CHAPTER 5 ENERGY
Section 1 - What Is Energy?

What You Will Learn
- Explain the relationship between energy and work.
- Compare kinetic and potential energy.
- Describe the different forms of energy.

It's match point. The crowd is silent. The tennis player tosses the ball into the air and then slams it with her racket. The ball flies toward her opponent, who swings her racket at the ball. THWOOSH!! The ball goes into the net, causing it to shake. Game, set, and match!!

The tennis player needs energy to slam the ball with her racket. The ball also must have energy in order to cause the net to shake. Energy is around you all of the time. But what, exactly, is energy?

Energy and Work: Working Together
In science, **energy** is the ability to do work. Work is done when a force causes an object to move in the direction of the force. How do energy and work help you play tennis? The tennis player in **Figure 1** does work on her racket by exerting a force on it. The racket does work on the ball, and the ball does work on the net. When one object does work on energy is transferred from the first object to the second object. This energy allows the second object to do work. So, work is a transfer of energy. Like work, energy is expressed in units of joules (J).

Figure 1 The tennis player does work and transfers energy to the racket. With this energy, the racket can then do work on the ball.

Reading Check What is energy?______________________________

Kinetic Energy
In tennis, energy is transferred from the racket to the ball. As it flies over the net, the ball has kinetic (ki N ik) energy. **Kinetic energy** is the energy of motion. All moving objects have kinetic energy. Like all forms energy, kinetic energy can be used to do work. For example, kinetic energy allows a hammer to do work or nail, as shown in **Figure 2.**

Figure 2 When you swing a hammer, you give it kinetic energy, which does work on the nail.

Kinetic Energy Depends on Mass and Speed

The faster something is moving, the more kinetic energy it has. Also, the greater the mass of a moving object, the greater its kinetic energy is.

A large car has more kinetic energy than a car that has less mass and that is moving at the same speed does. But as you can see from the equation, speed is squared. So speed has a greater effect on kinetic energy than mass does. For this reason, car crashes are much more dangerous at higher speeds than at lower speeds. A moving car has *4 times* the kinetic energy of the same car going half the speed! This is because it's going twice the speed of the slower car, and 2 squared is 4.

Potential Energy

Not all energy has to do with motion. **Potential energy** is the energy an object has because of its position. For example, the stretched bow shown in **Figure 3** has potential energy. The bow has energy because work has been done to change its shape. The energy of that work is turned into potential energy.

Figure 3 The stored potential energy of the bow and string allows them to do work on the arrow when the string is released.

Elastic Potential Energy

Energy can be stored in bowstrings, springs, and rubber bands. This kind of potential energy is called *elastic potential energy.* You change the shape of these objects by stretching them.

This stretching takes some effort. The energy put into stretching becomes elastic potential energy. When this energy is released, the stretched object goes back to its original shape.

Gravitational Potential Energy

When you lift an object, you do work on it. You use a force that is against the force of gravity. When you do this, you transfer energy to the object and give the object *gravitational potential energy.* Books on a shelf have gravitational potential energy. So does your backpack after you lift it on to your back. The amount of gravitational potential energy that an object has depends on its weight and its height.

Height Above What?

When you want to find out an object's gravitational potential energy, the "ground" that you measure the object's height from depends on where it is. For example, what if you want to measure the gravitational potential energy of an egg sitting on the kitchen counter? In this case, you would measure the egg's height from the floor. But if you were holding the egg over a balcony several stories from the ground, you would measure the egg's height from the ground!

Calculating Gravitational Potential Energy

You can find gravitational potential energy by using the following equation:

$$gravitational\ potential\ energy = weight \times height$$

Mechanical Energy

How would you describe the energy of the juggler's pins in **Figure 4**? To describe their total energy, you would state their mechanical energy. **Mechanical energy** is the total energy of motion and position of an object. Both potential energy and kinetic energy are kinds of mechanical energy. Mechanical energy can be all potential energy, all kinetic energy, or some of each. You can use the following equation to find mechanical energy: ***mechanical energy = potential energy + kinetic energy***

Figure 4 As a pin is juggled, its mechanical energy is the sum of its potential energy and its kinetic energy at any point.

Reading Check What two kinds of energy can make up the mechanical energy of an object?
_______________ & ________________

Mechanical Energy in a Juggler's Pin

The mechanical energy of an object remains the same unless it transfers some of its energy to another object. But even if the mechanical energy of an object stays the same, the potential energy or kinetic energy it has can increase or decrease.

Look at **Figure 4.** While the juggler is moving the pin with his hand, he is doing work on the pin to give it kinetic energy. But as soon as the pin leaves his hand, the pin's kinetic energy starts changing into potential energy. How can you tell that the kinetic energy is decreasing? The pin slows down as it moves upwards. Eventually, all of the pin's kinetic energy turns into potential energy, and it stops moving upward.

As the pin starts to fall back down again, its potential energy starts changing back into kinetic energy. More and more of its potential energy turns into kinetic energy. You can tell because the pin speeds up as it falls towards the ground.

