Kinetic Energy
SPH4C

When a force is applied to accelerate an object from speed v_1 to speed v_2, the work done on the object can be written as: W = _____ = _____

Since $a = \frac{v_2 - v_1}{\Delta t}$ and $\Delta d = v_{av}\Delta t = \frac{1}{2}(v_2 + v_1)\Delta t$,

W = _____

Since this work is done to _____ of the object, the energy that is increased is the object's kinetic energy E_k:

Kinetic energy is therefore E_k = _____

Example 1
A car of mass 1500 kg is travelling at a speed of 24 m/s. Calculate the kinetic energy of the car.

Example 2
An object of mass 5.0 kg is travelling at a speed of 4.0 m/s. 27 J of work is done to increase the speed of the object. Calculate its final kinetic energy and final speed.

More Practice

Match each situation below with the description of its kinetic energy.
Some descriptions may be used more than once.

A. $E_k = 0$ B. E_k is increasing C. E_k is decreasing D. E_k is constant

____ A ball is at rest.

____ A person is exerting a force on the ball to launch it upward.

____ The ball is freely moving upward through the air.

____ The ball is freely falling downward through the air.

____ The ball is rolling along the ground at constant speed.

1. What is the kinetic energy of a 1.0 kg object moving at 4.0 m/s?

   A. 4.0 J B. 8.0 J C. 16 J D. It cannot be determined.

2. An object is sliding across a frictionless surface at a constant speed. The kinetic energy of the object is:

   A. increasing at an increasing rate B. increasing linearly
   C. increasing at a decreasing rate D. constant

3. Which requires more work: increasing the speed of an object from 0 m/s to 5 m/s or from 5 m/s to 10 m/s?

   A. from 0 m/s to 5 m/s B. from 5 m/s to 10 m/s
   C. both require the same amount of work D. It cannot be determined.

4. A 2.0 kg ball is moving at 3.0 m/s while at a height of 1.5 m above the ground. Calculate the total mechanical energy (gravitational potential energy + kinetic energy) of the ball.