Name_____

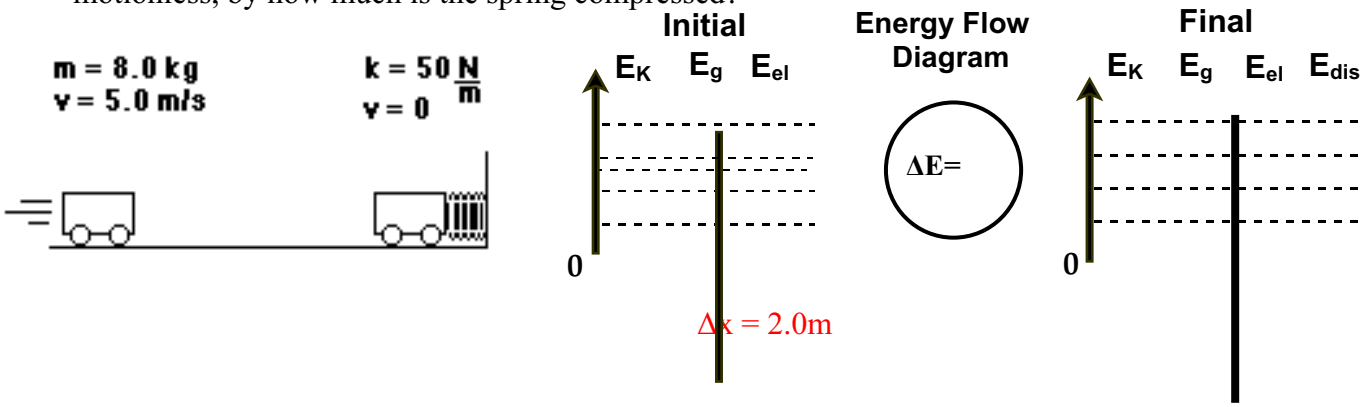
Date _____ Pd____

# UNIT VII: WS 3b Quantitative Bar Graphs and Problems

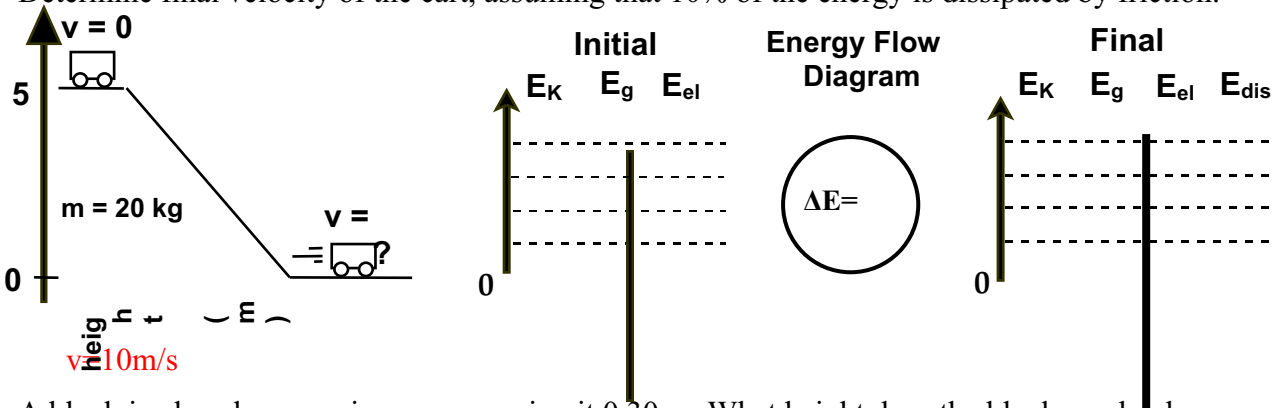
For each situation shown below:

1. In the energy flow diagram show the system you choose to analyze. *Assume the systems to be frictionless unless stated otherwise.*
2. Complete the energy bar graph QUANTITATIVELY (numerically accurate).
3. 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?



