W-E Application Problems

1. A ball having a weight of 1.5 N is dropped from a height of 4 meters. (Neglect air friction)
   - What net force is acting on the ball after being dropped? _____
   - What is the potential energy just before being dropped? _____ (reference ground)
   - What is the kinetic energy just before hitting the ground? _____
   - In what direction is the kinetic energy just before hitting the ground? _____
   - What mechanical energy is lost just before it hits? _____

2. In a similar situation to problem 1 above, it is found that the average frictional force on the1.5 N falling ball is 0.2 N.
   - What net force is acting on the ball after being dropped? _____
   - What is the kinetic energy just before hitting the ground? _____
   - What mechanical energy is lost? _____

3. In problem 1 above, from what height must the ball be dropped to have twice the kinetic energy as from 4 meters? _____. Explain.

4. In problem 1 above, from what height must the ball be dropped to have twice the velocity as from the 4 meters? _____ Explain.

5. The speed for an object to escape the Earth's gravity is called the escape velocity. This speed is calculated from energy considerations. An object must have enough kinetic energy to overcome the gravitational potential energy. For a 30 kg satellite in a circular orbit around the Earth at a distance of 7×10^6 m from the center, we find the orbital speed to be 7.56×10^3 m/s. From that location, calculate the gravitational PE, the kinetic energy, and the escape velocity.
   Gravitational PE = _____J
   Orbital KE = _____J
   Escape velocity = _____ m/s
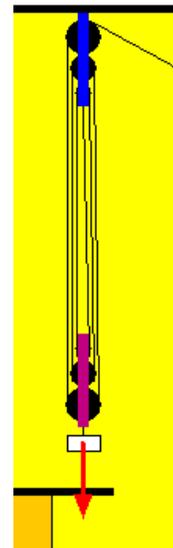
6. The pulley system, shown to the right, has 6 pulleys and thus it requires only 100 N to lift a 600 N weight. Using energy considerations and assuming that the unit is 100% efficient (no friction), how far must the rope be pulled to raise the weight a distance of 20 cm?
   Distance = _____ m.

7. Which of the following forces are conservative and non-conservative? Place an N or a C in the space to designate the force as non-conservative or conservative.
   _____ gravity   _____ bow (for arrow)   _____ spring
   _____ friction   _____ electrostatic   _____ air friction

8. If a woman lifts a 500 N weight a distance of 1.5 meters up in 0.5 seconds, what is her power output?

P = _____ W