

Controlling Chemical Reactions (pages 204–209)

Energy and Reactions (pages 205–206)

Key Concepts: All chemical reactions need a certain amount of activation energy to get started.

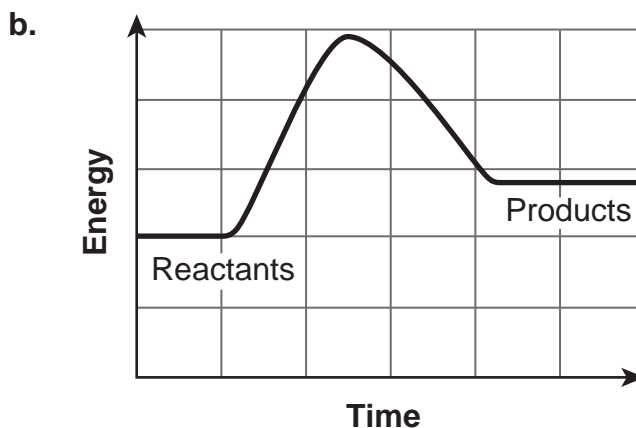
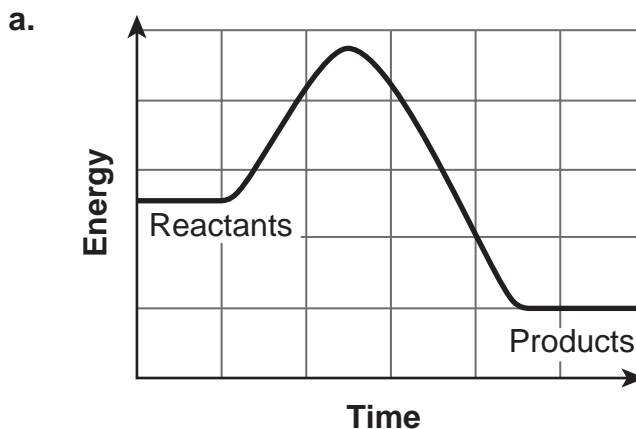
- **Activation energy** is the smallest amount of energy needed to start a chemical reaction.
- All chemical reactions need a little energy to get started. This energy is used to break the chemical bonds of the reactants. Then, the atoms begin to form the chemical bonds of the products.
- In exothermic reactions, the products have less energy than the reactants. The products have less energy because the reaction gives off heat energy.
- Endothermic reactions need activation energy plus energy to keep the reaction going. The products have more energy than the reactants because energy is added to the reaction.

Answer the following questions. Use your textbook and the ideas above.

1. Circle the letter of each sentence that is true about activation energy.
 - a. All chemical reactions need activation energy.
 - b. Exothermic reactions do not need activation energy.
 - c. Endothermic reactions need activation energy and energy to keep going.

Chemical Reactions ▪ *Adapted Reading and Study*

2. Look at the graphs below. Circle the letter of the graph in which the products have less energy than the reactants.



3. Draw a line from each term to its meaning.

Term

activation energy

endothermic
reactionexothermic
reaction**Meaning**

a. the products have more
energy than the reactants

b. the products have less
energy than the reactants

c. required to start a chemical
reaction

Chemical Reactions ▪ *Adapted Reading and Study***Rates of Chemical Reactions** (pages 207–209)

Key Concept: Chemists can control rates of reactions by changing factors such as surface area, temperature, and concentration, and by using substances called catalysts and inhibitors.

- Chemical reactions do not all occur at the same rate. Some reactions, like explosions, are very fast. Other reactions, like rusting metal, are very slow.
- Chemists can speed up reactions or slow them down. One way to speed up a reaction is to increase the surface area. When you break a solid into small pieces, more particles can react at once.
- Chemists also increase temperature to speed up a reaction. At higher temperatures, particles move faster and have more chances to react. Chemical bonds also break more easily. At lower temperatures, reactions slow down.
- **Concentration** is the amount of a substance in a given volume. Increasing the concentration of the reactants speeds up a reaction. More particles can react at once.
- A **catalyst** (KAT uh list) is a material that increases the speed of a reaction by lowering the activation energy. A catalyst does this by bringing the reactants close together. A catalyst is not changed in a reaction, so a catalyst is not a reactant.
- An **inhibitor** is a material used to slow down a reaction. Most inhibitors work by keeping reactants away from each other.

Answer the following questions. Use your textbook and the ideas above.

4. Is the following sentence true or false? All chemical reactions occur at the same speed. _____

Chemical Reactions ▪ *Adapted Reading and Study*

5. Complete the table. Write *F* if the chemical reaction will go faster. Write *S* if the chemical reaction will slow down.

Controlling Speeds of Chemical Reactions	
Reaction Conditions	Reaction Occurs Faster or Slower?
Surface area increases	a. _____
Temperature increases	b. _____
Temperature decreases	c. _____
Concentration increases	d. _____

6. Draw a line from each term to its meaning.

Term	Meaning
concentration	a. a material that slows down a reaction
catalyst	b. a material that speeds up a reaction
inhibitor	c. the amount of a substance in a given volume