Section 1

What Is Energy?

Reading Preview

Key Concepts

- How are energy, work, and power related?
- What are the two basic kinds of energy?

Key Terms

- energy
- kinetic energy
- potential energy
- gravitational potential energy
- elastic potential energy

Target Reading Skill

Using Prior Knowledge Before you read, look at the section headings and visuals to see what this section is about. Then write what you know about energy in a graphic organizer like the one below. As you read, write what you learn.

What You Know
1. The joule is the unit of work. 2.

What You Learned
1. 2.

Lab zone Discover Activity

How High Does a Ball Bounce?

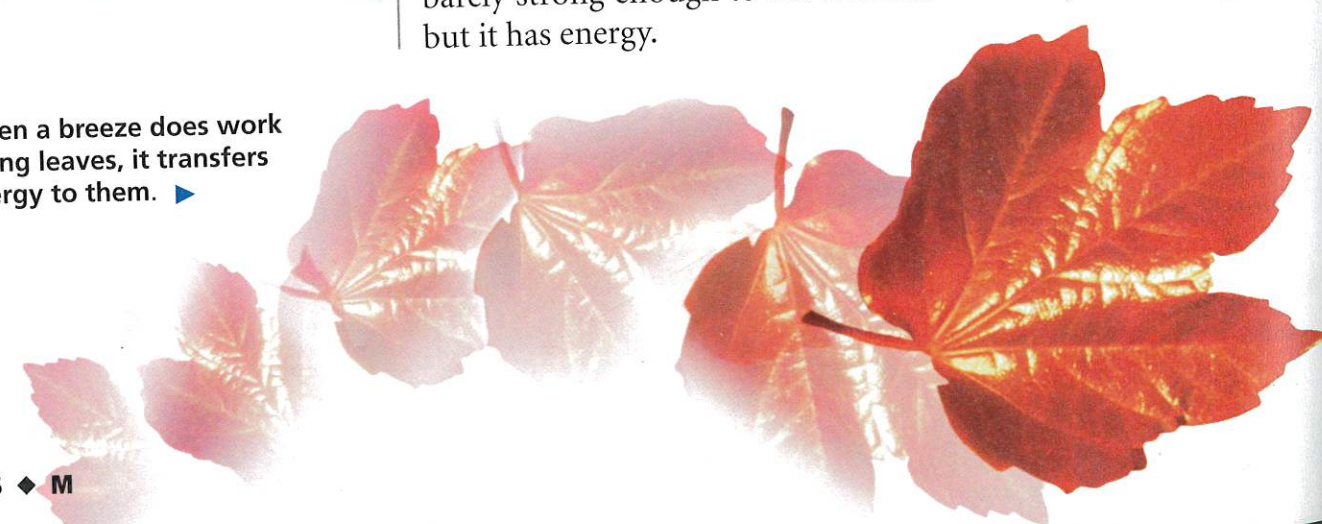
1. Hold a meter stick vertically, with the zero end on the ground.
2. Drop a tennis ball from the 50-cm mark and record the height to which it bounces.
3. Drop the tennis ball from the 100-cm mark and record the height to which it bounces.
4. Predict how high the ball will bounce if dropped from the 75-cm mark. Test your prediction.

Think It Over

Observing How does the height from which you drop the ball relate to the height to which the ball bounces?

Brilliant streaks of lightning flash across the night sky. The wind howls, and thunder cracks and rumbles. Then a sound like a runaway locomotive approaches, growing louder each second. Whirling winds rush through the town. Roofs are lifted off of buildings. Cars are thrown about like toys. Then, in minutes, the tornado is gone.

The next morning, a light breeze carries leaves past the debris. The wind that destroyed buildings hours before is now barely strong enough to move a leaf. Wind is just moving air, but it has energy.



When a breeze does work lifting leaves, it transfers energy to them. ▶

Energy, Work, and Power

When wind moves a house, or even a leaf, it causes a change. In this case, the change is in the position of the object. Recall that work is done when a force moves an object through a distance. The ability to do work or cause change is called **energy.** So the wind has energy.

Work and Energy When an object or living thing does work on another object, some of its energy is transferred to that object. You can think of work, then, as the transfer of energy. When energy is transferred, the object upon which the work is done gains energy. Energy is measured in joules—the same units as work.

Power and Energy You may recall that power is the rate at which work is done. **If the transfer of energy is work, then power is the rate at which energy is transferred, or the amount of energy transferred in a unit of time.**

$$\text{Power} = \frac{\text{Energy transferred}}{\text{Time}}$$

Power is involved whenever energy is being transferred. For example, a calm breeze's power is its rate of energy transfer to lift a leaf a certain distance. The tornado in Figure 1 transfers the same amount of energy when it lifts the leaf the same distance. However, the tornado has a greater power than the breeze because it transfers energy to the leaf in less time.

Reading Checkpoint What is power in terms of energy?

Kinetic Energy

Two basic kinds of energy are kinetic energy and potential energy. Whether energy is kinetic or potential depends on whether an object is moving or not.

A moving object, such as the wind, can do work when it strikes another object and moves it some distance. Because the moving object does work, it has energy. The energy an object has due to its motion is called **kinetic energy.** The word *kinetic* comes from the Greek word *kinetos,* which means "moving."