Other Forms of Energy

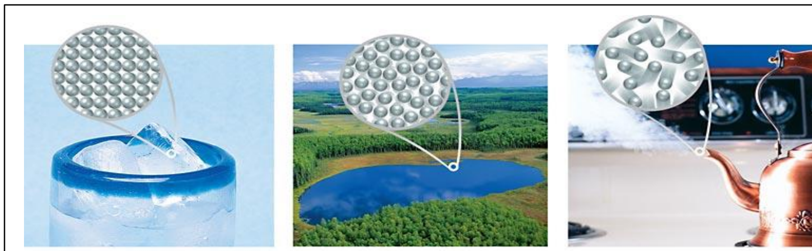
Energy can come in a number of forms besides mechanical energy. These forms of energy include thermal, chemical, electrical, sound, light, and nuclear energy. As you read the next few pages, you will learn what these different forms of energy have to do with kinetic and potential energy.

Thermal Energy

All matter is made of particles that are always in random motion. Because the particles are in motion, they have kinetic energy. *Thermal energy* is all of the kinetic energy due to random motion of the particles that make up an object.

As you can see in **Figure 5,** particles move faster at higher temperatures than at lower temperatures. The faster the particles move, the greater their kinetic energy and the greater the object's thermal energy. Thermal energy also depends on the number of particles. Water in the form of steam has a higher temperature than water in a lake does. But the lake has more thermal energy because the lake has more water particles.

Figure 5 Thermal Energy in Water



The particles in an ice cube vibrate in fixed positions and do not have a lot of kinetic energy.

The particles of water in a lake can move more freely and have more kinetic energy than water particles in ice do.

The particles of water in steam move rapidly, so they have more energy than the particles in liquid water do.

Chemical Energy

Where does the energy in food come from? Food is made of chemical compounds. When compounds such as sugar form, work is done to join the different atoms together. *Chemical energy* is the energy of a compound that changes as its atoms are rearranged. Chemical energy is a form of potential energy because it depends on the position and arrangement of the atoms in a compound.

Electrical Energy

The electrical outlets in your home allow you to use electrical energy. *Electrical energy* is the energy of moving electrons. Electrons are the negatively charged particles of atoms.

Suppose you plug an electrical device, such as the amplifier shown in **Figure 6,** into an outlet and turn it on. The electrons in the wires will transfer energy to different parts inside the amplifier. The electrical energy of moving electrons is used to do work that makes the sound that you hear from the amplifier.

Figure 6 The movement of electrons produces the electrical energy that an amplifier and a microphone use to produce sound.

The electrical energy used in your home comes from power plants. Huge generators turn magnets inside loops of wire. The changing position of a magnet makes electrical energy run through the wire. This electrical energy can be thought of as potential energy that is used when you plug in an electrical appliance and use it.

Sound Energy

Figure 7 shows how a vibrating object transmits energy through the air around it. Sound energy is caused by an object's vibrations. When you stretch a guitar string, the string stores potential energy. When you let the string go, this potential energy is turned into kinetic energy, which makes the string vibrate. The string also transmits some of this kinetic energy to the air around it. The air particles also vibrate, and transmit this energy to your ear. When the sound energy reaches your ear, you hear the sound of the guitar.

Figure 7 As the guitar strings vibrate, they cause particles in the air to vibrate. These vibrations transmit sound energy.

Reading Check What does sound energy consist of? ______________________________________

Section 2 - Energy Conversions

What You Will Learn

- Describe an energy conversion.
- Give examples of energy conversions for the different forms of energy.
- Explain how energy conversions make energy useful.
- Explain the role of machines in energy conversions.

Imagine you're finishing a clay mug in art class. You turn around, and your elbow knocks the mug off the table. Luckily, you catch the mug before it hits the ground.

The mug has gravitational potential energy while it is on the table. As the mug falls, its potential energy changes into kinetic energy. This change is an example of an energy conversion. An **energy conversion** is a change from one form of energy to another. Any form of energy can change into any other form of energy. Often, one form of energy changes into more than one other form.

Kinetic Energy and Potential Energy

Look at **Figure 1.** At the instant this picture was taken, the skateboarder on the left side of the picture was hardly moving. How did he get up so high in the air? As you might guess, he was moving at a high speed on his way up the half-pipe. So, he had a lot of kinetic energy. What happened to that energy? His kinetic energy changed to gravitational potential energy. Imagine that the picture below is a freeze-frame of a video. What happens once the video starts running again? The skateboarder's potential energy will become kinetic energy once again as he speeds down the side of the half-pipe.

Figure 1 Potential Energy and Kinetic Energy

Elastic Potential Energy

A rubber band can be used to show another example of an energy conversion. Look at **Figure 2.** The wound-up rubber band in the toy airplane has *elastic potential energy.* When the rubber band is let go, the stored energy becomes kinetic energy, spins the propeller, and makes the airplane fly.

Figure 2 The wound-up rubber band in this model airplane has potential energy because its shape has been changed.

The energy you put into stretching the rubber band becomes elastic potential energy. When you let the rubber band go, it goes back to its original shape. It releases its stored-up potential energy as it does so, as you know if you have ever snapped a rubber band against your skin!

