

WORK AND ENERGY

Work and energy are closely related. Work is the exertion of force over a given distance to displace or move an object. It is thus the product of force and distance exerted in the same direction. Energy is the ability to accomplish work.

There are many manifestations of energy, including one of principal concern in the present context: thermal or heat energy. Other manifestations include electromagnetic (sometimes divided into electrical and magnetic), sound, chemical, and nuclear energy. All these, however, can be described in terms of mechanical energy, which is the sum of potential energy—the energy that an object has due to its position—and kinetic energy, or the energy an object possesses by virtue of its motion.

Kinetic energy relates to heat more clearly than does potential energy; however, it is hard to discuss the one without the other. To use a simple example—one involving mechanical energy in a gravitational field—when a stone is held over the edge of a cliff, it has potential energy. Its potential energy is equal to its weight (mass times the acceleration due to gravity) multiplied by its height above the bottom of the canyon below. Once it is dropped, it acquires kinetic energy, which is the same as one-half its mass multiplied by the square of its velocity.

Just before it hits bottom, the stone's kinetic energy will be at a maximum, and its potential energy will be at a minimum. At no point can the value of its kinetic energy exceed the value of the potential energy it possessed before it fell: the mechanical energy, or the sum of kinetic and potential energy, will always be the same, though the relative values of kinetic and potential energy may change.