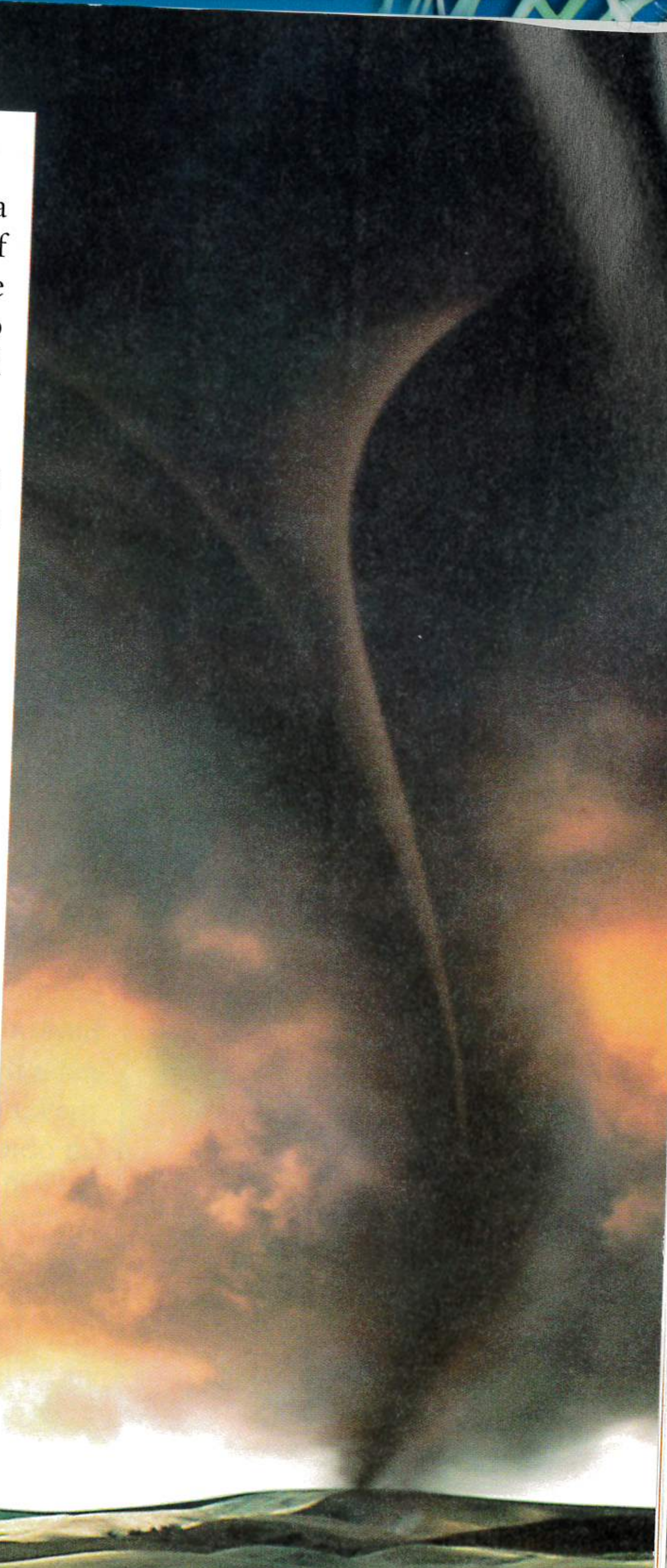


FIGURE 1
Energy and Power
A tornado and a calm breeze each do the same amount of work if they transfer the same amount of energy to a leaf. However, the tornado has a greater power than the breeze because it transfers its energy in less time.
Drawing Conclusions *Why is the same amount of work done on the leaf?*

Math Skills

Exponents

An exponent tells how many times a number is used as a factor. For example, 3×3 can be written as 3^2. You read this number as "three squared." An exponent of 2 indicates that the number 3 is used as a factor two times. To find the value of a squared number, multiply the number by itself.

$$3^2 = 3 \times 3 = 9$$

Practice Problem What is the value of the number 8^2?

Factors Affecting Kinetic Energy The kinetic energy of an object depends on both its mass and its velocity. Kinetic energy increases as mass increases. For example, think about rolling a bowling ball and a golf ball down a bowling lane at the same velocity, as shown in Figure 2. The bowling ball has more mass than the golf ball. If both balls have the same velocity, the bowling ball is more likely to knock down the pins because it has more kinetic energy than the golf ball.

Kinetic energy also increases when velocity increases. For example, suppose you have two identical bowling balls and you roll one ball so it moves at a greater velocity than the other. You must throw the ball harder to give it the greater velocity. In other words, you transfer more energy to it. Therefore, the faster ball has more kinetic energy.

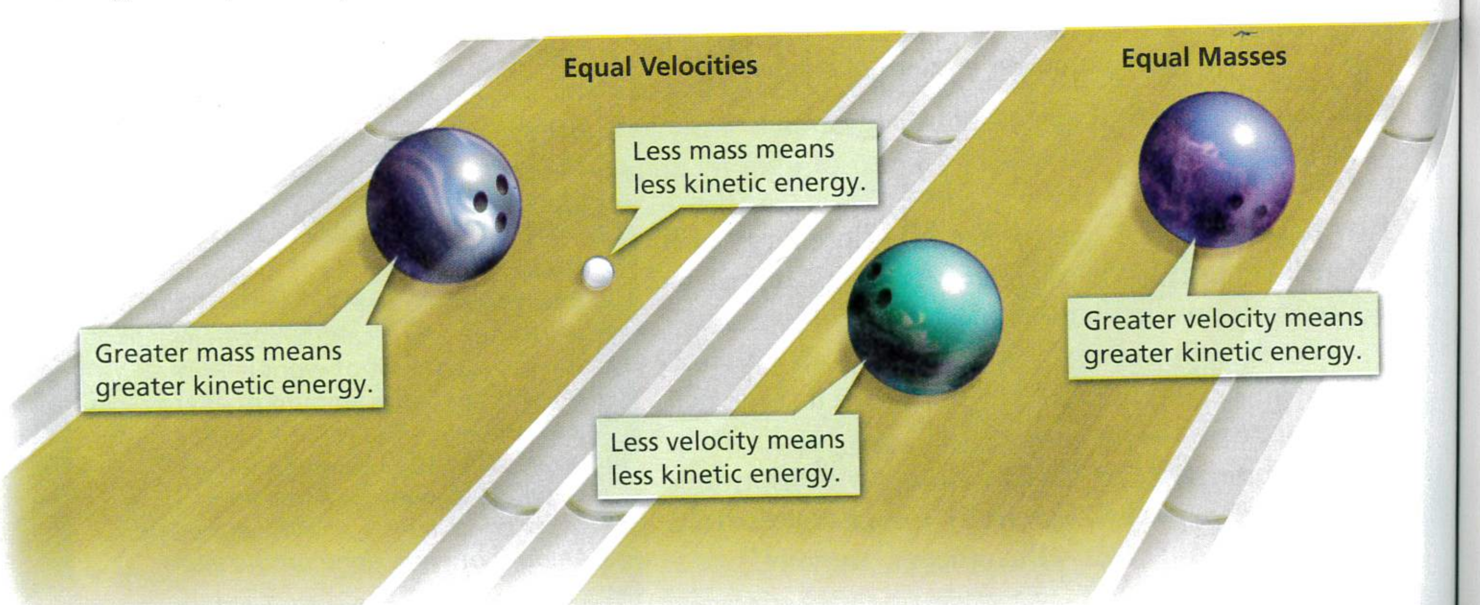
Calculating Kinetic Energy There is a mathematical relationship between kinetic energy, mass, and velocity.

$$\text{Kinetic energy} = \frac{1}{2} \times \text{Mass} \times \text{Velocity}^2$$

Do changes in velocity and mass have the same effect on kinetic energy? No—changing the velocity of an object will have a greater effect on its kinetic energy than changing its mass by the same factor. This is because velocity is squared in the kinetic energy equation. For instance, doubling the mass of an object will double its kinetic energy. But doubling its velocity will quadruple its kinetic energy.

Reading Checkpoint Which has a greater effect on an object's kinetic energy—doubling its mass or doubling its velocity?

FIGURE 2
Kinetic Energy
Kinetic energy increases as mass and velocity increase.
Predicting *In each example, which object will transfer more energy to the pins? Why?*