Several other conversions are also taking place as the rubber band unwinds. There is the sound energy of the rubber band and the propeller as they turn. There is increased thermal energy of the particles of the rubber band. There is also increased kinetic energy of air particles as the propeller pushes on them.

Reading Check How is elastic potential energy stored and released? ______________________________

Conversions Involving Chemical Energy

You may have heard someone say, "Breakfast is the most important meal of the day." Why is eating breakfast so important? As shown in **Figure 3,** chemical energy comes from the food you eat. Your body uses chemical energy to function. Eating gives your body the energy needed to help you start the day.

Figure 3 Chemical energy of food is converted into kinetic energy when you are active. It is converted into thermal energy to maintain body temperature.

Energy Conversions in Plants

Did you know that the chemical energy in the food you eat comes from the sun's energy? When you eat fruits, vegetables, or grains, you are taking in chemical energy. This energy comes from a chemical change that was made possible by the sun's energy. When you eat meat from animals that ate plants, you are also taking in energy that first came from the sun.

As shown in **Figure 4,** photosynthesis (FOHT oh SIN thuh sis) uses light energy to make new substances that have chemical energy. In this way, light energy is changed into chemical energy. The chemical energy from a tree can be changed into thermal energy when you burn the tree's wood. So, if you follow the conversion of energy back far enough, the energy from a wood fire actually comes from the sun!

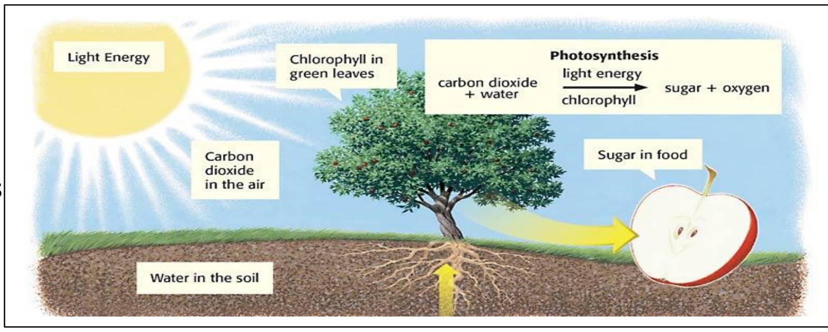


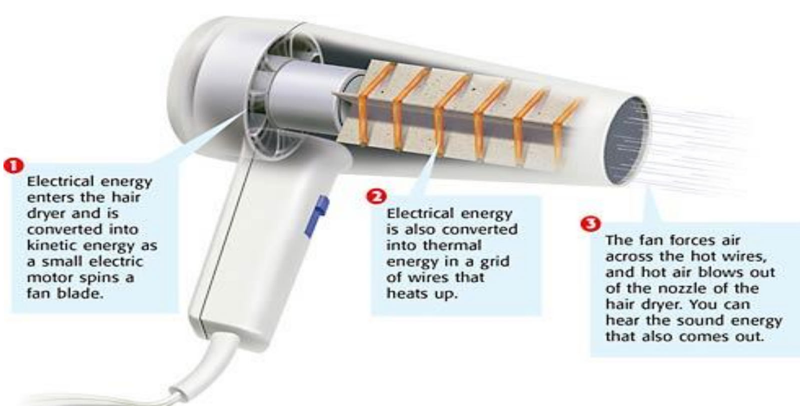
Figure 4 From Light Energy to Chemical Energy

Reading Check Where does the energy that plants come from? ______________________________

The Process Continues

Let's trace where the energy goes. Plants change light energy into chemical energy. The chemical energy in the food you eat is changed into another kind of chemical energy that your body can use. Your body then uses that energy to give you the kinetic energy that you use in everything you do. It's an endless process—energy is always going somewhere!

Why Energy Conversions Are Important



Energy conversions are needed for everything we do. Heating our homes, getting energy from a meal, and many other things use energy conversions. Machines, such as the hair dryer shown in **Figure 5,** help convert energy and make that energy work for you. Electrical energy by itself won't dry your hair. But you can use a hair dryer to convert electrical energy into the thermal energy that helps you dry your hair.

Conversions Involving Electrical Energy

You use electrical energy all of the time. When you listen to the radio, when you make toast, and when you take a picture with a camera, you use electrical energy. Electrical energy can easily be changed into other forms of energy. **Table 1** lists some common energy conversions that involve electrical energy.

