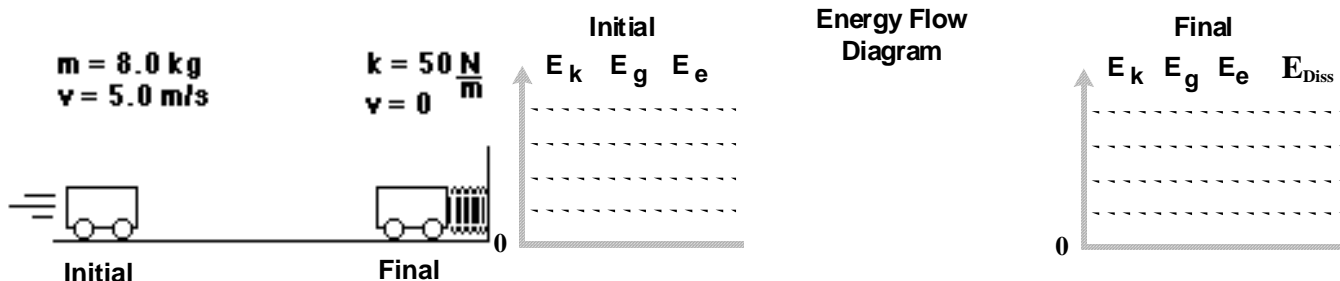


Energy: Worksheet 3 - Quantitative Bar Graphs and Problems

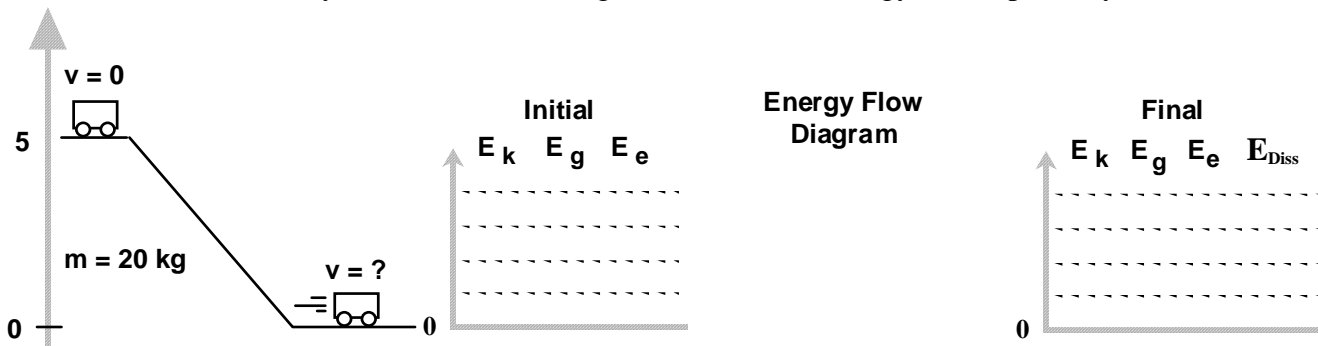
For each situation shown below:

- In the energy flow diagram show the system you choose to analyze. Assume the systems to be frictionless, unless stated otherwise.
- Complete the energy bar graph QUANTITATIVELY (numerically accurate).
- In the space below each diagram use conservation of energy equations to solve for the quantity called for in the question.

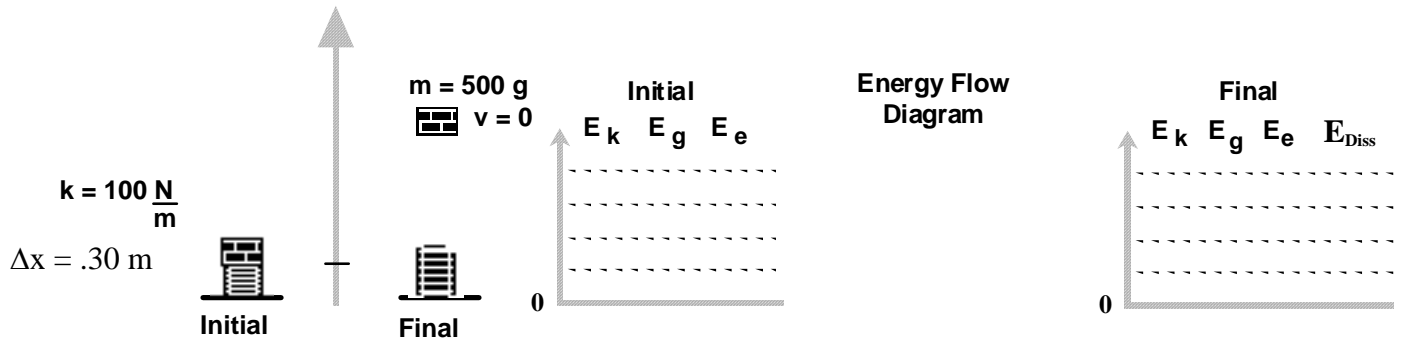
1. A moving cart hits a spring, traveling at 5.0 m/s at the time of contact. At the instant the cart is motionless, by how much is the spring compressed?



