Energy Changes

Energy changes in chemical reactions

Some chemical reactions give out energy. For example:

- Magnesium burning – this reaction gives out heat and light energy.
- A candle burning – this reaction gives out heat and light energy.
- A battery – this reaction gives out electrical energy.
- A firework or bomb – this reaction gives out light, heat and sound energy.

Exothermic reactions

Reactions that give out heat energy are called **exothermic**.

Combustion is an example of an exothermic reaction. For example, when a piece of wood is burned, heat is produced.

Reactions that take in heat energy are called **endothermic**.

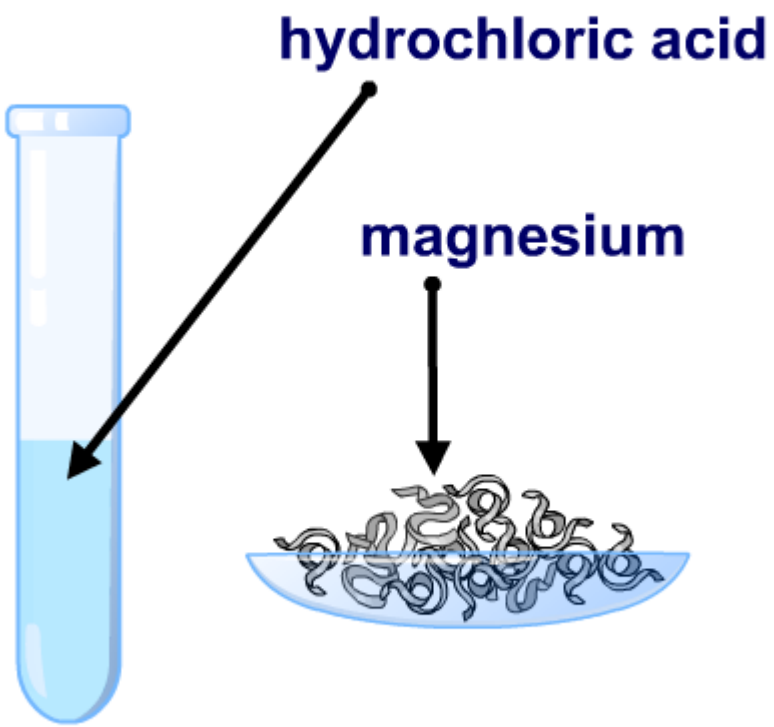
Instant, squeeze-activated ice packs are an example of an endothermic reaction.

Endothermic or exothermic?

Is this reaction exothermic or endothermic?

When magnesium reacts with hydrochloric acid it produces a temperature change.

Click "**play**" to find out if the reaction is endothermic or exothermic.

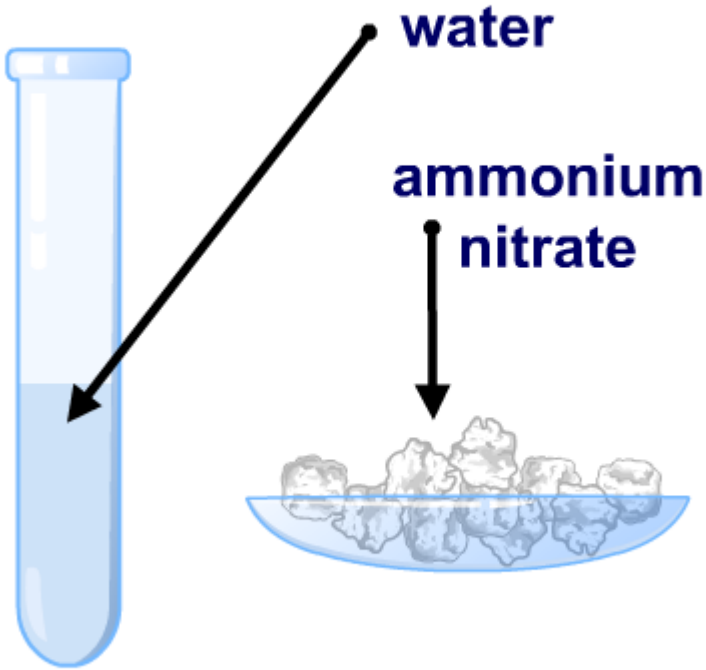


Exothermic or endothermic?

Is this reaction exothermic or endothermic?

When ammonium nitrate reacts with water it produces a temperature change.

Click "**play**" to find out if the reaction is endothermic or exothermic.



Endothermic or exothermic?

Are these reactions endothermic or exothermic?

Reaction	Start temp. (ºC)	End temp. (ºC)	Reaction type
A	21.0ºC	25.6ºC	?
B	21.1ºC	14.9ºC	?
C	21.0ºC	-1.0ºC	?
D	20.7ºC	73.2ºC	?
E	20.9ºC	21.3ºC	?

?

C solve

Types of chemical reactions

There are many different types of chemical reactions.

For example, **oxidation** is the reaction of a substance with oxygen.

What is the word equation for the oxidation of copper?

copper + oxygen → copper oxide

Reduction is the opposite of oxidation. What do you think is formed in the reduction of magnesium oxide?

magnesium oxide → magnesium + oxygen

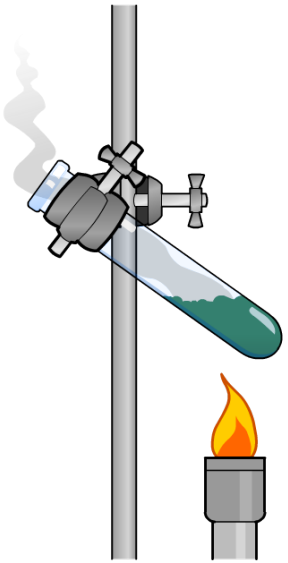
Heating copper carbonate

When you heat copper carbonate, it breaks up to form copper oxide and carbon dioxide.

What is the word equation for this reaction?

copper carbonate → copper oxide + carbon dioxide

This reaction is called **thermal decomposition**. Can you explain why?



Thermal means heat, and decomposition means breaking into smaller pieces.

So in a thermal decomposition reaction, heat is used to break a substance into smaller pieces.

Combustion

A common **combustion** reaction is gasoline burning with oxygen in a car engine.

The products of this reaction are carbon dioxide and water.

What is the word equation for this combustion reaction?

petrol + oxygen → carbon dioxide + water

Combustion involves reacting with oxygen, so it can also be classified as another type of reaction. Which one?

Displacement

Displacement reactions are commonly used to obtain pure metals from their ores.

Displacement means replacing something with something else.

For example, copper can be displaced from copper sulfate by reacting it with zinc.

copper sulfate + zinc → zinc sulfate + copper

What would be displaced in the reaction between zinc sulfate and magnesium?

zinc sulfate + magnesium → magnesium sulfate + zinc

Neutralization

What is **neutralization**?

Neutralization is the reaction between an acid and an alkali to make a neutral substance.

In the neutralization reaction between hydrochloric acid and sodium hydroxide, the products are sodium chloride and water.

What is the word equation for this reaction?

hydrochloric acid + **sodium hydroxide** → **sodium chloride** + **water**

Which type of reaction?

Match the word equations to the types of reaction

methane + oxygen → carbon dioxide + water	thermal decomposition
calcium carbonate → calcium oxide + carbon dioxide	neutralization
iron oxide + carbon → iron + carbon dioxide	reduction or displacement
magnesium sulfate + sodium → magnesium + sodium sulfate	displacement
sulfuric acid + sodium hydroxide → sodium sulfate + water	combustion or oxidation

?

solve