Table 1 **Some Conversions of Electrical Energy**	
Alarm clock	electrical energy → light energy and sound energy
Battery	chemical energy → electrical energy
Light bulb	electrical energy → light energy and thermal energy
Blender	electrical energy → kinetic energy and sound energy

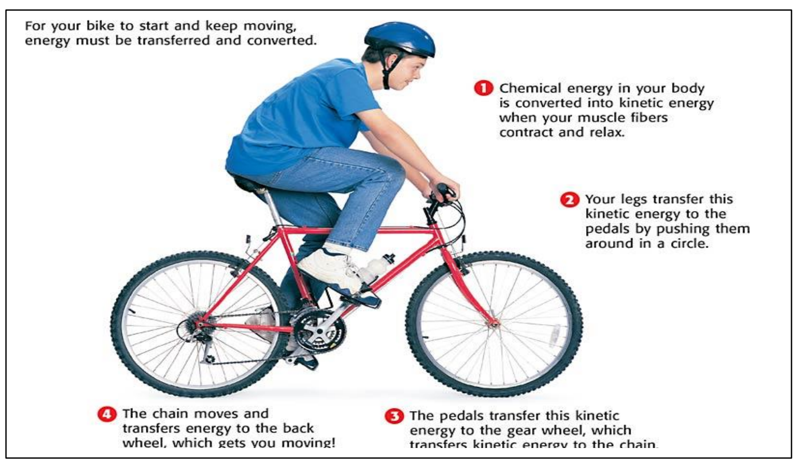
Energy and Machines

You've been learning about energy, its different forms, and the ways that it can change between forms. Another way to learn about energy is to look at how machines use energy. A machine can make work easier by changing the size or direction (or both) of the force needed to do the work.

Suppose you want to crack open a walnut. Using a nutcracker, such as the one shown in **Figure 6,** would be much easier (and less painful) than using your fingers. You transfer energy to the nutcracker, and it transfers energy to the nut. The nutcracker allows you to use less force over a greater distance to do the same amount of work as if you had used your bare hands. Another example of how energy is used by a machine is shown in **Figure 7.** Some machines change the energy put into them into other forms of energy.

Figure 6 Some of the energy you transfer to a nutcracker is converted into sound energy as the nutcracker transfers energy to the nut.

Figure 7 Energy Conversions in a Bicycle



Reading Check What are two things that machines can do to force that is put into them?
_________________________ & ___________________________

Machines as Energy Converters

Machines help you use energy by converting it into the form that you need. **Figure 8** shows a device called a Camel Fridge. This refrigerator was designed and built by Naps Systems in Finland to keep medicines and vaccines cold in hot places. Many places, such as parts of the Sahara Desert, do not have electricity to keep medicines cool. By placing the Camel Fridge on the back of a camel, people can move vaccines and medicines from village to village. Solar panels on the device convert sunlight to electricity. The electricity does the work of removing heat from inside the refrigerator, keeping the medicines cool.

Figure 8 The Camel Fridge converts sunlight to electricity, which is used by the refrigeration unit to keep the contents cold.

Section Summary

- An energy conversion is a change from one form of energy to another. Any form of energy can be converted into any other form of energy.
- Kinetic energy is converted to potential energy when an object is moved against gravity.
- Elastic potential energy is another example of potential energy.
- Your body uses the food you eat to convert chemical energy into kinetic energy.
- Plants convert light energy into chemical energy.
- Machines can transfer energy and can convert energy into a more useful form.

Section 3 - Conservation of Energy

What You Will Learn

- Explain how energy is conserved within a closed system.
- Explain the law of conservation of energy.
- Give examples of how thermal energy is always a result of energy conversion.
- Explain why perpetual motion is impossible.

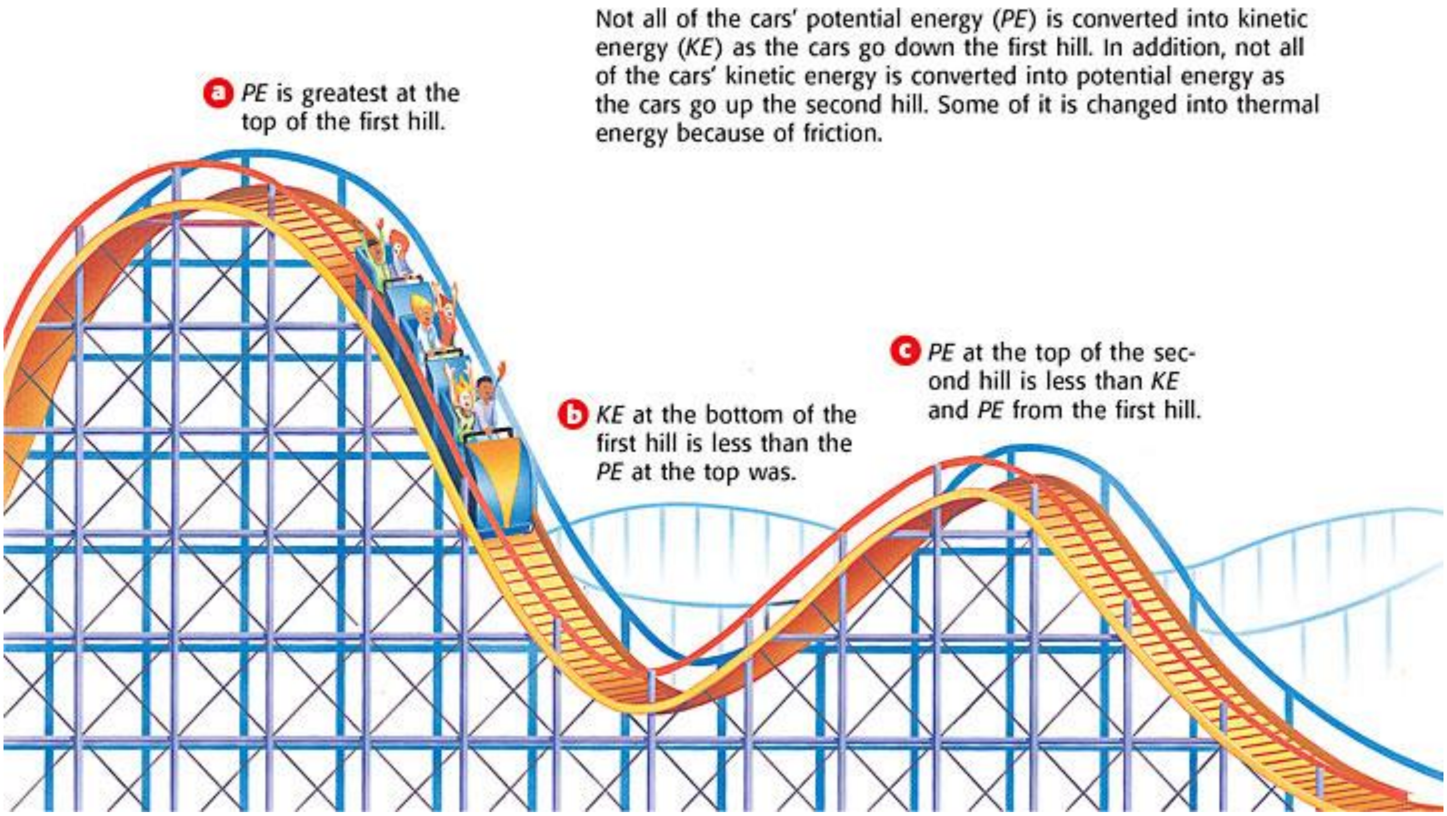
Many roller coasters have a mechanism that pulls the cars up to the top of the first hill. But the cars are on their own for the rest of the ride.

