Glossary

basal metabolic rate the total energy conversion rate of a person at rest

chemical energy the energy in a substance stored in the bonds between atoms and molecules that can be released in a chemical reaction

conservation of mechanical energy the rule that the sum of the kinetic energies and potential energies remains constant if only conservative forces act on and within a system

conservative force a force that does the same work for any given initial and final configuration, regardless of the path followed

efficiency a measure of the effectiveness of the input of energy to do work; useful energy or work divided by the total input of energy

electrical energy the energy carried by a flow of charge

energy the ability to do work

fossil fuels oil, natural gas, and coal

friction the force between surfaces that opposes one sliding on the other; friction changes mechanical energy into thermal energy

gravitational potential energy the energy an object has due to its position in a gravitational field

horsepower an older non-SI unit of power, with 1 hp = 746 W

joule SI unit of work and energy, equal to one newton-meter

kilowatt-hour $(kW \cdot h)$ unit used primarily for electrical energy provided by electric utility companies

kinetic energy the energy an object has by reason of its motion, equal to $\frac{1}{2}mv^2$ for the translational (i.e., non-rotational) motion of an object of mass m moving at speed v

law of conservation of energy the general law that total energy is constant in any process; energy may change in form or be transferred from one system to another, but the total remains the same

mechanical energy the sum of kinetic energy and potential energy

metabolic rate the rate at which the body uses food energy to sustain life and to do different activities

net work work done by the net force, or vector sum of all the forces, acting on an object

nonconservative force a force whose work depends on the path followed between the given initial and final configurations

nuclear energy energy released by changes within atomic nuclei, such as the fusion of two light nuclei or the fission of a heavy nucleus

potential energy energy due to position, shape, or configuration

potential energy of a spring the stored energy of a spring as a function of its displacement; when Hooke's law applies, it is given by the expression $\frac{1}{2}\mathrm{kx}^2$ where x is the distance the spring is compressed or extended and k is the spring constant

power the rate at which work is done

radiant energy the energy carried by electromagnetic waves

renewable forms of energy those sources that cannot be used up, such as water, wind, solar, and biomass

thermal energy the energy within an object due to the random motion of its atoms and molecules that accounts for the object's temperature

useful work work done on an external system

watt (W) SI unit of power, with 1 W = 1 J/s

work the transfer of energy by a force that causes an object to be displaced; the product of the component of the force in the direction of the displacement and the magnitude of the displacement

work-energy theorem the result, based on Newton's laws, that the net work done on an object is equal to its change in kinetic energy