Work and Energy

1. Firemen are attempting to put out a fire on the 44th floor (128 meters above the ground) of a condo complex. 7.5 ML of water are required to put out the fire.

   a) Calculate the work done b y the pump in the fire engine.

   b) Calculate the amount of potential energy gained by the water

   c) If the firemen put the fire out in twenty minutes, calculate the horsepower generated by the fire engine.

2. An 85 kg. Man is riding his 3 kg bicycle at 45 mi/hr

a) Neglecting friction, calculate the amount of work done in maintaining the motion described below.

b) Calculate the kinetic energy of the man.

3. The engines of a rocket have 2.7GJ of energy at their disposal. The initial velocity of the rocket is 4300 m/s.

a) Calculate the height above the earth's surface the rocket will attain.

b) Calculate the maximum potential energy the rocket will attain.

c) Calculate the mass of the rocket.

4. Calculate the velocity a snow boarder will attain at the bottom of a 185 meter hill.

5. Calculate the work required to stop a 1700 kg automobile which is traveling at 35 m/s.

6. Kelly is hiking in the Grand Canyon and finds an unusual spot to conduct a conservation of energy experiment. She is standing on top of a 75m hill which is 20m form the edge of a cliff which drops 190m to a swiftly flowing stream. Jenny, Kelly's assistant, is waiting anxiously in the stream to help Kelly perform this experiment. Kelly releases an 8kg bowling ball from the top of the hill.

   a) Calculate the horsepower Jenny must apply in order to stop the ball in .26 seconds.

   b) Calculate the velocity of the ball as Jenny catches it.

   c) Calculate the P.E. at the top of the hill before Kelly releases it.

7. A bullet is fired form a rifle with a muzzle velocity of 250 m/s. The bullet has a mass of .085 kg.

   a) Calculate the Potential Energy in the spring system of the gun.

   b) Calculate the spring constant for the gun, if the hammer displaces the spring 1.8 cm when the hammer is cocked. (P.E. spring = $1/2\ kx^2$)