As the cars go up and down the hills on the track, their potential energy is converted into kinetic energy and back again. But the cars never return to the same height at which they started. Does energy get lost somewhere along the way? No, it is just converted into other forms of energy.

Where Does the Energy Go?

To find out where a roller coaster's original potential energy goes, you have to think about more than just the hills of the roller coaster. Friction plays a part too. **Friction** is a force that opposes motion between two surfaces that are touching. For the roller coaster to move, energy must be used to overcome friction. There is friction between the cars' wheels and the track and between the cars and the air around them. As a result, not all of the potential energy of the cars changes into kinetic energy as the cars go down the first hill. Likewise, as you can see in **Figure 1,** not all of the kinetic energy of the cars changes back into potential energy.

Figure 1 Energy Conversions in a Roller Coaster



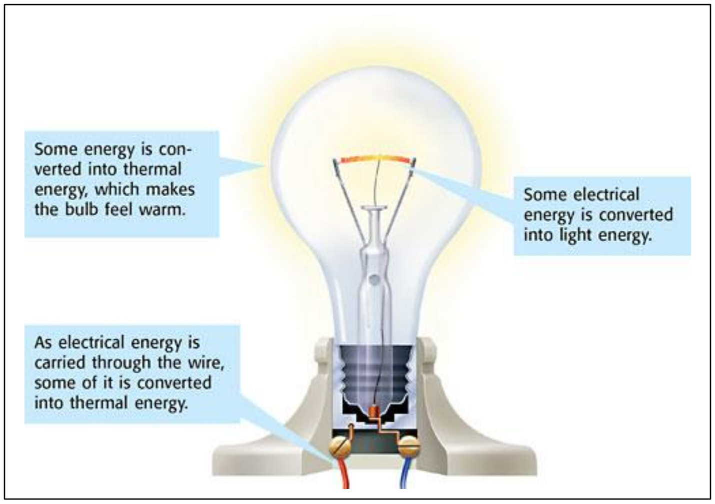
Energy Is Conserved Within a Closed System

A *closed system* is a group of objects that transfer energy only to each other. For example, a closed system that involves a roller coaster consists of the track, the cars, and the air around them. On a roller coaster, some mechanical energy (the sum of kinetic and potential energy) is always converted into thermal energy because of friction. Sound energy also comes from the energy conversions in a roller coaster. If you add together the cars' kinetic energy at the bottom of the first hill, the thermal energy due to overcoming friction, and the sound energy made, you end up with the same total amount of energy as the original amount of potential energy. In other words, energy is conserved and not lost.

Law of Conservation of Energy

Energy is conserved in all cases. Because no exception to this rule has been found, this rule is described as a law. According to the **law of conservation of energy**, energy cannot be created or destroyed. The total amount of energy in a closed system is always the same. As **Figure 2** shows, energy can change from one form to another. But all of the different forms of energy in a system always add up to the same total amount of energy. It does not matter how many energy conversions take place.

Figure 2 Energy Conservation in a Light Bulb



Reading Check Why is the conservation of energy considered a scientific law?