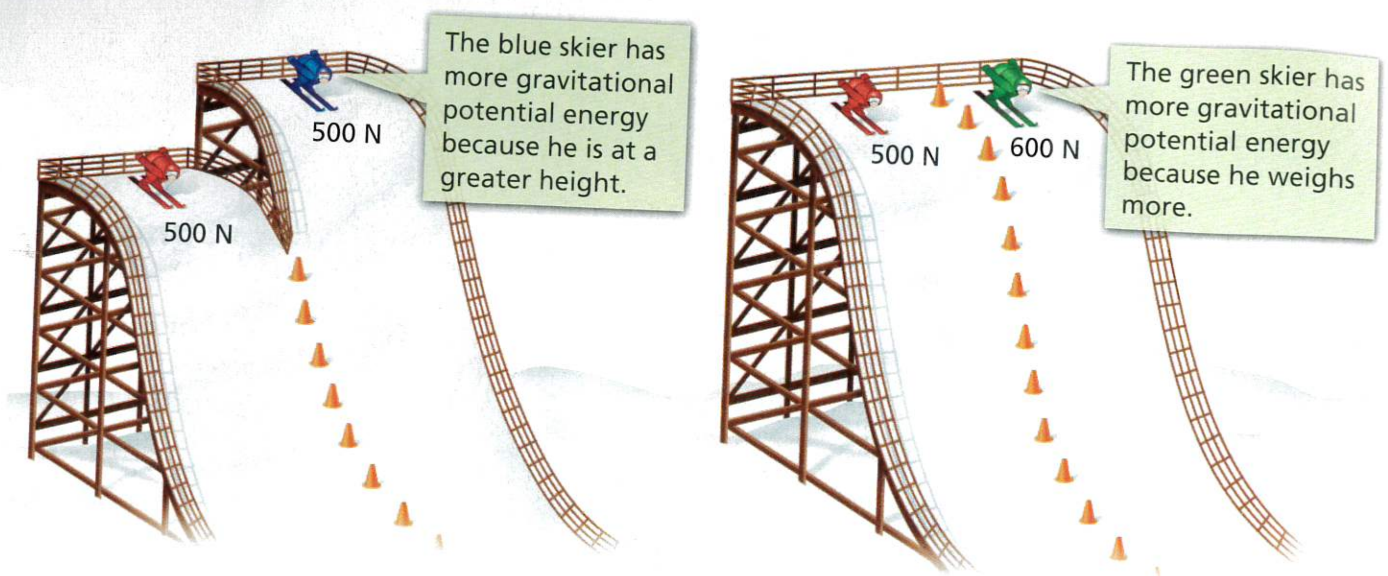


FIGURE 3
Gravitational Potential Energy
Gravitational potential energy increases as weight and height increase.
Interpreting Diagrams *Does the red skier have more gravitational potential energy on the higher ski jump or the lower one? Why?*

Potential Energy

An object does not have to be moving to have energy. Some objects have stored energy as a result of their positions or shapes. When you lift a book up to your desk from the floor or compress a spring to wind a toy, you transfer energy to it. The energy you transfer is stored, or held in readiness. It might be used later when the book falls to the floor or the spring unwinds. Stored energy that results from the position or shape of an object is called **potential energy.** This type of energy has the potential to do work.

Gravitational Potential Energy Potential energy related to an object's height is called **gravitational potential energy.** The gravitational potential energy of an object is equal to the work done to lift it. Remember that Work = Force × Distance. The force you use to lift the object is equal to its weight. The distance you move the object is its height. You can calculate an object's gravitational potential energy using this formula.

$$\text{Gravitational potential energy} = \text{Weight} \times \text{Height}$$

For example, the red skier on the left in Figure 3 weighs 500 newtons. If the ski jump is 40 meters high, then the skier has 500 newtons × 40 meters, or 20,000 J, of gravitational potential energy.

The more an object weighs, or the greater the object's height, the greater its gravitational potential energy. At the same height, a 600-newton skier has more gravitational potential energy than a 500-newton skier. Similarly, a 500-newton skier has more gravitational potential energy on a high ski jump than on a low one.

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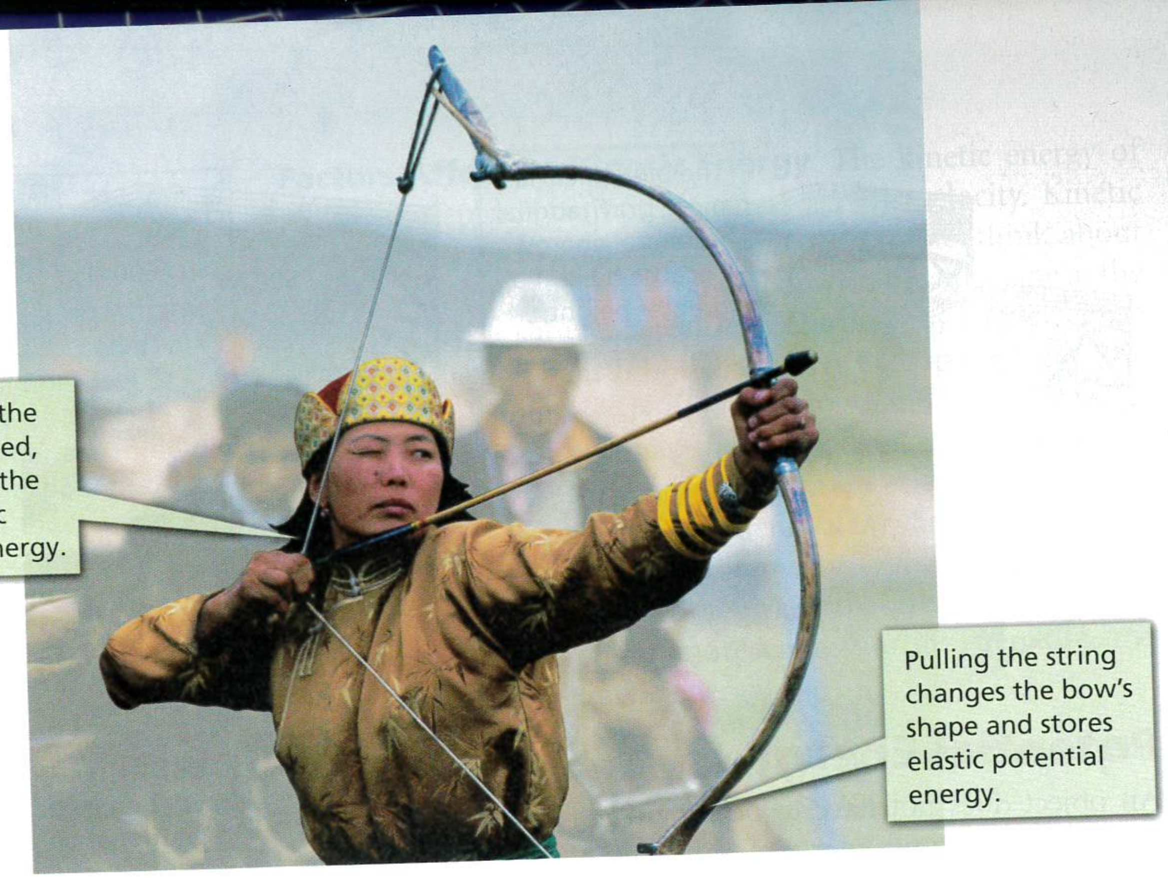


FIGURE 4
Elastic Potential Energy
The energy stored in a stretched object, such as a bow, is elastic potential energy. **Interpreting Photographs** *When the energy stored in the bow is released, how is it used?*

Elastic Potential Energy An object gains a different type of potential energy when it is stretched. The potential energy associated with objects that can be stretched or compressed is called **elastic potential energy.** For example, when an archer pulls back an arrow, the bow changes shape. The bow now has potential energy. When the archer releases the string, the stored energy sends the arrow flying to its target.

Reading Checkpoint **What type of energy does a bow have when you pull back an arrow?**

Section 1 Assessment

Target Reading Skill

Using Prior Knowledge Review your graphic organizer and revise it based on what you just learned in the section.

Reviewing Key Concepts

1. a. **Defining** What is energy?
   b. **Describing** How are energy, work, and power related?
   c. **Applying Concepts** If a handsaw does the same amount of work on a log as a chainsaw does, which has a greater power? Why?
2. a. **Identifying** What is kinetic energy? What is potential energy?
   b. **Explaining** What factors affect an object's kinetic energy?
   c. **Problem Solving** At a given height above Earth, how would you determine the potential energy of a sky diver? The kinetic energy of a sky diver?

Math Practice

3. **Exponents** What is the value of the number 10^2?
4. **Exponents** What number when squared gives you the value 36?

Section 2 Forms of Energy

Reading Preview

Key Concepts

- How can you determine an object's mechanical energy?
- What are some forms of energy associated with the particles that make up objects?

