

USES OF ENERGY

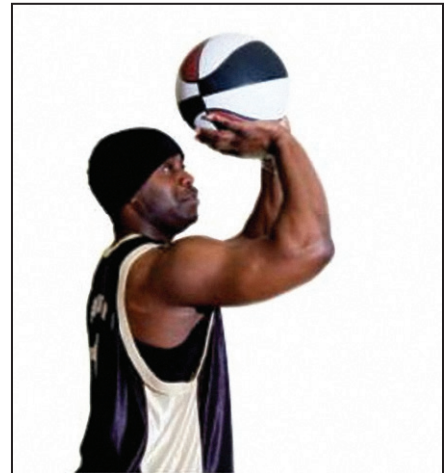
reflect

Take a moment to think about three common objects: a flashlight, a computer, and a toaster. A flashlight provides light. A computer stores information and displays it on a screen. A toaster cooks food. They each do a different job. But these items have something in common. Each uses at least one type of energy. You have probably heard the word *energy*, and you use energy everyday, but what exactly is energy?

What is energy? What are some different forms of energy?

Sometimes it's easier to explain what energy does than to define what it is. Unlike matter, energy is not something you can see. *Energy* is the ability to do work or cause change. All matter has some form of energy. Whenever a flashlight is lit, a computer is turned on, or a toaster cooks food, you can be sure that energy made it happen.

There are two main forms of energy: the energy of motion and the energy of position. The energy of motion is called *kinetic energy*. Any object that is in motion has kinetic energy. Think about a ball rolling down a ramp. The ball is moving, so it has kinetic energy. The energy of position is called potential energy. If a ball is placed at the top of a ramp and is at rest, the ball has a lot of *potential energy*. If the ball is at rest at the bottom of the ramp, it still has potential energy. However, it has less potential energy than it had at the top of the ramp. It's often helpful to think of potential energy as stored energy, or what could happen.

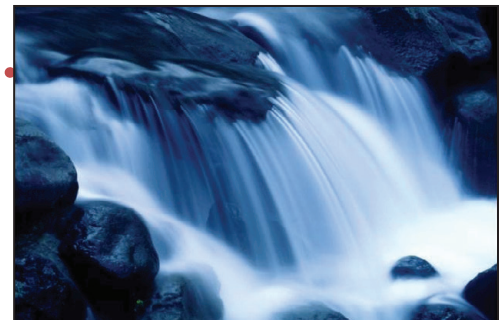


Because of its position above the ground, this ball has a lot of potential energy.

Most types of energy are either kinetic or potential energy. Some of these types include mechanical, thermal, electrical, light, and sound energy. You will learn more about these types of energy next.

look out!

Sometimes energy may seem to disappear. For example, what happens to the energy in a moving car when the car stops moving? The energy does not disappear. It simply changes form from kinetic to potential energy. Energy can be moved from one object to another, and it can be changed from one form to another. However, energy can never be created or destroyed.



Moving water has mechanical energy.

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How can we use different energy forms?

Mechanical energy is the energy that an object (or group of objects) has because of its motion and its position. So, mechanical energy includes both the kinetic and potential energy of an object. As different parts of the object alternate between motion and rest, energy in the object cycles between potential and kinetic. One example of mechanical energy can be seen when a person is riding a bike. The mechanical energy of the bike helps the person travel from one place to another. Other examples include a spinning top, a moving car, or flowing water. In a world full of motion, mechanical energy is all around us!

Thermal energy is energy that can be felt as heat. The movement of tiny particles in matter produces heat. The faster the particles move in matter, the more thermal energy the matter has and the more heat we feel. Thermal energy is sometimes called heat energy. Using an oven to bake a cake or a fire to roast marshmallows are examples of thermal energy in action.



Electrical energy travels through the wires of this toaster and generates thermal energy to toast the bread.

Many household appliances like washing machines, refrigerators, and dishwashers need electrical energy in order to work. *Electrical energy* is a form of energy caused by the movement of **electrons**. The electrons move along a path called a *circuit*. *Conductors* are materials that allow these electrons to flow easily. Copper and aluminum wires are good conductors. You'll learn more about circuits and conductors in a later lesson. The important thing to remember is that electrical energy is often used to generate other forms of energy.

electrons: tiny particles that have electrical charges

Two other types of energy are light energy and sound energy. *Light energy* is energy that can travel through space. People can see some forms of light energy.