No Conversion Without Thermal Energy

Any time one form of energy is converted into another form, some of the original energy always gets converted into thermal energy. The thermal energy due to friction that results from energy conversions is not useful energy. That is, this thermal energy is not used to do work. Think about a car. You put gas into a car. But not all of the gasoline's chemical energy makes the car move. Some wasted thermal energy will always result from the energy conversions. Much of this energy leaves through the radiator and the exhaust pipe.

Perpetual Motion? No Way!

People have sometimes tried to make a machine that would run forever without any additional energy. This perpetual (puhr PECH oo uhl) motion machine would put out exactly as much energy as it takes in. But that's impossible, because some waste thermal energy always results from energy conversions. The only way a machine can keep moving is to have a constant supply of energy. For example, the "drinking bird" shown in **Figure 3** is not a closed system. The bird uses thermal energy from the air to evaporate the water from its head. So, it is not a perpetual motion machine.

Figure 3 The "Drinking Bird"

TN Standards Check How do the energy transformations of the drinking bird in **Figure 3** illustrate the law of conservation of energy? ____

Making Conversions Efficient

You may have heard that a car is energy efficient if it gets good gas mileage, and that your home may be energy efficient if it is well insulated. In terms of energy conversions, *energy efficiency* (e FISH uhn see) is a comparison of the amount of energy before a conversion with the amount of useful energy after a conversion. A car with high energy efficiency can go farther than other cars with the same amount of gas

More aerodynamic car

Energy conversions that are more efficient end up wasting less energy. Look at **Figure 4.** Newer cars tend to be more energy efficient than older cars. One reason is the smooth, aerodynamic (ER oh die NAM ik) shape of newer cars. The smooth shape reduces friction between the car and the surrounding air. Because these cars move through air more easily, they use less energy to overcome friction. So, they are more efficient. Improving the efficiency of machines, such as cars, is important because greater efficiency results in less waste. If less energy is wasted, less energy is needed to operate a machine.

Figure 4 The shape of newer cars reduces friction between the body of the car and the air.

Section Summary

- Because of friction, some energy is always converted into thermal energy during an energy conversion.
- Energy is conserved within a closed system. According to the law of conservation of energy, energy cannot be created or destroyed.
- Perpetual motion is impossible because some of the energy put into a machine is converted into thermal energy because of friction.

Section 4 - Energy Resources

What You Will Learn

- Name several energy resources.
- Explain how the sun is the source of most energy on Earth.
- Evaluate the advantages and disadvantages of using various energy resources.

Energy is used to light and warm our homes. It is used to make food, clothing, and other things. It is also used to transport people and products from place to place. Where does all of this energy come from?

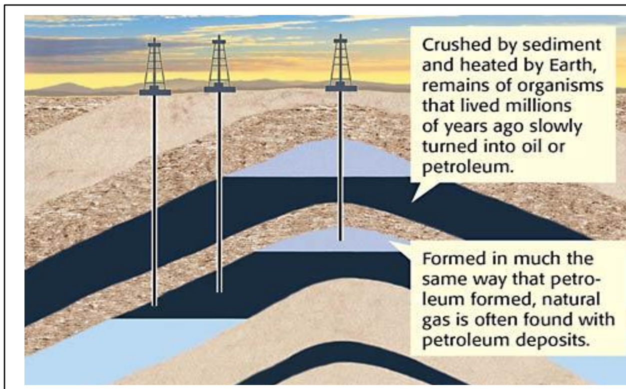
An *energy resource* is a natural resource that can be converted into other forms of energy in order to do useful work. In this section, you will learn about several energy resources, including the one that most other energy resources come from—the sun.

Nonrenewable Resources

Some energy resources, called **nonrenewable resources**, cannot be replaced or are replaced much more slowly than they are used. Fossil fuels are the most important nonrenewable resources.

Oil and natural gas, shown in **Figure 1,** as well as coal, are the most common fossil fuels. **Fossil fuels** are energy resources that formed from the buried remains of plants and animals that lived millions of years ago. These plants stored energy from the sun by photosynthesis. Animals used and stored this energy by eating the plants. So, fossil fuels are concentrated forms of the sun's energy. Now, millions of years later, energy from the sun is released when these fossil fuels are burned.

