

## Forms of Energy

By Cindy Grigg

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Energy is everywhere. We can see it as light, feel it as heat, and hear it as sound. It's easier to describe what energy does than what energy is. Energy is not something you can see or touch. Energy is a property of matter, and all matter has it. Whenever you turn on a flashlight, your mom cooks dinner, a fan spins, a rock falls downhill, a fire burns, or music plays, you can be sure that energy made it happen. **Energy** is the ability to do work or bring about change.

There are two types of energy: kinetic and potential. **Kinetic energy** is the energy an object has because it is moving. The more mass the object has and the greater the speed at which it is moving, the greater the kinetic energy it has. **Potential energy** is stored energy. It is the energy an object has because of its position or shape. If the object is sent into motion, it would have kinetic energy. A rock balanced on top of a mountain has a lot of potential energy because of where it is. If it falls, it has the potential to do much damage. As it falls, it will collide with more rocks, making them fall. A rockslide might be the result.

Work is the transfer of energy that results from motion. We say that work is done on an object when energy is transferred to that object. Work is calculated by the amount of force on the object times the distance it travels. Some energy is lost in every transfer of energy. A light bulb uses electrical energy to give off light, but most of the energy it uses is lost as heat. Energy is measured in joules (j). One joule is the amount of energy needed to move a one kilogram mass using one newton of force over a distance of one meter. It is also called a newton-meter.

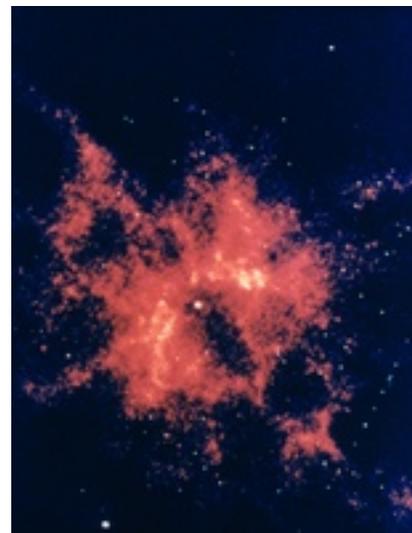
Energy comes in many different forms. While it can be transferred from one object or system to another, energy cannot be created or destroyed. The amount of total energy remains constant. This rule is the first law of thermodynamics, called the law of conservation of energy. If energy cannot be created, then where did all of our energy come from?

Around fourteen billion years ago, there was a huge explosion called the Big Bang. After the Big Bang, the universe was almost all energy at very high temperature. As the universe expanded, it cooled. Some of the energy formed matter. The universe is still made of only matter and energy. We use that energy today in different forms.

**Atomic or nuclear energy** is the energy found in the nuclei of atoms. It is also a type of potential energy. This energy is released by fission (the splitting of the nucleus) or by fusion (the joining together of two nuclei).

**Chemical energy** is the energy stored in chemical bonds holding a molecule together. When the bonds are broken, energy is released. We get chemical energy from our food. Other examples of chemical energy are wood, gasoline, and batteries. Chemical energy is potential energy.

**Heat or thermal energy** is the energy related to the temperature of an object or a substance. All matter is made of atoms. Atoms are always in constant motion. Since they are in motion, they have kinetic energy. Thermal energy is the total amount of kinetic energy contained in all the particles of a substance. The amount of thermal energy depends on two things. They are the amount of kinetic energy of the particles and the number of particles in the substance. The greater the kinetic energy of the particles in the substance, the more thermal energy the substance has. The more particles a substance has, the greater the energy it has. If we say an object has more thermal energy than another object, it does not necessarily mean that the first object has a higher temperature than the other object. For instance, the ocean has much more thermal energy than a pan of boiling water. That's because the ocean is so large, it has many more particles than the pan of water. Even though the pan of water's particles has greater thermal energy, the vast number of particles in the ocean gives it greater energy.





**Electrical energy** is the energy produced by electric charges. An electric charge is a physical property of protons and electrons, particles that make up every atom. There are two kinds of electric charges: positive and negative. Protons have a positive charge, and electrons have a negative charge. Like charges repel or push away from each other. Unlike charges attract or pull toward each other.

**Light energy** is the energy carried by light and other kinds of electromagnetic waves. Light is a type of energy produced by the vibration of electrically charged particles. Light travels in the form of electromagnetic waves. There are many different types of electromagnetic waves, most of which cannot be seen by the human eye.

**Mechanical energy** is the energy an object has because of its motion or position. It can be either kinetic or potential energy. An object that has mechanical energy is able to do work. Mechanical energy does not necessarily mean a machine is involved. A rock balanced on top of a mountain has potential mechanical energy.

**Sound energy** is the energy carried by sound waves. Sound waves are produced when an object vibrates. Unlike light, sound waves need a medium to travel through. A medium is any type of matter whose particles can be vibrated by sound waves.

All living things on Earth depend on the sun for their energy. Plants use it to perform photosynthesis and make their food. People and other animals eat plants or other animals that relied on plants for their food. Even the gasoline, natural gas, and coal we use to generate our electricity were formed by the remains of plants that got their energy from the sun. The sun is the most powerful source of energy in our solar system. It has provided heat and light for billions of years. Its energy is released by the fusion of about twenty billion tons of hydrogen atoms every minute.

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## Questions

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1. Energy is:

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2. There are two main types of energy. Name them.

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\_\_\_\_\_ 3. A moving object has:

- A. electrical energy
- B. kinetic energy
- C. potential energy

\_\_\_\_\_ 4. Work is calculated by multiplying the force exerted on an object times:

- A. energy
- B. distance
- C. joules

Name \_\_\_\_\_



Date \_\_\_\_\_

- \_\_\_\_\_ 5. The amount of energy needed to move a one kilogram mass using one newton of force over a distance of one meter is a:
- A. newton
  - B. newton-meter
  - C. joule
  - D. both b and c

- \_\_\_\_\_ 6. The first law of thermodynamics says that:
- A. Energy can not be created or destroyed; it only changes forms.
  - B. There are only two types of energy.
  - C. There are many types of energy.

- \_\_\_\_\_ 7. Atomic and chemical energy are two forms of:
- A. kinetic energy
  - B. potential energy
  - C. mechanical energy

8. The amount of thermal energy depends on two things. Name them.

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