Answer Key
Energy, Work, and Simple Machines

Lesson 1
Before You Read
1. Disagree
2. Agree

Read to Learn
1. the ability to cause a change
2. Wind generates energy only when the wind blows, so it provides an inconsistent supply of energy.
3. the kinetic energy of moving electrons
4. the science book, because it is higher above Earth’s surface
5. the energy that is stored in the bonds between atoms
6. Answers will vary. Students should list three sources of food energy.
7. Nuclear fusion joins the nuclei of atoms. Nuclear fission breaks nuclei apart.
8. potential energy and kinetic energy
9. Mechanical energy relates to a system of objects. Thermal energy relates to particles that make up an object.
10. thermal energy of particles in Earth’s interior
11. Students should highlight the magnetic field.
12. potential energy, gravitational potential energy, chemical energy, nuclear energy, mechanical energy, thermal energy, geothermal energy, sound energy, seismic energy, and radiant energy
13. microwaves
14. Possible answers: cooking food, lighting homes, heating and cooling homes, transporting people and products, and manufacturing products.

After You Read
1. Possible answer: Seismic energy comes from the energy released by the movement of Earth’s tectonic plates.
2. kinetic: energy of motion; electric: from moving electrons; potential: stored energy; mechanical: from a system of objects; chemical: stored in bonds between atoms; nuclear: released from the nuclei of atoms; gravitational potential:
from an object’s height above Earth’s surface; thermal: the kinetic and potential energy of particles; geothermal: thermal energy inside Earth; sound: carried by sound waves; seismic: from shifting tectonic plates; radiant: carried by electromagnetic waves

Lesson 2

Before You Read
3. Agree
4. Disagree

Read to Learn
1. Energy can be transformed from one form to another, but it cannot be created or destroyed
2. At the top of the highest hill
3. Possible answers: Chemical energy to electric energy; radiant energy to electric energy; wind’s kinetic energy to electric energy; Earth’s thermal energy to electric energy; gravitational potential energy of water to electric energy
4. The height of the drums increases, so the gravitational potential energy increases. The kinetic energy of the drums also increases.
5. Its energy will increase.
6. \( W = (20 \text{ N}) \times (0.75 \text{ m}) = 15 \text{ J} \)

After You Read
1. Possible answer: During photosynthesis, a plant transforms radiant energy from the Sun into chemical energy.
2. Going up the hill: kinetic energy to gravitational potential energy; going down the hill: gravitational potential energy to kinetic energy
3. Students should write a question about information they marked with a sticky note and answer it.

Lesson 3

Before You Read
5. Disagree
6. Agree

Read to Learn
1. A machine that does work using one movement
2. Possible answers: an inclined plane, a screw, a wedge, a lever, a pulley, a wheel and axle
3. A simple machine uses one motion to accomplish a task, and a complex machine uses several motions.

4. the work a person does on a machine, such as when a window washer uses a pulley system to move a platform

5. by changing the distance the object moves, the size of a force, or the direction of a force

6. The window washer pulls the rope with less force but over a longer distance. This decreases the input force and changes the direction of the force.

7. $60 \text{ J} ÷ 80 \text{ J} = 0.75 = 75\%$

8. because some work is always transformed into waste energy because of friction

9. If one object exerts a force on a second object, the second object exerts an equal and opposite force on the first object.

10. 20 N to the left

**After You Read**

1. Possible answer: A more efficient machine produces more output work per unit of input than does a less-efficient machine.

2. *pulley:* raises flag on flagpole; *lever:* a seesaw; *wedge:* a knife; *screw:* a screw-top bottle; *wheel and axle:* a screwdriver; *lever:* a wheelbarrow