Figure 1 Formation of Fossil Fuels



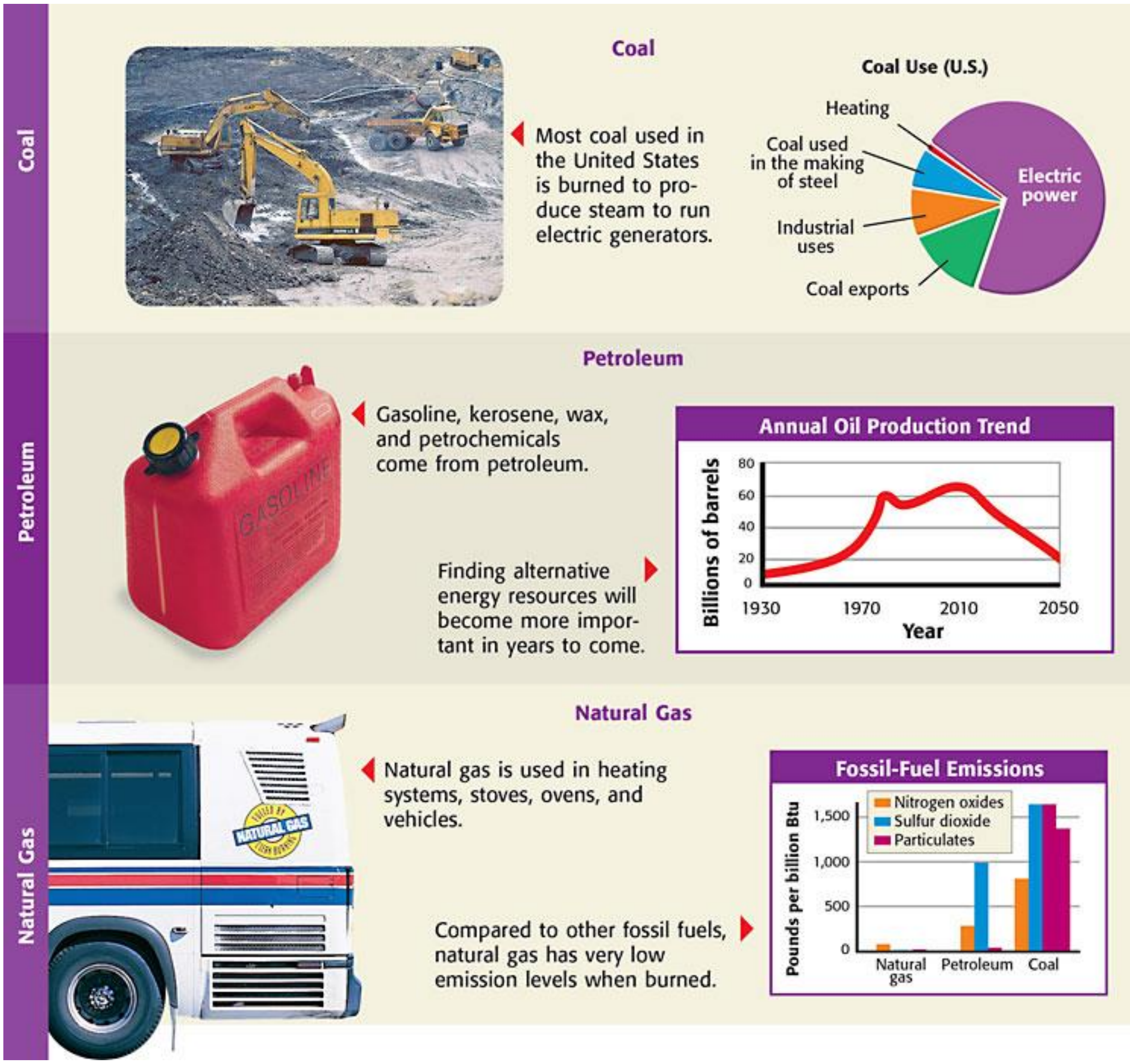
Reading Check Why are fossil fuels considered nonrenewable resources?

____

Uses of Fossil Fuels

All fossil fuels contain stored energy from the sun, which can be converted into other kinds of energy. **Figure 2** shows some different ways that fossil fuels are used in our society.

Figure 2 Everyday Uses of Some Fossil Fuels

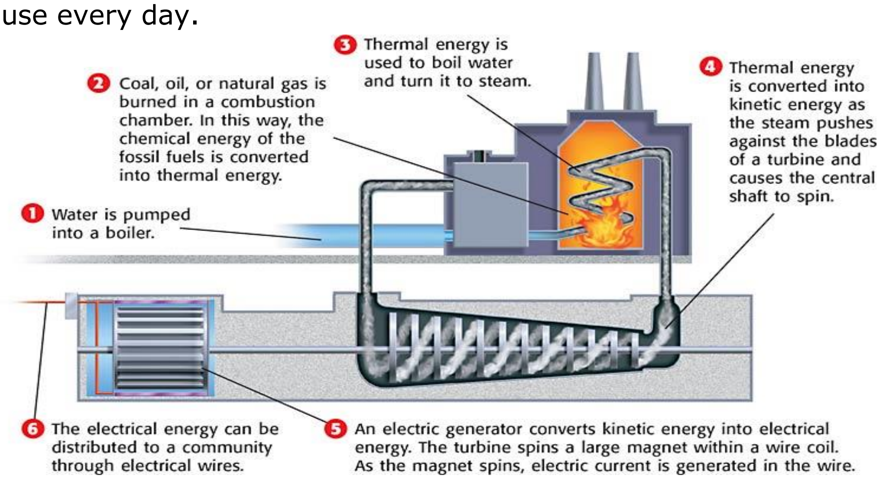


People have been getting energy from the burning of coal, a fossil fuel, for hundreds of years. Today, burning coal is still a very common way to generate electrical energy. Many products, such as gasoline, wax, and plastics, are made from petroleum, another fossil fuel. A third kind of fossil fuel, natural gas, is often used in home heating.

Electrical Energy from Fossil Fuels

One way to generate electrical energy is to burn fossil fuels. In fact, fossil fuels are the main source of electrical energy generated in the United States. *Electric generators* convert the chemical energy in fossil fuels into electrical energy by the process shown in **Figure 3.** The chemical energy in fossil fuels is changed into the electrical energy that you use every day.

