Name: _____

You may answer the questions in the space provided here, or if you prefer, on your own notebook paper.

1. **Chapter 6: 22** A question familiar to those who have seen the recent film Gravity. A 15g piece of space junk has a speed of 1.2 km/s.

   (a) What is its kinetic energy?

   (b) What is its kinetic energy if its speed is halved?

   (c) What is its kinetic energy if its speed is doubled?

   (d) What is the trend here? How does K change with speed?

Please go on to the next page...

2. **Chapter 6: 49** A single force of 5.0 N acts in the +x direction on an 8.0 kg object.

   (a) If the object starts at rest at $x = 0$ at $t = 0$, write an expression for the power delivered by this force as a function of time. *hint: apply Newton's second law to find the acceleration on the particle, and use this to find a function that describes the velocity as a function of time.*

   (b) What is the power delivered by this force at time $t = 3.0$ s.

3. **Chapter 7:23** A spring has a force constant of 1.0×10^4N/m. How far must the spring be stretched for its potential energy to equal 50 J? How far to get 100 J?

4. **Chapter 7: 39** A 3.00 kg object is released from rest at a height of 5.00 m on a curved frictionless ramp. At the foot of the ramp is a spring with K=400 N/m. The object slides down the ramp and into the spring, compressing it a distance x before coming momentarily to rest. What is x? What happens next? (see the figure in the book).

5. **Chapter 7: 51** A 0.17 kg baseball is launched from the roof of a building 12 m above the ground. Its initial velocity is 30 m/s at 40° above the horizontal. Assume no air friction. What is the maximum height of the ball and the speed of the ball when it hits the ground. *Hint: You will need to break the velocity into x-y components; but otherwise try to solve this problem just using energy concepts–it turns out to be much easier that way. Go back and check using projectile motion concepts if you have the time.*

6. **Chapter 7: 67** You will need to refer to the figure on page 242 for this problem. Block 1 is on a table with coefficient of friction of kinetic friction of 0.35 and it weighs 4.0 kg. It is attached via an ideal rope and ideal pulley to Block 2 which is hanging off the side. Block 2 has a mass of 2.0 kg.

   (a) Find the energy dissipated by friction as Block 2 falls a distance y. That is, find an equation that relates distance fallen, y, with energy lost.

   (b) Find the change in mechanical energy (remember that mechanical energy is defined as $E_{mech} = K + U$, the sum of kinetic and potential energies) of the two-block-Earth system during the time it takes the 2 kg block to fall a distance y.

   (c) Find the speed of either block after the 2 kg block has fallen 2 meters.