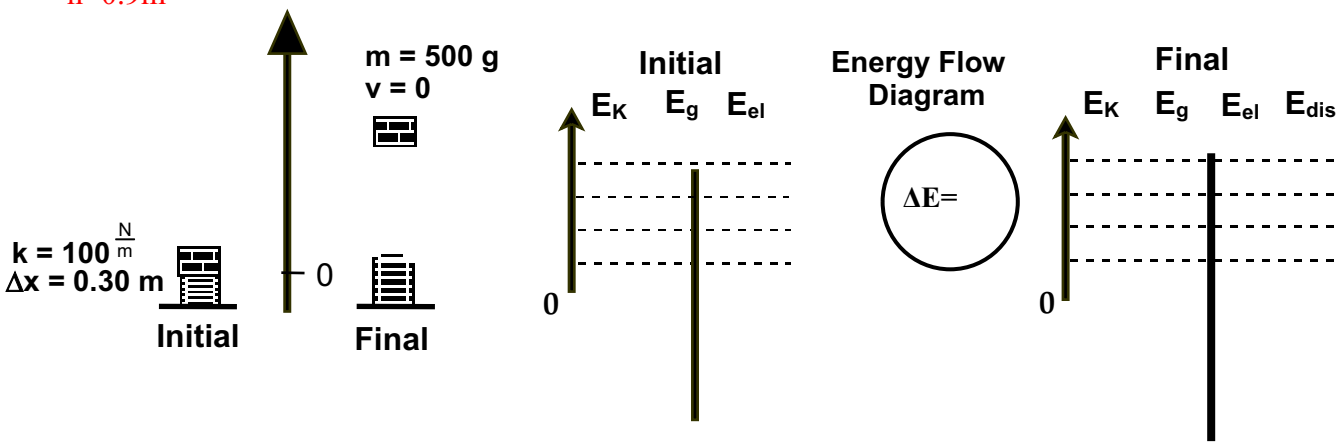

2. Determine final velocity of the cart, assuming that 10% of the energy is dissipated by friction.



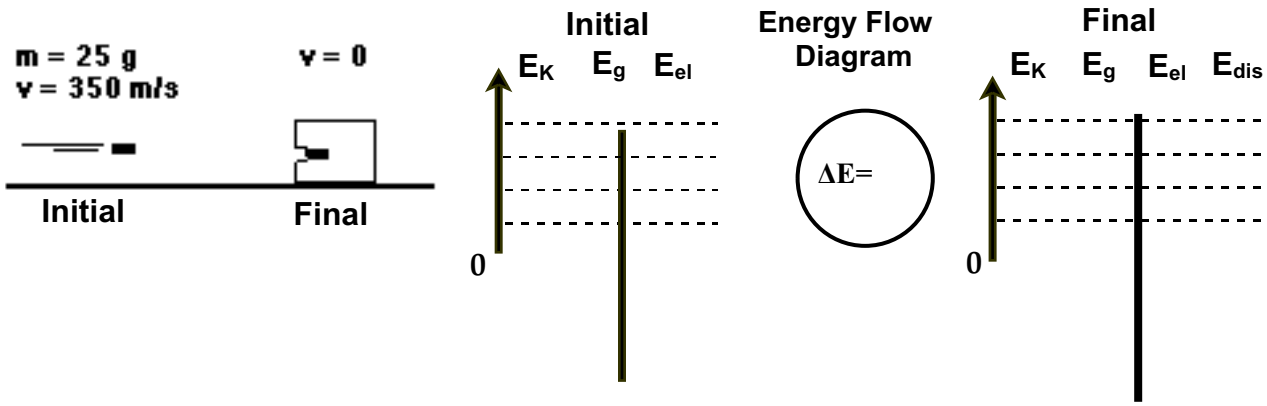

v=10m/s

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

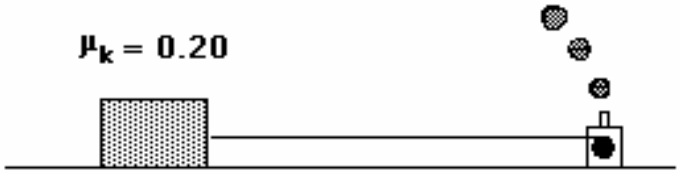
h=0.9m



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.




a) Draw a force diagram of all relevant forces acting on the box.

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

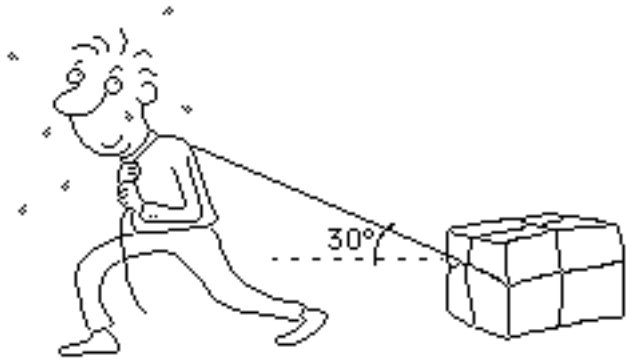
c) How much energy is transferred by the engine? (1000J)

d) 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. (UA : $a=0.5 m/s^2$)

6. How far could the box in problem 5 be pulled *at constant velocity* with the expenditure of 8,000 J of energy? ($\Delta x = 20m$)

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? (86.6N) How much energy is transferred (via working) by the person who pulls the box a distance of 10. m? (866J)

c. Is the box moving at constant speed? (No) Explain how you know. (Fnet-x = Fpx+Ff ≠0N = 19.1N) What does this tell you about the kinetic energy $E_k$ of the system? (over the time interval Ek is increasing)

d. How much energy is stored as internal energy due to friction in the pulling process over the 10.m? What eventually happens to this energy? (675J of energy is stored internally, it is dissipated)

e. Show that energy is conserved in the system, accounting for all the energy stored and transferred in the process.