

# Chemical reactions that involve heat

## Summary

Through demonstration, discussion and activities, students will be introduced to endothermic and exothermic reactions.

## Time Frame

1 class periods of 90 minutes each

## Materials

Per group:

3 plastic foam cups

amonia solution

vinegar

hydrogen peroxide

manganese dioxide

plaster of paris

water

three plastic spoons

wooden splint

thermometer

50-mL graduated cylinder

## Student Prior Knowledge

\*Chemical reactions involve breaking and reforming new bonds.

\*Heat is a form of energy.

## Intended Learning Outcomes

\*The learner will be able to describe the difference between exothermic and endothermic reactions.

\*The learner will be able to interpret data from charts and diagrams and make comparisons.

\*The learner will be able to make observations in an exploration activity.

## Instructional Procedures

Bell Ringer:

Balance the following equations

Introduction: 20 minutes

Light a sparkler and ask: What is happening?

Is this reaction using energy or producing energy? How can you tell?

A simple sparkler contains potassium perchlorate, aluminum and dextrin. The  $\text{KClO}_4$  provides the oxygen to cause a fire, dextrin (a sugar) provides the fuel and is also a binder to hold the whole thing together, and aluminum creates the bright shimmering sparks.

Can you think of other processes that produce energy in the form of heat?

Remember from our last chapter that in chemical reactions, bonds are broken, atoms are rearranged, and new bonds are formed. Bond breaking requires energy and bond formations releases energy.

Almost all chemical reactions either absorb or release energy.

Reactions that release heat, like sparklers are called exothermic reactions. It releases heat to its' surroundings.

The opposite of an exothermic reaction is a reaction that absorbs heat. Reactions than absorb heat

are called endothermic reactions.

Activity: 40 minutes to model materials usage, read procedure, gather supplies, perform experiments, collect data, put away supplies and answer questions.

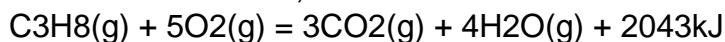
Make sure students put on goggles and aprons before conducting this group activity. Groups should be 4-5 students. Give each student their own lab worksheet and table to fill out.

Reinforce: 20 minutes

Use transparency during discussion

### Endothermic Reactions

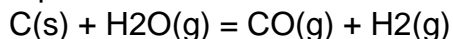
A camping stove uses oxygen from the air and a fuel such as propane to heat food and water. When mixed and ignited, propane and oxygen undergo a chemical reaction that generates heat. This is a combustion reaction, it's exothermic.



Are molecular bonds being formed or broken in this reaction?(both-but heat is produced because the the energy released as new bonds are formed in the products is greater than the energy required to break the old bonds in the reactants.)draw molecular diagram on board

notice that the "heat" is on the right side of the equation. This means that heat is released.

An endothermic reaction equation has heat in it too. Where do you think the heat goes in this equation?



113 kJ goes on the left side because that is how much heat is absorbed in this reaction. This is a reaction that is actually used to produce water gas. (mixture of CO and Hydrogen)It is prepared by passing steam over hot coal (C). This reaction absorbs heat, so it is endothermic.

What happens to the heat that is absorbed in this reaction? The energy released as new bonds are formed in the products is less than the energy required to break the bonds in teh reactants. This energy must be supplied in order for trhe reaction to proceed. The added heat does not disappear, of course, because energy is conserved. Instead, it becomes stored in the chemical bonds of the products.

Assess: 10 minutes

What happens in an endothermic reaction? Exothermic?

Why do almost all chemical reactons involve changes in energy?(All chemical reactions involve breaking existing chemical bonds and forming new bonds between atoms. When bonds are broken or reformed, energy is transferred.)

On which side of a chemical equation does the energy term appear in an exothermic reaction?

Endothermic?

Collect lab sheets.

### Authors

[jill buckmiller](#)