Physics 10
Ms. Martinez
Work/Energy/Power WS

1. How much work is done by gravity when a 5 kg concrete block falls 2.0 m?

   Fg = -50 N d = - 2.0 m Wg=+100 J

2. The same 5 kg block is now pushed horizontally with a 5 N force over a distance of 3.0 m. What is the work done pushing the block? If it takes 4.0 seconds to complete, what power is developed pushing the block?

   F= +5 N d= + 3.0 m W = +15 J P= 15J/4.0 s = 3.75 Watts

3. A butterfly with a mass of 0.52 kg flies 5.0 m off the ground at a speed of 4.2 m/s. What are the butterfly's potential energy with respect to the ground and its kinetic energy?

   PEg= mgh = (0.52kg)(-10m/s^2)(5.0m) = 26J KE=1/2(m)(V^2) = 4.6 J

4. A 7.0 kg bowling ball moves at 3.00 m/s. How much kinetic energy does the bowling ball have? How fast must a 2.5 g ping-pong ball move in order to have the same kinetic energy as the bowling ball? Is this speed reasonable?

   KE=31.5 J v=159m/s not reasonable

5. A 1.50 x 10 ^{3} kg Volvo accelerates uniformly from rest to 10.0 m/s in 3.00 second.
   a. Determine the work done on the car in this time interval.
   b. Determine the power delivered by the engine in this time interval in W and hp.

   a. 7.5 x 10^4 J
   b. 2.5 x 10^4 watts (33.5 horsepower)

6. A skateboard of mass 4.2 kg is moving at a velocity of 1.00 m/s. (a) How much work (net) must be done to the skateboard in order for it to move at a velocity of 4.0 m/s? (b) What net force is needed if it is applied for a distance of 520 cm? c) What is the acceleration of the skateboard?

   a. 31.5 J
   b. 6.1 N
   c. 1.44 m/s^2

7. A 65.0 kg bungee jumper jumps off a 60.0 m bridge. The bungee cord has an unstretched length of 20.0 m. When the bungee jumper jumps and comes to rest, the bungee cord stretched to a length of 45.0 m. Disregarding the weight of the bungee and assuming the bungee cord has a spring constant of 72.0 N/m, determine the total potential energy of the man relative to the water when he comes to a rest.

PEelastic = 13125 J **PEgravitational = 9750** **PEtotal = 2.29 x 10^4 J**

8. Two horses pull a cart – each horse exerts a force of 250.0 N in the same direction at a speed of 2.0 m/s for 10 minutes.
   a. Calculate the power delivered by the horses.
   Time = 600 seconds **d= 1200 m** **work = 300,000 J**

   P = 500 W per horse or 1000 W total

   b. Calculate the work done by the horses.

   6.0 x 10^5 J

9. A motor driven winch is used to pull a 50.0 kg student up into the air during the fall play. If the actress must be pulled up 5.0 m at a constant speed of 1.25 m/s, determine the power rating of the motor (in Watts and in hp.)

   625 W

10. A student on a frictionless ice surface is pushed by another person at a constant force of 35 N. How far must the student be pushed, starting from rest, so that his final kinetic energy is 352 J?

    10.1 m

11. A 40.0 kg child is in a swing that is attached to ropes that are 2.00 m long. The swing is 0.50 m off the ground. Find the gravitational potential energy relative to the ground under the following conditions:
    a. When the ropes are horizontal.

    1000 J

    b. When the child is at the bottom of the circular arc.

    200 J

    c. After the swing's rope breaks and the swing falls to the ground.

    0 J