Figure 3 Converting Fossil Fuels into Electrical Energy



Nuclear Energy

Another way to generate electrical energy i
power plant generates thermal energy that
which runs a generator. The spinning gene
the fuels used in nuclear power plants diffe
elements, such as uranium, shown in **Figu**
uhn), the nucleus of a uranium atom is spli
Because the supply of these elements is lin

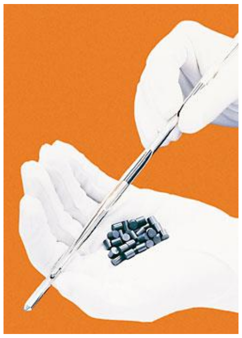


Figure 4 A single uranium fuel pellet contains the energy equivalent of about 1 metric ton of coal.

Reading Check What kinds of substances are used to generate nuclear energy? ____

Renewable Resource

Some energy resources, called **renewable resources**, are naturally replaced more quickly than they are used. Some renewable resources, such as solar energy and wind energy, are considered practically limitless.

Solar Energy

Sunlight can be changed into electrical energy through solar cells. These cells can be used in devices such as calculators. Solar cells can also be placed on the roof of a house to provide electrical energy. Some houses can use solar energy by allowing sunlight into the house through large windows. The sun's energy can then be used to heat the house.

Energy from Water

The sun causes water to evaporate and fall again as rain that flows through rivers. The potential energy of water in a reservoir can be changed into kinetic energy as the water flows through a dam. **Figure 5** shows a hydroelectric dam. Falling water turns turbines in a dam. The turbines are connected to a generator that changes kinetic energy into electrical energy.

Figure 5 This dam converts the energy from water going downstream into electrical energy.

Wind Energy

Wind is caused by the sun's heating of Earth's surface. Because Earth's surface is not heated evenly, wind is created. The kinetic energy of wind can turn the blades of a windmill. Wind turbines are shown in **Figure 6.** A wind turbine changes the kinetic energy of the air into electrical energy by turning a generator.

Figure 6 These wind turbines are converting wind energy into electrical energy.

Geothermal Energy

Thermal energy caused by the heating of Earth's crust is called *geothermal energy.* Some geothermal power plants pump water underground next to hot rock. The water returns to the surface as steam, which can then turn the turbine of a generator.

Reading Check Where does geothermal energy come from? ___________________________________

Biomass

Plants use and store energy from the sun. Organic matter, such as plants, wood, and waste, which can be burned to release energy is called *biomass.* **Figure 7** shows an example. Some countries depend on biomass for energy.

Figure 7 Plants capture the sun's energy. When wood is burned, it releases the energy it got from the sun, which can be used to generate electrical energy.

The Two Sides to Energy Resources

All energy resources have advantages and disadvantages. How can you decide which energy resource to use? **Table 1** compares several energy resources. Depending on where you live, what you need energy for, and how much energy you need, one energy resource may be a better choice than another.

***Table 1* Advantages and Disadvantages of Energy Resources**

Energy Resource	**Advantages**	**Disadvantages**
Fossil fuels	• provide a large amount of thermal energy per unit of mass • are easy to get and transport • can be used to generate electricity and to make products such as plastic	• are nonrenewable • produce smog • release substances that can cause acid precipitation • create a risk of oil spills
Nuclear	• is a very concentrated form of energy • does not produce air pollution	• produces radioactive waste • is nonrenewable
Solar	• is an almost limitless source of energy • does not produce pollution	• is expensive to use for large-scale energy production • is practical only in sunny areas
Water	• is renewable • does not produce air pollution	• requires dams, which disrupt a river's ecosystem • is available only where there are rivers
Wind	• is renewable • is relatively inexpensive to generate • does not produce air pollution	• is practical only in windy areas
Geothermal	• is an almost limitless source of energy • power plants require little land	• is practical only in areas near hot spots • produces wastewater, which can damage soil
Biomass	• is renewable • is inexpensive	• requires large areas of farmland • produces smoke

Choosing the Right Energy Resource

As **Table 1** shows, each source of energy that we know about on Earth has advantages and disadvantages. For example, you have probably heard that fossil fuels pollute the air. They will also run out after they are used up. Even renewable resources have their drawbacks. Generating lots of energy from solar energy is difficult. So it cannot be used to meet the energy needs of large cities. Geothermal energy is limited to the "hot spots" in the world where it is available. Hydroelectric energy requires large dams, which can affect the ecology of river life. Energy planning in all parts of the world requires careful consideration of energy needs and the availability and responsible use of resources.

Section Summary

- An energy resource is a natural resource that can be converted into other forms of energy in order to do useful work.
- Nonrenewable resources cannot be replaced, or can be replaced only after a long time. They include fossil fuels and nuclear energy.
- Renewable resources can be replaced in nature relatively fast. They include energy from sun, wind, and water; geothermal energy; and biomass.
- The sun is the source of most energy on Earth.
- Choices about energy resources depend on where you live and what you need energy for.