Key Terms

- mechanical energy
- thermal energy
- electrical energy
- chemical energy
- nuclear energy
- electromagnetic energy

Target Reading Skill

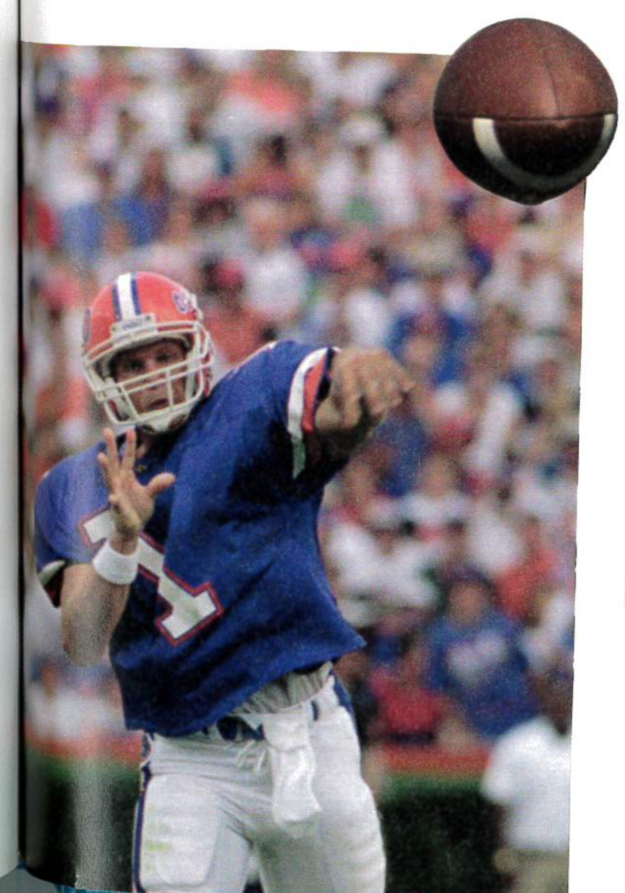
Building Vocabulary After you read the section, reread the paragraphs that contain definitions of Key Terms. Use the information you have learned to write a definition of each Key Term in your own words.

Lab zone Discover Activity

What Makes a Flashlight Shine?

1. Remove the batteries from a flashlight and examine them. Think about what type of energy is stored in the batteries.
2. Replace the batteries and turn on the flashlight. What type of energy do you observe?
3. After a few minutes, place your hand near the bulb of the flashlight. What type of energy do you feel?

Think It Over
Inferring Describe how you think a flashlight works in terms of energy. Where does the energy come from? Where does the energy go?



◀ A quarterback transfers mechanical energy to the football.

You are on the edge of your seat as the quarterback drops back, steps forward, and then launches a deep pass. The ball soars down the field and drops into the receiver's hands. The electronic scoreboard flashes TOUCHDOWN. You jump to your feet and cheer!

As the crowd settles back down, you shiver. The sun is setting, and the afternoon is growing cool. A vendor hands you a hot dog, and its heat helps warm your hands. Suddenly, the stadium lights switch on. You can see the players more clearly as they line up for the next play.

The thrown football, the scoreboard, the sun, the hot dog, and the stadium lights all have energy. You have energy, too! Energy comes in many different forms.

Mechanical Energy

Think about the pass thrown by the quarterback. A football thrown by a quarterback has mechanical energy. So does a moving car or a trophy on a shelf. The form of energy associated with the position and motion of an object is called **mechanical energy.**

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An object's mechanical energy is a combination of its potential energy and kinetic energy. **You can find an object's mechanical energy by adding the object's kinetic energy and potential energy.**

Mechanical Energy = Potential energy + Kinetic energy

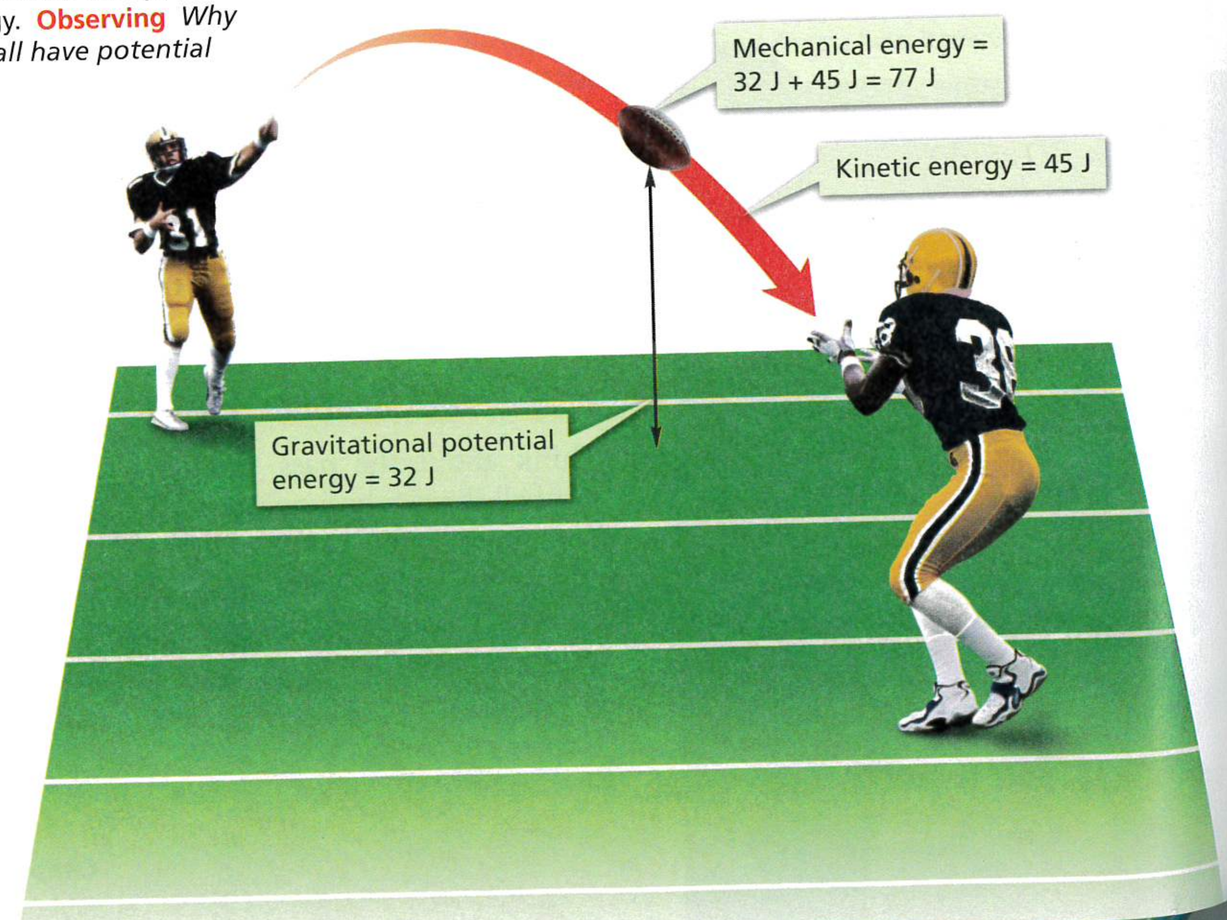
For example, a football thrown by a quarterback has both potential energy and kinetic energy. The higher the football, the greater its potential energy. The faster the football moves, the greater its kinetic energy.

