

Mechanical Work: Notes

SPH4C

The **mechanical work** on an object is the amount of mechanical _____

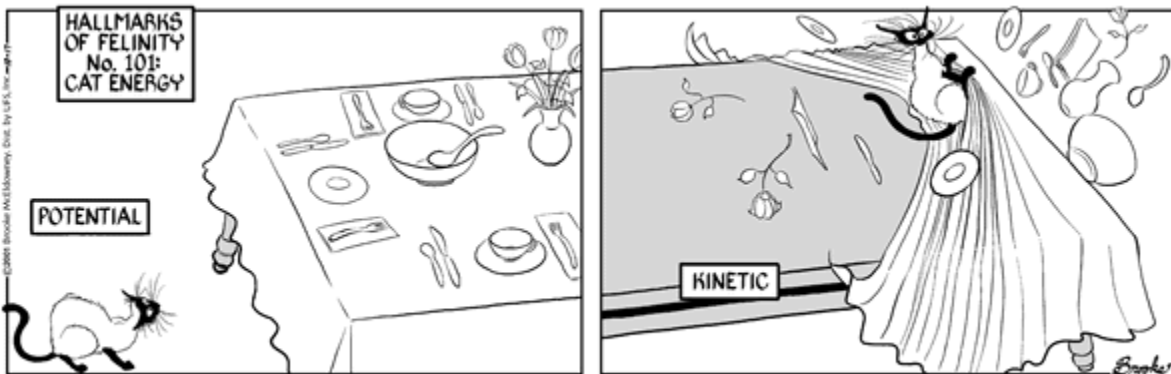
to that object by a _____:

$$W = \underline{\hspace{2cm}}$$

Whereas the **mechanical energy** of an object is that part of its total energy which is subject to change by mechanical work (*definition by the Department of Redundancy Department*).

Energy is a concept so fundamental in physics that it is not easily defined in terms of anything more fundamental. It is easier just to understand energy in terms of its component kinetic and potential energies.

Kinetic energy is the energy of _____ and **potential energy** is the energy to, potentially, _____.



Thermal energy, the energy of the particles of a substance, is partly kinetic energy and partly potential energy:

The kinetic energy is in the kinetic energy of the _____.

The potential energy is stored in the atomic _____ during this motion.

The SI derived unit of work is the Joule: $1 \text{ J} = \underline{\hspace{2cm}}$

But there exist other metric units, e.g. kilowatt-hours: $1 \text{ kWh} = \underline{\hspace{2cm}}$

calories: $1 \text{ cal} = \underline{\hspace{2cm}}$

Nutrition Facts	
Per 125 mL (87 g)	
Amount	%Daily Value
Calories 80	(335 kJ)

A calorie is the amount of _____ necessary to raise the temperature of 1 g of water by 1°C (at standard atmospheric pressure).

Food energy is measured in *kilocalories* (or Calories with a capital C).

$$1 \text{ Calorie} = 1000 \text{ cal} = 4184 \text{ J} = 4.184 \text{ kJ}$$

More Practice

Match each term on the left with the most appropriate description on the right.

- | | |
|------------------------|--|
| _____ kinetic energy | A. energy possessed by the particles of a substance |
| _____ mechanical work | B. when a force is applied to an object to change its energy |
| _____ potential energy | C. rate of doing work |
| _____ power | D. energy possessed by moving objects |
| _____ thermal energy | E. energy an object possesses because of its position |

1. Energy is measured in:

- A. calories B. Joules C. kilowatt-hours D. all of the above

2. 1 Joule is equivalent to:

- A. $1 \frac{m}{s^2}$ B. $1 \frac{kg \cdot m}{s^2}$ C. $1 \frac{kg \cdot m}{s}$ D. $1 \frac{kg \cdot m^2}{s^2}$

3. If a force is applied to an object that is opposite its direction of motion, the total mechanical energy of the object will be:

- A. the same B. increased C. decreased D. It cannot be determined.

4. A student uses a force of 20 N to push a book 1.0 m along a table. A frictional force of 20 N opposes the motion of the book. The work done by the student is:

- A. 0 J B. 20 J C. 40 J D. It cannot be determined.

5. A shopper pushes a shopping cart across a horizontal surface with a horizontal applied force of 41 N for 11 m. The cart experiences a frictional force of 35 N.

(a) Calculate the work done by the shopper on the shopping cart.

(b) Calculate the work done by friction on the shopping cart.

(c) Calculate the total mechanical work done on the shopping cart.