Name_____

Date _____ **Pd** ____

Energy Storage and Transfer Model Worksheet 4:

Quantitative Energy Calculations & Energy Conservation

Be careful with units and unit conversions!

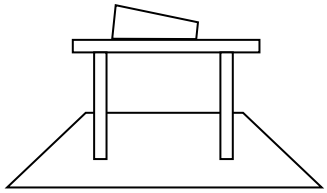
1. How much kinetic energy does a 2000 kg SUV traveling 70 mph have? (1 mile = 1600 meters)

2. How much energy does a 180 Calorie, half-pint carton of chocolate milk store? (One food Calorie = 4186 Joules)

3. Consider your 3 kg physics binder resting on the table in the classroom. Determine the gravitational energy of the earth-book system if the zero reference level is chosen to be:

   a) the table

   b) the floor, 0.68 meters below the book



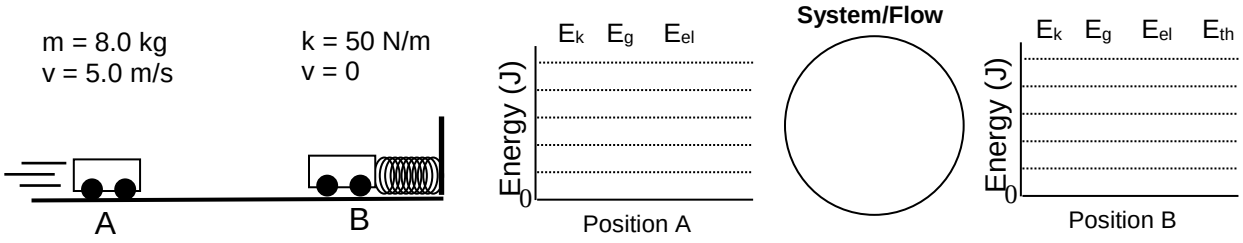
   c) the ceiling, 2.5 meters above the book

4. A bungee cord stretches 25 meters and has a spring constant of 140 N/m. How much energy is stored in the bungee?

5. How fast does a 50 gram arrow need to travel to have 40 joules of kinetic energy?

6. How much energy is stored when a railroad car spring is compressed 10.0 cm? (The spring requires about 10,000 N to be compressed 3.0 cm.)

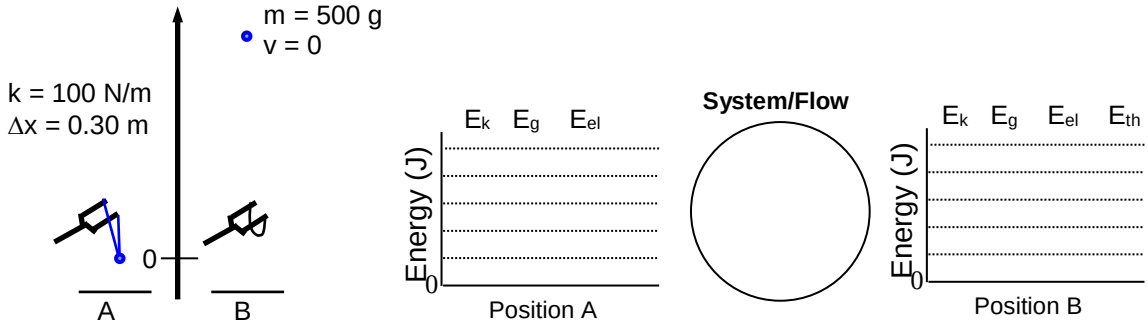
7. A cart moving at 5.0 m/s collides with a spring. At the instant the cart is motionless, what is the largest amount that the spring could be compressed? Assume no friction.
   a. Define the system with the energy flow diagram, then complete the energy bar graphs qualitatively.



   b. Quantitative Energy Conservation Equation:

   c. Determine the maximum compression of the spring.

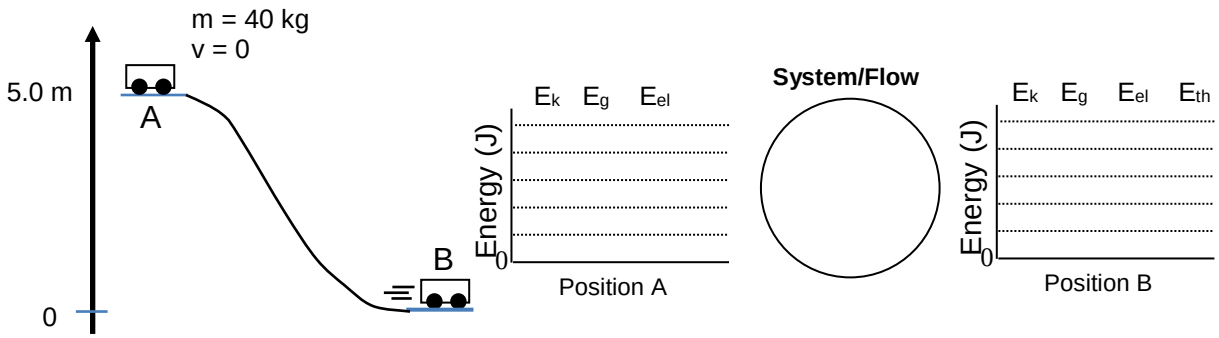
8. A rock is shot straight up into the air with a slingshot that had been stretched 0.30 m. Assume no air resistance.
   a. Qualitatively complete the energy flow diagram and the energy bar graphs.



   b. Quantitative Energy Conservation Equation:

   c. Determine the greatest height the rock could reach.

9. Determine final velocity of the rollercoaster, assuming a 10% loss to friction.



10. The moon could be an ideal spaceport for exploring the solar system. A moon launching system could consist of a magnetic rail gun that shoots items into moon orbit. How much energy would be needed from the rail gun to get a 10,000 kg capsule into an orbit 100 km above the moon surface? The moon's gravitational field strength is 1.6 N/kg and the orbital velocity for this altitude is 1700 m/s. Hint: Put the rail gun outside of the system.