Conservation of Mechanical Energy
SPH4C

Starting with gravitational potential energy. . . .

An object of mass 3.0 kg is suspended at a height of 12 m above the ground.
Calculate its gravitational potential energy:

Calculate its kinetic energy: _____

The object is released. . . .

The object is released and hits the ground at a speed of 15.3 m/s. What is its kinetic energy when it hits the ground?

Calculate its gravitational potential when it hits the ground: _____

Our energy has been entirely _____ from gravitational potential to kinetic energy.

But the total mechanical energy of the object (E_g + E_k) _____.

Conservation of Energy: In general, if no _____ is being done on the object by an outside force, the total mechanical energy of the system will remain _____:

Note that in real life, energy is never transformed with _____:

a ball dropped from a given height will never bounce back up to that same height.

Some energy is always “lost” as _____ energy or _____ energy because of

_____. However, just as we often neglect friction, we will often neglect these losses.

Efficiency is the _____ of useful energy or work output to the total energy or work input:

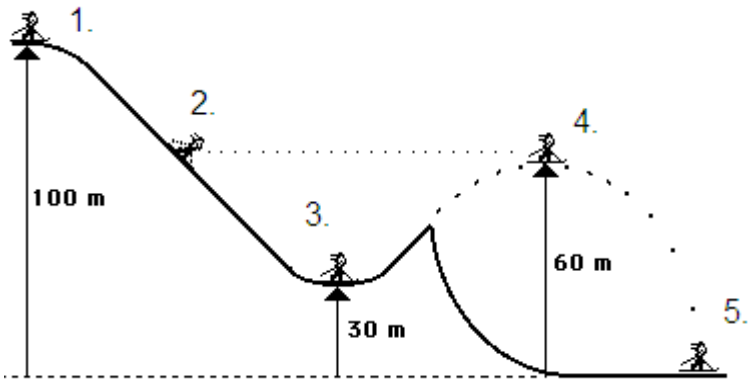
Example 1: A model rocket engine contains explosives storing 3500 J of chemical potential energy. Calculate how efficiently the rocket transforms stored chemical energy into gravitational potential energy if the 0.50 kg rocket is propelled to a height of 1.0×10^2 m.

Alternately, efficiency is also the ratio of the useful _____ output to the _____ input:

Example 2: A 120-W motor accelerates a 5.0-kg mass from rest to a speed of 4.0 m/s in 2.0 s. Calculate the motor’s efficiency.

More Practice

Match each position on the path of the 50-kg ski jumper at left to its gravitational potential and kinetic energies on the right. One combination of energies will be used more than once.



A. E_k = 50 000 J
E_g = 0 J

B. E_k = 20 000 J
E_g = 30 000 J

C. E_k = 35 000 J
E_g = 15 000 J

D. E_k = 0 J
E_g = 50 000 J

1. An object is lifted to some height and then dropped. During the drop, which of the following is increased?

A. gravitational potential energy B. kinetic energy
C. total mechanical energy D. both B and C

2. An object is lifted to some height and then dropped. During the drop, which of the following is decreased?

A. gravitational potential energy B. kinetic energy
C. total mechanical energy D. both A and C

3. A projectile is launched from ground level. At the highest point in its trajectory its total mechanical energy is _____ its total mechanical energy at its launch position.

A. less than B. equal to C. greater than D. It cannot be determined.

4. An object is launched from ground level at a velocity of 5 m/s [37° above the horizontal]. Neglecting air resistance, what is the speed of the object when it hits the ground again?

A. 3 m/s B. 4 m/s C. 5 m/s D. It cannot be determined.

5. Coin A is thrown up in the air at a speed *v* from an height of *h*. Coin B is thrown down at the same speed from the same height. Which coin hits the ground at the highest speed?

A. Coin A B. Coin B
C. They hit the ground at the same speed. D. It cannot be determined.