You can add the potential energy and kinetic energy of the football in Figure 5 to find its mechanical energy. The football has 32 joules of potential energy due to its position above the ground. It also has 45 joules of kinetic energy due to its motion. The total mechanical energy of the football is equal to 32 joules + 45 joules, or 77 joules.

An object with mechanical energy can do work on another object. In fact, you can think of mechanical energy as the ability to do work. The more mechanical energy an object has, the more work it can do.

Reading Checkpoint **What two forms of energy combine to make mechanical energy?**

FIGURE 5
Mechanical Energy
To find the football's mechanical energy, add its kinetic energy to its potential energy. **Observing** *Why does the football have potential energy?*



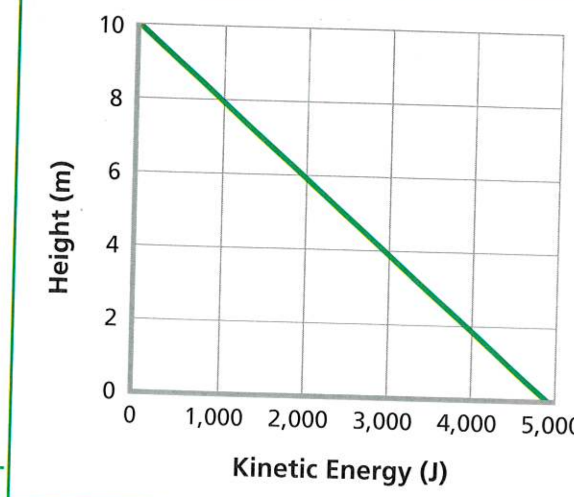
Math Analyzing Data

Calculating Mechanical Energy

The kinetic energy of a 500-N diver during a dive from a 10-m platform was measured. These data are shown in the graph.

1. **Reading Graphs** According to the graph, how much kinetic energy does the diver have at 8 m?
2. **Calculating** Using the graph, find the kinetic energy of the diver at 6 m. Then calculate the diver's potential energy at that point.
3. **Inferring** The mechanical energy of the diver is the same at every height. What is the mechanical energy of the diver?

Energy of a Diver



Other Forms of Energy

So far in this chapter, you have read about energy that involves the motion and position of an object. But an object can have other forms of kinetic and potential energy. Most of these other forms are associated with the particles that make up objects. These particles are far too small to see. **Forms of energy associated with the particles of objects include thermal energy, electrical energy, chemical energy, nuclear energy, and electromagnetic energy.**

Thermal Energy All objects are made up of particles called atoms and molecules. Because these particles are constantly in motion, they have kinetic energy. The faster the particles move, the more kinetic energy they have. These particles are arranged in specific ways in different objects. Therefore, they also have potential energy. The total potential and kinetic energy of the particles in an object is called **thermal energy.** Look at Figure 6. Even though the lava may be flowing slowly down the volcano, its particles are moving quickly. Because the particles have a large amount of kinetic energy, the lava has a large amount of thermal energy.

If you've ever eaten ice cream on a hot day, you've experienced thermal energy. Fast-moving particles in the warm air make the particles of ice cream move faster. As the kinetic energy of the particles increases, so does the thermal energy of the ice cream. Eventually, the ice cream melts.

FIGURE 6
Thermal Energy
The lava flowing from this volcano has a large amount of thermal energy. **Predicting** *Will the thermal energy of the lava increase or decrease as it flows away from the volcano?*

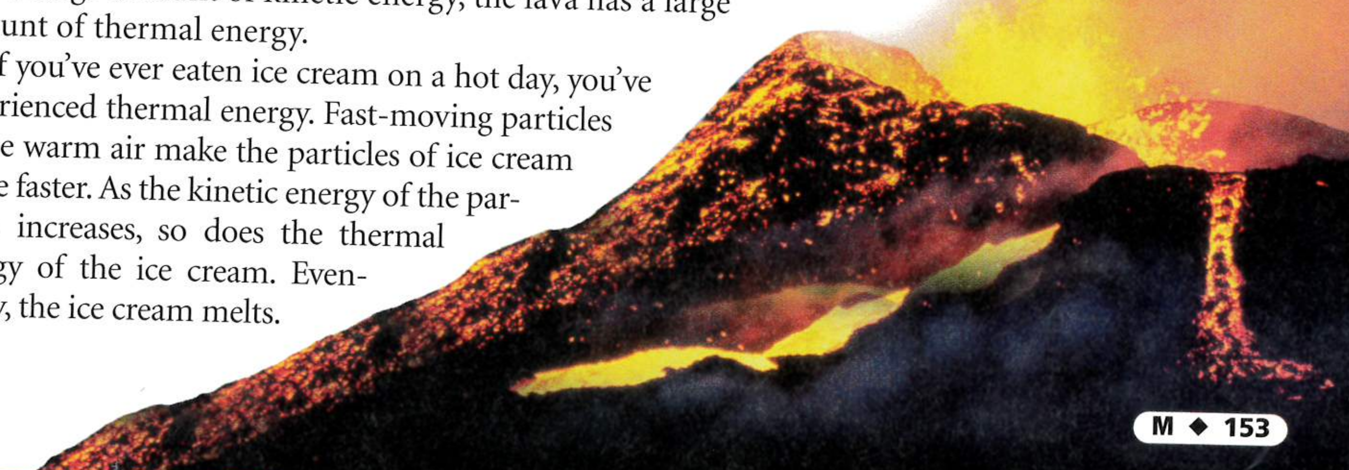


FIGURE 7
Electrical Energy
Electric charges in lightning carry electrical energy.

Electrical Energy When you receive a shock from a metal doorknob, you are experiencing electrical energy. The energy of electric charges is **electrical energy.** Depending on whether the charges are moving or stored, electrical energy can be a form of kinetic or potential energy. The lightning in Figure 7 is a form of electrical energy. You rely on electrical energy from batteries or electrical lines to run devices such as flashlights, handheld games, and radios.

Chemical Energy Almost everything you see, touch, or taste is composed of chemical compounds. Chemical compounds are made up of atoms and molecules. Bonds between the atoms and molecules hold chemical compounds together. These bonds have chemical energy. **Chemical energy** is potential energy stored in the chemical bonds that hold chemical compounds together. Chemical energy is stored in the foods you eat, in the matches you can use to light a candle, and even in the cells of your body. When bonds in chemical compounds break, new chemical compounds may form. When this happens, chemical energy may be released.

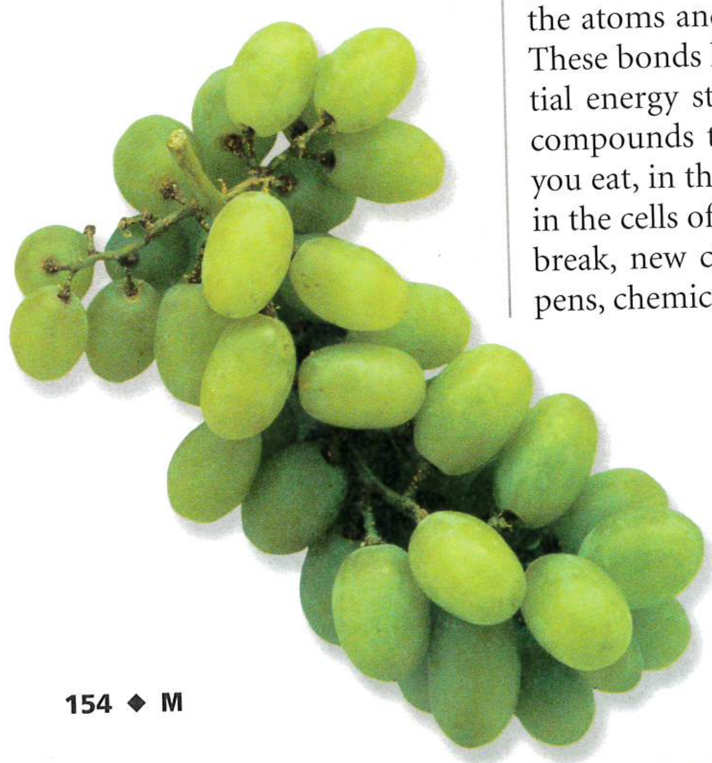


FIGURE 8
Chemical Energy
The particles in these grapes contain chemical energy. Your body can use this energy after you eat them.

