

Endothermic and Exothermic Reactions Experiment

Every chemical reaction that exists is one of two things: **endothermic** or **exothermic**. The Greek root *therm* means temperature or heat, which gives us a clue about all reactions: there is energy exchange! *Endo* means "within" while *exo* means "outside," so these types of reactions are opposite.

Endothermic reactions are those which absorb heat during the reaction. They take in more energy than they give off, which leaves the surroundings cooler than the starting point. Evaporation of water by sunlight is a great example. The sun and the liquid water combine and the water absorbs energy and eventually becomes as gas.

Exothermic reactions are exactly the opposite. While they take some energy to get going, called the activation energy of reaction, these reactions give off heat during the reaction. Good examples of exothermic reactions are explosions like fireworks or combustion in engines.

Problem:

Observe endothermic and exothermic reactions and determine which absorb or produce the most energy. Which reactions will be endothermic? Which reactions will be exothermic? Why?

Materials

- Clear glass or cup
- Water
- White vinegar
- Baking Soda
- Epsom Salts
- Hydrogen peroxide
- Steel wool
- Dry yeast
- Thermometer

Procedure

1. The table below has a list of liquids to combine with solids. Pick a combination, and fill the glass or cup about half way with the liquid.
2. Insert the thermometer in the liquid and record the temperature.
3. Add a tablespoon of the dry material. Record your observations.
4. Wait 2 minutes and record the final temperature of the solution. *Why should you wait the same amount of time for each trial?*
5. Discard the solution and try another combination.
6. For each trial, calculate the change in temperature of the reaction by subtracting the final value from the initial value.

Try any of these combinations:

Liquid	Additive
Water	Epsom salt
Water	NoSalt salt alternative
Vinegar	Baking soda
Vinegar	Steel wool pad
Hydrogen Peroxide	Dry yeast
Water	Ice



Liquid	Additive
Water	Epsom Salt
Water	Ice
Vinegar	Baking Soda
Vinegar	Steel Wool
Peroxide	Dry yeast
Acetone	Shampoo
Water	NoSalt

Acetone *do this one outside!*	Half a Styrofoam packing peanut
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Results

Endothermic reactions: water and Epsom salt, water and NoSalt, water and ice

Exothermic reactions: vinegar and baking soda, vinegar and steel wool, hydrogen peroxide and dry yeast, acetone and Styrofoam

Graph your results! Make a bar for each reaction and draw a line from 0 to the temperature change. Be sure to label each line!

Why?

Energy can be a reactant or byproduct of any reaction. While all reactions require some amount of energy to get going, called the activation energy, whether the reaction is endothermic or exothermic depends on where energy fits into the equation. For example:

Endothermic reactions:

reactants + energy = products

And for Exothermic reactions:

reactants = products + energy

It is important to measure the time for each experiment because some may go on even longer than 2 minutes, or be done far before 2 minutes have passed. Taking the temperature measurements at the same time for each trial allows you to compare the combinations. Time is the control variable.