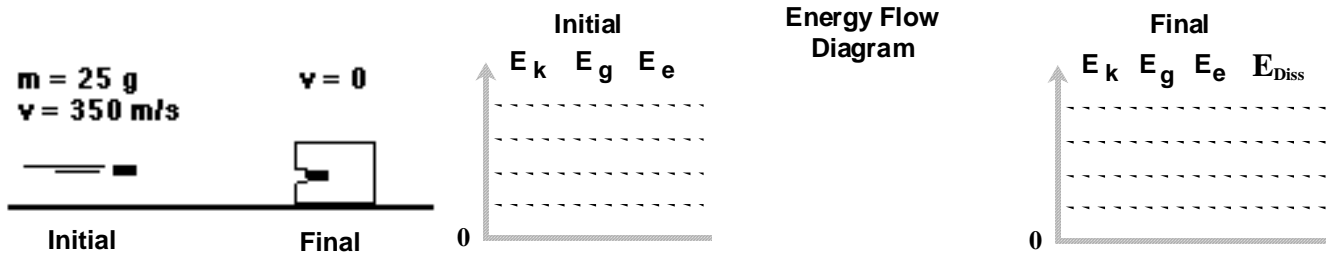
2. Determine final velocity of the cart, assuming that 10% of the energy is dissipated by friction.



3. A block is placed on a spring, compressing it 0.30m. What height does the block reach when launched by the spring?



4. The bullet strikes a block of wood which exerts, on average, a force of 50,000N opposing the motion of the bullet. How far does the bullet penetrate?

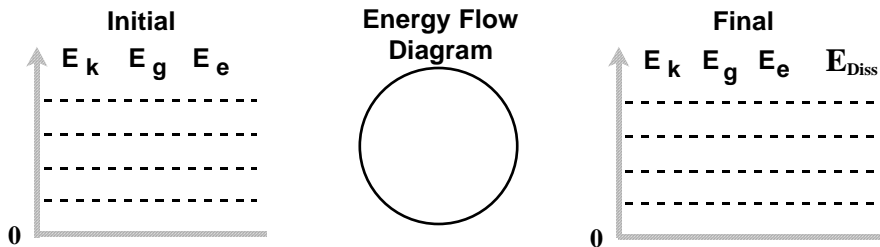


5. A 200. kg box is pulled at constant speed by the little engine pictured below. The box moves a distance of 2.5 m across a horizontal surface.



Force Diagram

- a) Construct a **qualitative** energy bar graph/flow diagram for this situation. Be sure to specify your system.



- b) How much energy is transferred by the engine?

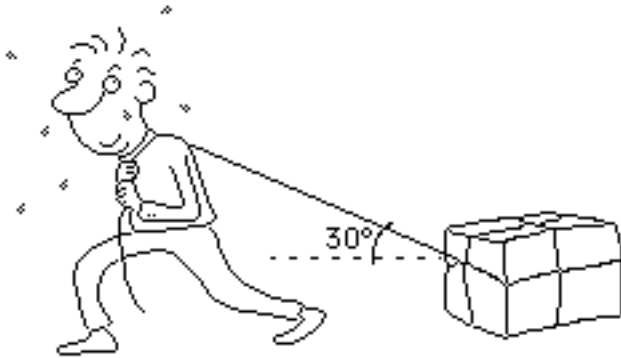
- c) What type of motion would occur if the engine pulled with a force of 500 N? Modify your force diagram and apply Newton's 2nd Law.

Force Diagram

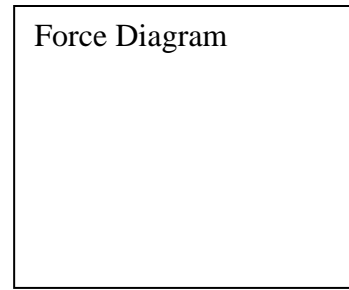
- Circle One:
- constant velocity
 - acceleration
 - no movement

6. How far could the box in problem 5 be pulled *at constant velocity* with the expenditure of 8,000 J of energy?

7. A person pulls a 50. kg box pictured below with a force of 100. N. The coefficient of kinetic friction is 0.15.



- a. Sketch a force diagram for the box.



- b. How much of the force acts in the direction of motion? How much energy is transferred (via working) by the person who pulls the box a distance of 10. m?
- c. Is the box moving at constant speed? Explain how you know. What does this tell you about the kinetic energy E_k of the system?
- d. How much energy is lost as dissipated energy due to friction in the pulling process? What eventually happens to this energy?
- e. Show that energy is conserved in the system, accounting for all the energy stored and transferred in the process.