Nuclear Energy A type of potential energy called **nuclear energy** is stored in the nucleus of an atom. Nuclear energy is released during a nuclear reaction. One kind of nuclear reaction, known as nuclear fission, occurs when a nucleus splits. Nuclear power plants use fission reactions to produce electricity. Another kind of reaction, known as nuclear fusion, occurs when the nuclei of atoms fuse, or join together. Nuclear fusion reactions occur continuously in the sun, releasing tremendous amounts of energy.

Electromagnetic Energy The sunlight that you see each day is a form of **electromagnetic energy.** Electromagnetic energy travels in waves. These waves have some electrical properties and some magnetic properties.

The microwaves you use to cook your food and the X-rays doctors use to examine patients are types of electromagnetic energy. Other forms of electromagnetic energy include ultraviolet radiation, infrared radiation, and radio waves.

Reading Checkpoint What form of energy are microwaves?

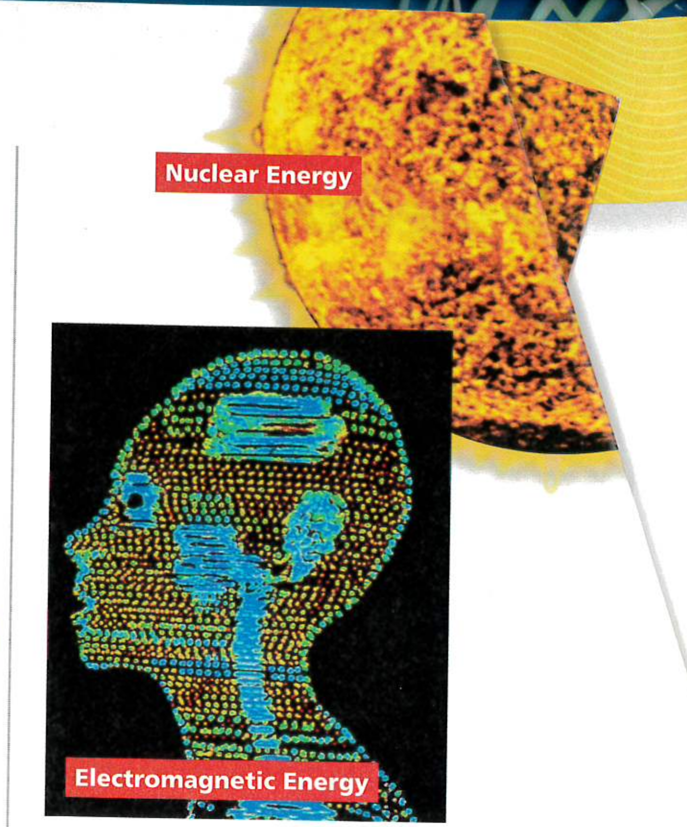


FIGURE 9
Nuclear and Electromagnetic Energy
The sun is a source of nuclear energy. Doctors use X-rays, a form of electromagnetic energy, when taking a CT scan to look for brain disorders. **Observing** *What other forms of energy from the sun can you observe?*

Section 2 Assessment

Target Reading Skill Building Vocabulary Use your definitions to help answer the questions.

Reviewing Key Concepts

1. a. **Defining** What is mechanical energy?
   b. **Drawing Conclusions** If an object's mechanical energy is equal to its potential energy, how much kinetic energy does the object have? How do you know?
   c. **Calculating** If the kinetic energy of a falling apple is 5.2 J and its potential energy is 3.5 J, what is its mechanical energy?
2. a. **Listing** List the five forms of energy associated with the particles that make up objects.
   b. **Explaining** Why do the particles of objects have both kinetic and potential energy?
   c. **Classifying** What kind of energy do you experience when you eat a peanut butter and jelly sandwich?

Writing in Science

Detailed Observation In terms of energy, think about what happens when you eat a hot meal. Describe all the different forms of energy that you experience. For example, if you are eating under a lamp, its electromagnetic energy helps you see the food. Explain the source of each form of energy.

Section 3

Energy Transformations and Conservation

Reading Preview

Key Concepts

- How are different forms of energy related?
- What is a common energy transformation?
- What is the law of conservation of energy?

Key Terms

- energy transformation
- law of conservation of energy
- matter

Target Reading Skill

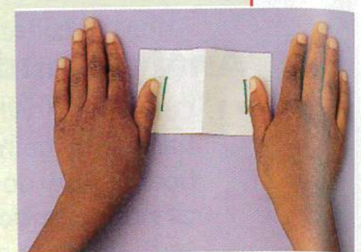
Asking Questions Before you read, preview the red headings and ask a *what* or *how* question for each heading. As you read, write the answers to your questions.

Energy Transformations

Question	Answer
What is an energy transformation?	An energy transformation is . . .

Lab zone Discover Activity

What Would Make a Card Jump?



1. Fold an index card in half.
2. In the edge opposite the fold, cut two slits that are about 2 cm long and 2 cm apart.
3. Keep the card folded and loop a rubber band through the slits. With the fold toward you, gently open the card like a tent and flatten it against your desk.
4. Predict what will happen to the card if you let go. Then test your prediction.

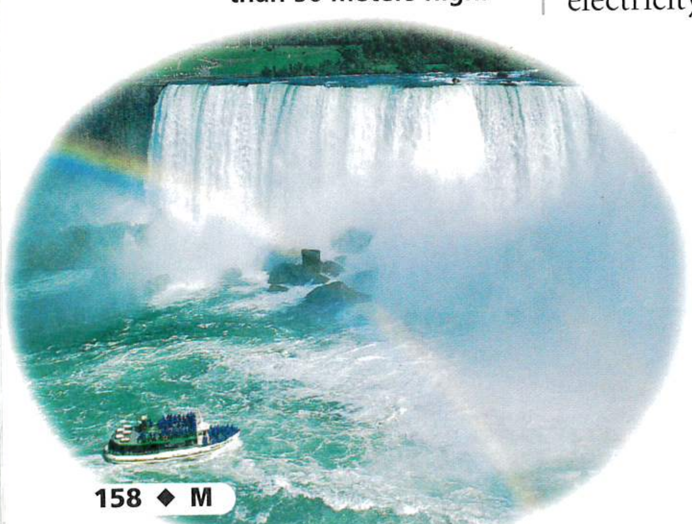
Think It Over

Drawing Conclusions Describe what happened to the card. Based on your observations, what is the relationship between potential and kinetic energy?

