction. During this activity, you will have to measure, observe, record, and interpret.

### Materials:

SAFETY GOGGLES

2 small sheets of waxed paper

balance

graduated cylinder

thermometer

stopwatch

2 styrofoam cups with lids

30 mL vinegar (part 1)

1 g baking soda (part 1)

30 mL hydrogen peroxide (part 2)

1 g baking soda (part 2)

When you are completed with the activities, liquids may be poured down the drain, and solids may be disposed in a waste basket.

### Experiment 1

- 1) Pour 30 mL of vinegar into a styrofoam cup.
- 2) Use a thermometer to record the initial temperature.
- 3) Measure 1 g of baking soda on a piece of waxed paper on a balance (remember to subtract the mass of the paper).

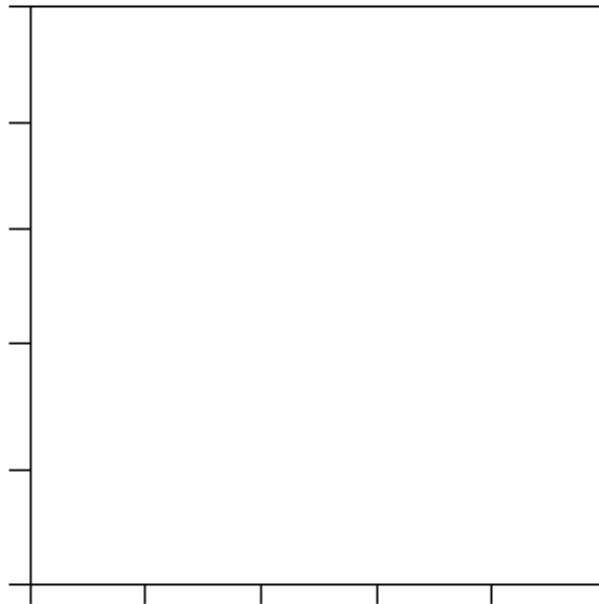


- 4) Stir in the baking soda.
- 5) Record the temperature reading in the table at 0, 0.5, 2.5, and 5 minutes.
- 6) Make a graph of these data in terms of temperature change over time, and be sure to add numbers and labels for each axis.

data table

0 min	
0.5 min	
2.5 min	
5.0 min	

temperature of reaction over time





## Experiment 2

- 1) Pour 30 mL of hydrogen peroxide into a styrofoam cup.
- 2) Use a thermometer to record the initial temperature.
- 3) Measure 1 g of yeast on a piece of waxed paper on a balance  
(remember to subtract the mass of the paper).
- 4) Stir in the yeast.
- 5) Record the temperature reading in the table at 0, 0.5, 2.5, and 5 minutes.
- 6) Make a graph of these data in terms of temperature change over time, and be sure to add numbers and labels for each axis.

data table

0 min	
0.5 min	
2.5 min	
5.0 min	

## Questions

Define “endothermic” and “exothermic” reactions (hint: break the word apart).

Describe the temperature trend in experiment 1, and explain which type of reaction it is.



Describe the temperature trend in experiment 2, and explain which type of reaction it is.

Which reaction happened faster?

What does reaction speed tell you about the strength of the bonds of the reactants?

How do you know when the reactions are finished?

Where might errors have occurred during the experiments?

Source: McDougal, Littell, Eds. Physical Science