

Getting to Know: Potential Energy



At the top of a ramp, a skater has potential energy as a result of his position above Earth's surface.

At a competition, a skateboarder begins his ride teetering on the rim of a half-pipe. With a slight lean forward, the skateboard tips down onto the ramp. Suddenly the skateboarder is flying down and up again, soaring right over the rim and performing tricks in midair.

What gives the skateboarder energy to perform such thrilling tricks? The skateboarder's initial position at the top of the half-pipe gives him *potential energy*. That potential energy changes to *kinetic energy*—the energy of motion—as he moves down and up the ramp. The skateboarder's breakfast also gave him potential energy. His muscles release some of that energy as they work to twist and turn his body through tricks.

What is potential energy?

Potential energy is energy that is stored in a system or an object. This energy has the potential to do work when it is eventually released. The amount of stored energy depends on an object's position or condition. For example, as a skateboarder moves to a position higher above Earth's surface, he gains potential energy. When this potential energy is released, gravity does the work of moving his body

to a new position. The higher his initial position above the ground, the more potential energy he has and the faster and farther he will move when he finally begins moving down.



Misconception 1: *Energy is a material substance or "thing" that objects can gain or lose.*

Energy is not a "thing." It is not matter; you cannot touch it. Energy is the ability to do work. In science, work is moving a mass over a distance. Potential energy is stored energy. An object's potential energy can change when the object's position or condition changes.

Potential energy also depends on an object's condition. The cells in your body, for example, contain chemical compounds. Energy stored in the molecules of these compounds is released during the chemical reactions that occur during cell functioning. If you have not been eating properly, your cells might be in a depleted condition and they would store less potential energy. When your cells are functioning normally, however, they contain a great deal of chemical potential energy, which they transform into other kinds of energy all the time. This is how you produce the thermal energy that keeps your body warm and the kinetic energy present when you move your arms and legs.

Does the skateboarder's potential energy disappear as he moves down the ramp?

No—his potential energy changes into kinetic energy. Some of the potential energy he had at the top of the half-pipe changes to kinetic energy as he begins moving downward. As he moves upward on the other side of the half-pipe, some of his kinetic energy changes back to potential energy. Kinetic and potential energy continually change from one to the other as a person, or any object, moves up and down.



Misconception 2: *Some energy is destroyed as it changes form.*

Actually, energy can never really be created or destroyed. It sometimes seems like energy goes away, for example, when a moving object comes to a rest. However, that is the result of kinetic energy changing to another form of energy such as heat energy.

Are there different kinds of potential energy?

Yes, there are several kinds of potential energy. The potential energy an object has as a result of its height above the ground is called *gravitational potential energy*. Gravity has the potential to set the object in motion.

The atoms and molecules that make up your body and the food you eat have *chemical potential energy*. That energy can be released when you use your muscles to move objects or when your body breaks down food.

The centers of atoms have *nuclear potential energy*. Huge amounts of energy can be released in nuclear reactions such as those that occur in the Sun.

Objects that can spring back after being stretched or compressed have *elastic potential energy*. For example, when you let go of a stretched rubber band, you release its elastic potential energy. That energy changes to kinetic energy as the rubber band flies through the air.

During the lesson, you will learn more about different kinds of potential energy and how potential energy changes to other forms of energy.



Foods, like this pineapple, have chemical potential energy. Your cells can release that energy and use it to perform life processes.