The spray bounces off your raincoat as you look up at the millions of liters of water plunging toward you. The roar of the water is deafening. Are you doomed? Fortunately not—you are on a sightseeing boat at the foot of the mighty Niagara Falls. The waterfall carries the huge amount of water that drains from the upper Great Lakes. It lies on the border between Canada and the United States.

What many visitors don't know, however, is that Niagara Falls serves as much more than just a spectacular view. The Niagara Falls area is the center of a network of electrical power lines. Water that is diverted above the falls is used to generate electricity for much of the surrounding region.

▼ Niagara Falls is more than 50 meters high.



Energy Transformations

What does flowing water have to do with electricity? You may already know that the mechanical energy of moving water can be transformed into electrical energy. **Most forms of energy can be transformed into other forms.** A change from one form of energy to another is called an **energy transformation.** Some energy changes involve single transformations, while others involve many transformations.

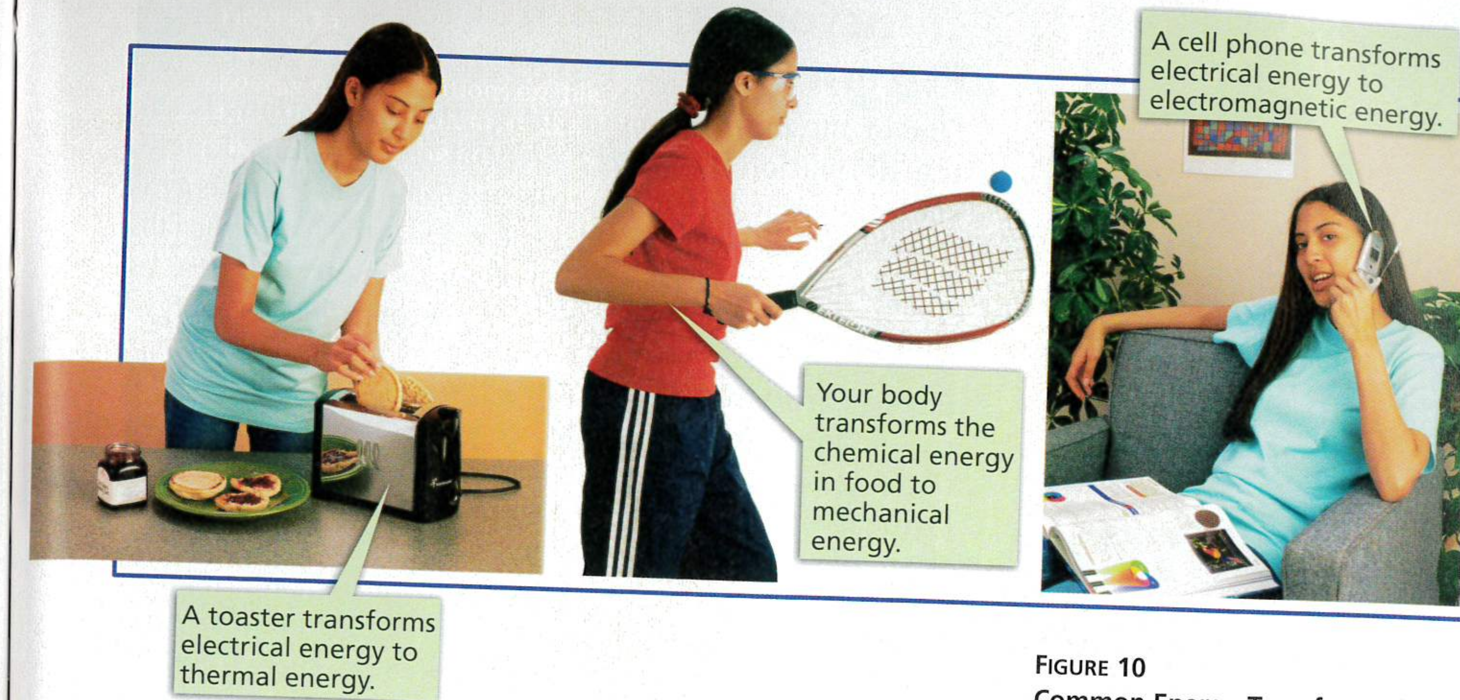


FIGURE 10
Common Energy Transformations
Every day, energy transformations are all around you. Some of these transformations happen inside you! **Observing** *What other energy transformations do you observe every day?*

Single Transformations Sometimes, one form of energy needs to be transformed into another to get work done. You are already familiar with many such energy transformations. For example, a toaster transforms electrical energy to thermal energy to toast your bread. A cell phone transforms electrical energy to electromagnetic energy that travels to other phones.

Your body transforms the chemical energy in your food to mechanical energy you need to move your muscles. Chemical energy in food is also transformed to the thermal energy your body uses to maintain its temperature.

Multiple Transformations Often, a series of energy transformations is needed to do work. For example, the mechanical energy used to strike a match is transformed first to thermal energy. The thermal energy causes the particles in the match to release stored chemical energy, which is transformed to thermal energy and the electromagnetic energy you see as light.

In a car engine, another series of energy conversions occurs. Electrical energy produces a spark. The thermal energy of the spark releases chemical energy in the fuel. The fuel's chemical energy in turn becomes thermal energy. Thermal energy is converted to mechanical energy used to move the car, and to electrical energy to produce more sparks.

Reading Checkpoint What is an example of a multiple transformation of energy?

Lab zone Skills Activity

Classifying

Many common devices transform electrical energy into other forms. Think about the following devices in terms of energy transformations.

- steam iron • ceiling fan
- digital clock • dryer

For each device, describe which form or forms of energy the electrical energy becomes. Do these devices produce single or multiple transformations of energy?

FIGURE 11
Juggling The kinetic energy of an orange thrown into the air becomes gravitational potential energy. Its potential energy becomes kinetic energy as it falls.

Transformations Between Potential and Kinetic Energy

One of the most common energy transformations is the transformation between potential energy and kinetic energy. In waterfalls such as Niagara Falls, potential energy is transformed to kinetic energy. The water at the top of the falls has gravitational potential energy. As the water plunges, its velocity increases. Its potential energy becomes kinetic energy.

Energy Transformation in Juggling Any object that rises or falls experiences a change in its kinetic and gravitational potential energy. Look at the orange in Figure 11. When it moves, the orange has kinetic energy. As it rises, it slows down. Its potential energy increases as its kinetic energy decreases. At the highest point in its path, it stops moving. Since there is no motion, the orange no longer has kinetic energy. But it does have potential energy. As the orange falls, the energy transformation is reversed. Kinetic energy increases while potential energy decreases.

Energy Transformation in a Pendulum In a pendulum, a continuous transformation between kinetic and potential energy takes place. At the highest point in its swing, the pendulum in Figure 12 has no movement, so it only has gravitational potential energy. As it swings downward, it speeds up. Its potential energy is transformed to kinetic energy. The pendulum is at its greatest speed at the bottom of its swing. There, all its energy is kinetic energy.