To sense or detect other forms of light energy, we need special tools. *Sound energy* is energy that travels through matter. Sometimes we can hear sound energy. Think about a television. You can see the light energy from the screen and hear the sound energy from the speakers.

look out!

You might wonder why sound is considered a type of energy. Remember, any matter that is in motion has energy. Sound is produced when an object vibrates, and vibration is a type of motion.

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what do you think?

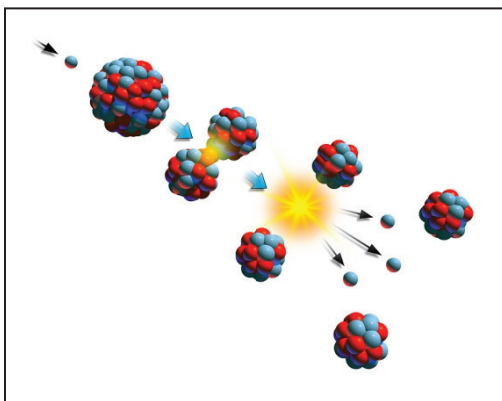
Look at the pictures below. The picture on the left shows thermal and light energy. The center picture shows mechanical energy. The picture on the right shows electrical and sound energy. What are some objects you depend on every day that use these forms of energy?



try now

Take some time to explore different types of energy. You will need a working flashlight to complete the activity.

1. Hold your hands together with your palms touching. Describe how your hands feel. Are they cold or warm?
2. Rub your hands together as fast as you can for about 20 seconds. Describe how your hands feel now. Are they warmer? Why do you think this is so?
3. Observe the flashlight while it is turned off. Does it have potential energy? How do you know?
4. Turn on the flashlight. What forms of energy can you observe? (Use caution when handling the flashlight—the bulb can get hot!)



During nuclear fission, a huge amount of energy is released when the center of an atom is split.

Looking to the Future: Using Nuclear Energy

We use many types of energy every day. As the number of people living on Earth grows, our need for energy grows too. Scientists are always looking for new ways to use different types of energy. One type that scientists spend a lot of time exploring is *nuclear energy*, which comes from the center of an **atom**. Powerful forces hold together the center of an atom. Splitting apart the atom releases these forces in the form of nuclear energy. This process is called *fission*.

atom: basic unit of matter

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Nuclear energy is used in a small number of **power plants** around the world. That number may grow as scientists learn more about how nuclear energy works. Fission releases a huge amount of energy. This is useful because a small amount of matter can go a long way. But nuclear energy can be very dangerous if not handled the right way. It also generates waste that is very difficult to dispose of.

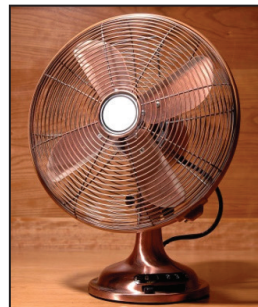
power plants: factories that convert certain forms of energy, including nuclear, into electrical energy

What do you know?

Energy is the ability to do work or cause change. Energy comes in different forms and may change from one form to another. Study the photographs below. Then read the descriptions of how energy is being used. Match each description with the correct photograph. Write your answer in the space below each photograph.

Energy in Action

- Electrical energy is changed into thermal energy and light energy.
- Electrical energy is changed into mechanical energy.
- Mechanical energy is changed into thermal and light energy.
- Mechanical energy is changed into sound energy.



connecting with your child

Uses of Energy Close to Home

To help students learn more about uses of energy, spend some time looking around the house for examples of energy in action. Have students make a list of objects they use every day that require or use energy. Ask them to rate the importance of each object on a number scale, with 1 being the most important. Some common examples include lamps, computers, appliances, clocks, sports balls, and toys that move—for example, remote-control cars. Discuss how each object uses energy and which form(s) it uses.

Then take students on a walk outside and ask them to look for other examples of energy they can observe. Birds flying, water flowing, and crickets chirping are some examples you might encounter. Ask students to describe the different forms of energy in each example they find outside. Encourage students to be specific and to describe the importance of each form of energy to the organism that uses it. For example, students may explain that a bird is using mechanical energy to move across the sky because it needs to find food, and using sound energy to communicate with other birds in order to mate.

Here are some questions to discuss with students:

- What form of energy do you consider most important in your life? Why?
- What are some ways that you can reduce the amount of energy you use?
- How might you be affected if you couldn't use certain forms of energy like electricity?
- Do other organisms use the same forms of energy as humans? Give some examples.