





CHAPTER 9	Endothermic and Exothermic Reactions Quiz	BLM 9.1.3
ASSESSMENT		

Read the following summary of exothermic and endothermic reactions. Then answer the questions on the next page.

- A chemical change is always accompanied by a change in energy because the atoms or ions that make up the reactants are rearranged.
- During a reaction, chemical bonds that hold the reactant atoms or ions together must be broken and new chemical bonds must be formed within the product substance(s).
- The breaking of chemical bonds requires the input of energy and is defined as an *endothermic process*.
- The formation of chemical bonds releases energy and is defined as an *exothermic process*.
- Since any chemical change involves both the breaking and formation of chemical bonds, there are two possible outcomes of any chemical change.
- The overall change is exothermic if more energy is released to form the product chemical bonds than is required to break the reactant chemical bonds.
- The overall change is endothermic if less energy is released to form the product chemical bonds than is required to break the reactant chemical bonds.
- The energy that is released or absorbed is related to the external environment of the chemical reaction. Endothermic reactions absorb thermal energy from the surrounding environment and result in a decrease in temperature. Exothermic reactions, on the other hand, release thermal energy to the surrounding environment and result in an increase in temperature.

Type of reaction	Breaking chemical bonds (reactants)	Forming chemical bonds (products)	Overall energy change
exothermic			energy released
endothermic			energy absorbed

1. (a) What is the source of the energy that is released in an exothermic reaction? What absorbs the energy that is released?

- (b) What is the source of the energy that is absorbed in an endothermic reaction?

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2. Classify each reaction as either endothermic or exothermic, and briefly explain your answer.

Description of chemical reaction	Endothermic or exothermic?	Explanation
A piece of paper is ignited and burns with a bright flame.		
Pentaborane (a colourless liquid), B_5H_9 , reacts violently with oxygen gas to form solid boric oxide, B_2O_3 , and water, typically bursting into flame and often exploding.		
Pure iron metal is formed and carbon dioxide is released when iron(III) oxide ore is heated to a very high temperature in the presence of solid carbon.		
Sodium hydroxide solution and hydrochloric acid solution are mixed. The temperature of the mixture increases.		
Mixing ammonium thiocyanate and barium hydroxide octahydrate in a beaker causes water on the outside of the beaker to freeze.		
The high temperature in an oven causes baking soda (sodium hydrogencarbonate) to break down into carbon dioxide, water, and sodium carbonate.		

3. A student claims that the reaction of butane gas and oxygen gas must be endothermic since a spark is needed to ignite the butane gas in a lighter. Do you agree or disagree with this claim? Explain your answer.