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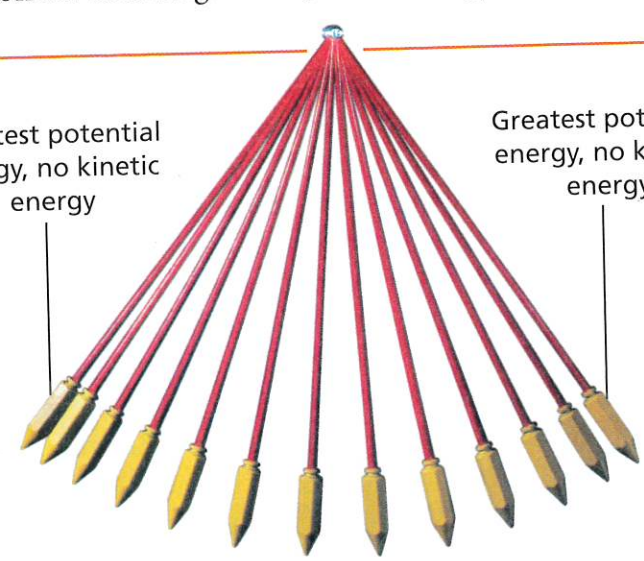

FIGURE 12
Pendulum
A pendulum continuously transforms energy from kinetic to potential energy and back.
Interpreting Diagrams *At what two points is the pendulum's potential energy greatest?*

FIGURE 13
Pole Vault
Energy transformations enable this athlete to vault more than six meters into the air.

As the pendulum swings to the other side, its height increases. The pendulum regains gravitational potential energy and loses kinetic energy. At the top of its swing, it comes to a stop again. And so the pattern of energy transformation continues.

Energy Transformation in a Pole Vault A pole-vaulter transforms kinetic energy to elastic potential energy, which then becomes gravitational potential energy. The pole-vaulter you see in Figure 13 has kinetic energy as he runs forward. When the pole-vaulter plants the pole to jump, his velocity decreases and the pole bends. His kinetic energy is transformed to elastic potential energy in the pole. As the pole straightens out, the pole-vaulter is lifted high into the air. The elastic potential energy of the pole is transformed to the gravitational potential energy of the pole-vaulter. Once he is over the bar, the pole-vaulter's gravitational potential energy is transformed back into kinetic energy as he falls toward the safety cushion.

Reading Checkpoint What kind of energy lifts a pole-vaulter over the bar?

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Lab zone Try This Activity

Pendulum Swing

1. Set up a pendulum using washers or a rubber stopper, string, a ring stand, and a clamp.
2. Pull the pendulum back so that it makes a 45° angle with the vertical. Measure the height of the stopper. Release it and observe how high it swings.

3. Use a second clamp to reduce the length of the pendulum as shown. The pendulum will run into the second clamp at the bottom of its swing.
4. Pull the pendulum back to the same height as you did the first time. Predict how high the pendulum will swing. Then set it in motion and observe.

Observing How high did the pendulum swing in each case? Explain your observations.

Conservation of Energy

If you set a spinning top in motion, will the top remain in motion forever? No, it will not. Then what happens to its energy? Is the energy destroyed? Again, the answer is no. The **law of conservation of energy** states that when one form of energy is transformed to another, no energy is destroyed in the process. **According to the law of conservation of energy, energy cannot be created or destroyed.** So the total amount of energy is the same before and after any transformation. If you add up all the new forms of energy after a transformation, all of the original energy will be accounted for.

Energy and Friction So what happens to the energy of the top in Figure 14? As the top spins, it encounters friction with the floor and friction from the air. Whenever a moving object experiences friction, some of its kinetic energy is transformed into thermal energy. So, the mechanical energy of the spinning top is transformed to thermal energy. The top slows and eventually falls on its side, but its energy is not destroyed—it is transformed.

The fact that friction transforms mechanical energy to thermal energy should not surprise you. After all, you take advantage of such thermal energy when you rub your cold hands together to warm them up. The fact that friction transforms mechanical energy to thermal energy explains why no machine is 100 percent efficient. You may recall that the output work of any real machine is always less than the input work. This reduced efficiency occurs because some mechanical energy is always transformed into thermal energy due to friction.

FIGURE 14
Conservation of Energy
A spinning top's kinetic energy is not lost. It is transformed into thermal energy through friction.
Applying Concepts *How much of the top's kinetic energy becomes thermal energy?*

Energy and Matter You might have heard of Albert Einstein's theory of relativity. His theory stated that energy *can* sometimes be created—by destroying matter! **Matter** is anything that has mass and takes up space. All objects are made up of matter.

Just as one form of energy can be transformed to other forms, Einstein discovered that matter can be transformed to energy. In fact, destroying just a small amount of matter releases a huge amount of energy.

Einstein's discovery meant that the law of conservation of energy had to be adjusted. In some situations, energy alone is not conserved. However, since matter can be transformed to energy, scientists say matter and energy together are always conserved.

Reading Checkpoint How can energy be created?

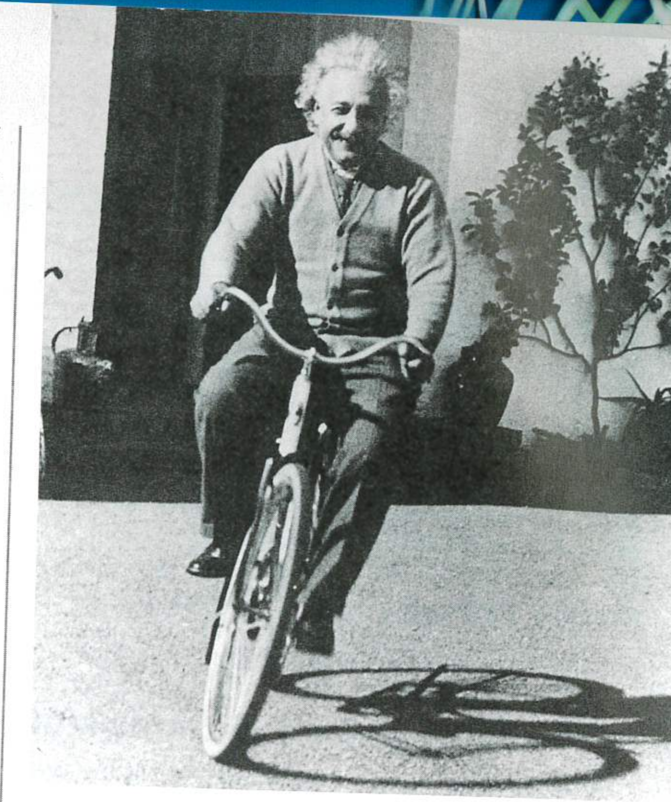

FIGURE 15
Albert Einstein
Einstein published his theory of special relativity in 1905.

Section 3 Assessment

Target Reading Skill **Asking Questions** Use the answers to the questions you wrote about the headings to help you answer the questions below.

Reviewing Key Concepts

1. a. **Reviewing** What is the relationship between different forms of energy?
   b. **Relating Cause and Effect** When you turn a toaster on, what happens to the electrical energy?
   c. **Sequencing** Describe the energy transformations that happen when you strike a match. List them in the order in which they occur.
2. a. **Identifying** What common energy transformation allows you to send a rubber band flying across the room?
   b. **Describing** Describe the energy transformations that occur when you bounce a ball.
   c. **Interpreting Diagrams** Describe the energy transformations that occur in the pendulum in Figure 12.
3. a. **Summarizing** State the law of conservation of energy in your own words.
   b. **Explaining** Thermal energy is produced when a firefighter slides down a pole. Where does it come from?
   c. **Making Generalizations** Based on the theory of relativity, what must always be conserved?

Lab zone At-Home Activity

Hot Wire Straighten a wire hanger. Have a family member feel the wire and observe whether it feels cool or warm. Then hold the ends of the wire and bend it back and forth several times. **CAUTION:** *If the wire breaks, it can be sharp.* Do not bend it more than a few times. After bending the wire, have your family member feel it again. Explain how energy transformations can produce a change in temperature.