Lesson 1

Before You Read
1. Disagree
2. Disagree

Read to Learn
1. A physical change does not produce new substances. During a chemical change, one or more substances change into new substances.
2. Chemical and physical properties change.
3. A fire gives off thermal energy and light.
4. Changes in properties, such as color, odor, formation of bubbles, and formation of a precipitate; changes in energy, such as warming or cooling and release of light.
5. Atoms rearrange and form new substances.
6. The number of hydrogen atoms and oxygen atoms before and after the reaction is the same.
7. It means the molecule has two oxygen atoms.
8. C = 1 carbon atom; Co = 1 cobalt atom; CO = 1 carbon atom and 1 oxygen atom; CO₂ = 1 carbon atom and 2 oxygen atoms.
9. Students should highlight the arrow.
10. It equals the total mass of the products.
11. 5
12. The number of atoms of each element is the same on each side of the arrow.
13. Yes, because the equation is balanced. One atom of carbon and two atoms of oxygen are on each side of the arrow.
14. Students should circle O₂ and O.
15. 3; there are three molecules of oxygen.
16. oxygen; hydrogen

After You Read
1. Possible answer: A chemical equation is a way of describing a chemical reaction.
2. Both sides: C = 1, H = 4, O = 4; balanced.
3. This is a physical change, because the water is changing state from a liquid to a gas.

Lesson 2

Before You Read
3. Disagree
4. Agree

Read to Learn
1. one
2. In synthesis, two or more reactants form one product. In decomposition, one reactant forms two or more products.
3. copper and silver
4. synthesis, decomposition, replacement, combustion
5. oxygen

After You Read
1. Possible answer: Combustion usually releases energy as thermal energy and light energy.
2. top box: combustion; left-side box: synthesis; right-side box: decomposition; bottom-left box: single-replacement; bottom-right box: double-replacement

Lesson 3

Before You Read
5. Agree
6. Disagree

Read to Learn
1. because when chemical bonds break or form, energy is released or absorbed
2. The upward arrow indicates that energy is absorbed in the reaction.
3. exothermic, because the reaction releases a lot of energy
4. The downward arrow indicates that energy is released in the reaction.
5. An endothermic reaction absorbs energy; an exothermic reaction releases energy.
6. because the reaction requires higher activation energy than is provided in the book’s environment
7. Exothermic reactions need activation energy to start but then release energy.
8. 8 cm²
9. because pressure pushes the gas particles closer together, which makes more collisions occur between gas particles
10. by lowering the activation energy
11. c. surface area
12. surface area, temperature, concentration, pressure, presence of catalysts, presence of inhibitors

After You Read
1. Possible answer: An enzyme is a type of catalyst that works within living cells.
2. To slow reaction rate: All factors decrease.
   To speed up reaction rate: All factors increase.
3. Students should record a question from their partner’s quiz and answer it.