

mechanical energy

the sum of kinetic energy and all forms of potential energy

Analyzing situations involving kinetic, gravitational potential, and elastic potential energy is relatively simple. Unfortunately, analyzing situations involving other forms of energy—such as chemical potential energy—is not as easy.

We can ignore these other forms of energy if their influence is negligible or if they are not relevant to the situation being analyzed. In most situations that we are concerned with, these forms of energy are not involved in the motion of objects. In ignoring these other forms of energy, we will find it useful to define a quantity called **mechanical energy**. The mechanical energy is the sum of kinetic energy and all forms of potential energy associated with an object or group of objects.

$$ME = KE + \Sigma PE$$

All energy, such as nuclear, chemical, internal, and electrical, that is not mechanical energy is classified as *nonmechanical energy*. Do not be confused by the term *mechanical energy*. It is not a unique form of energy. It is merely a way of classifying energy, as shown in **Figure 10**. As you learn about new forms of energy in this book, you will be able to add them to this chart.

Figure 10

Energy can be classified in a number of ways.

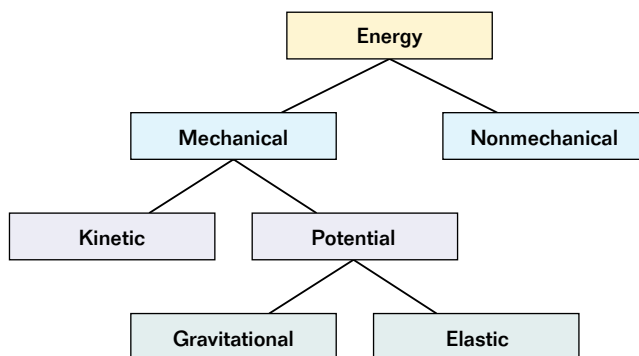


Figure 11

The total mechanical energy, potential energy plus kinetic energy, is conserved as the egg falls.

Mechanical energy is often conserved

Imagine a 75 g egg located on a countertop 1.0 m above the ground, as shown in **Figure 11**. The egg is knocked off the edge and falls to the ground. Because the acceleration of the egg is constant as it falls, you can use the kinematic formulas to determine the speed of the egg and the distance the egg has fallen at any subsequent time. The distance fallen can then be subtracted from the initial height to find the height of the egg above the ground at any subsequent time. For example, after 0.10 s, the egg has a speed of 0.98 m/s and has fallen a distance of 0.05 m, corresponding to a height above the ground of 0.95 m. Once the egg's speed and its height above the ground are known as a function of time, you can use what you have learned in this chapter to calculate both the kinetic energy of the egg and the gravitational potential energy associated with the position of the egg at any subsequent time. Adding the kinetic and potential energy gives the total mechanical energy at each position.