AP Physics – Unit 4

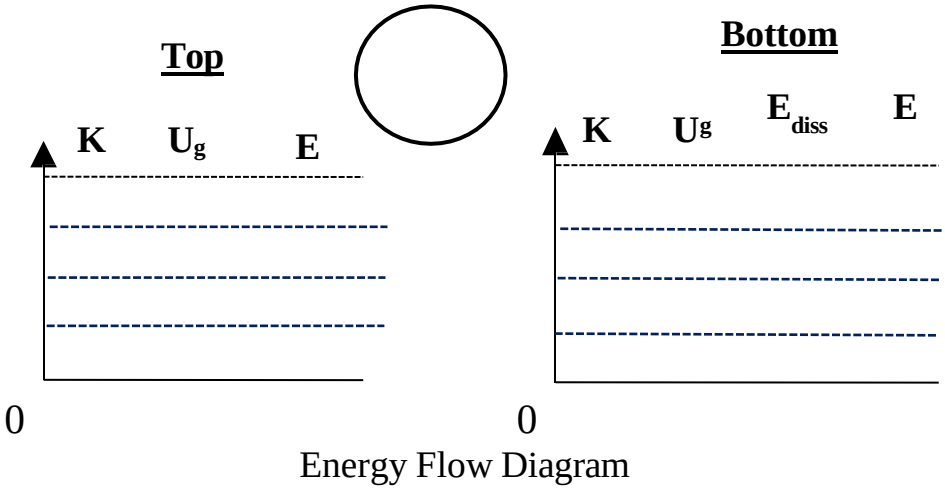
Wkst – Quantitative Bar Graphs and Problems

For each situation shown below: *Assume the systems to be frictionless ,unless stated otherwise.*

a) In the energy flow diagram show the system you choose to analyze; indicate what is included in the system in the circle. If the system gains or looses energy via work by nonconservative forces, indicate that energy flow into or out of circle
b) Complete the energy bar graph. Include numbers in the vertical axes.
c) n the space below each diagram use conservation of energy equations to solve for the quantity called for in the question.

1. A 60. kg student jumps from a 10.0 m platform into a pool below.

   a. Determine her U_g At the top of the platform



Energy Flow Diagram

10m

0

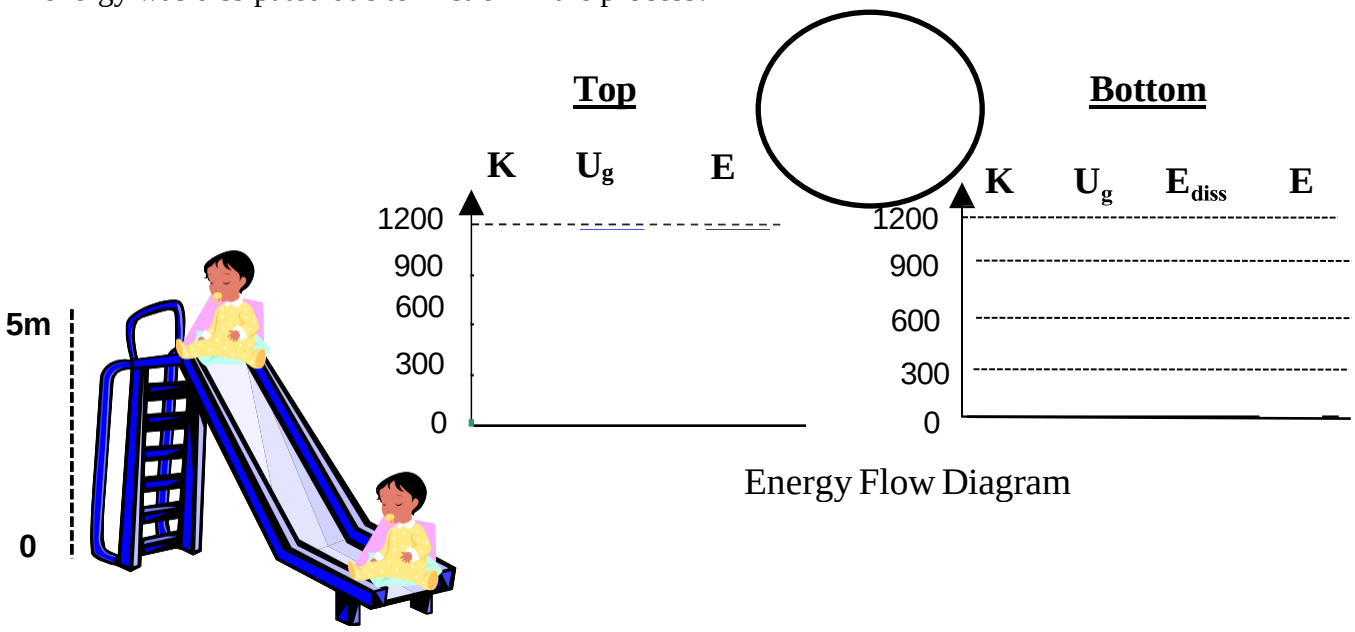
b. How much K does she possess at impact? What is her speed at impact?

c. Do you think a heavier diver of 75 kg would have more speed and kinetic energy on impact? Repeat steps a and b for a 75 kg diver

d. If she jumped from a platform that was twice as high, how many times greater would be her speed at impact?

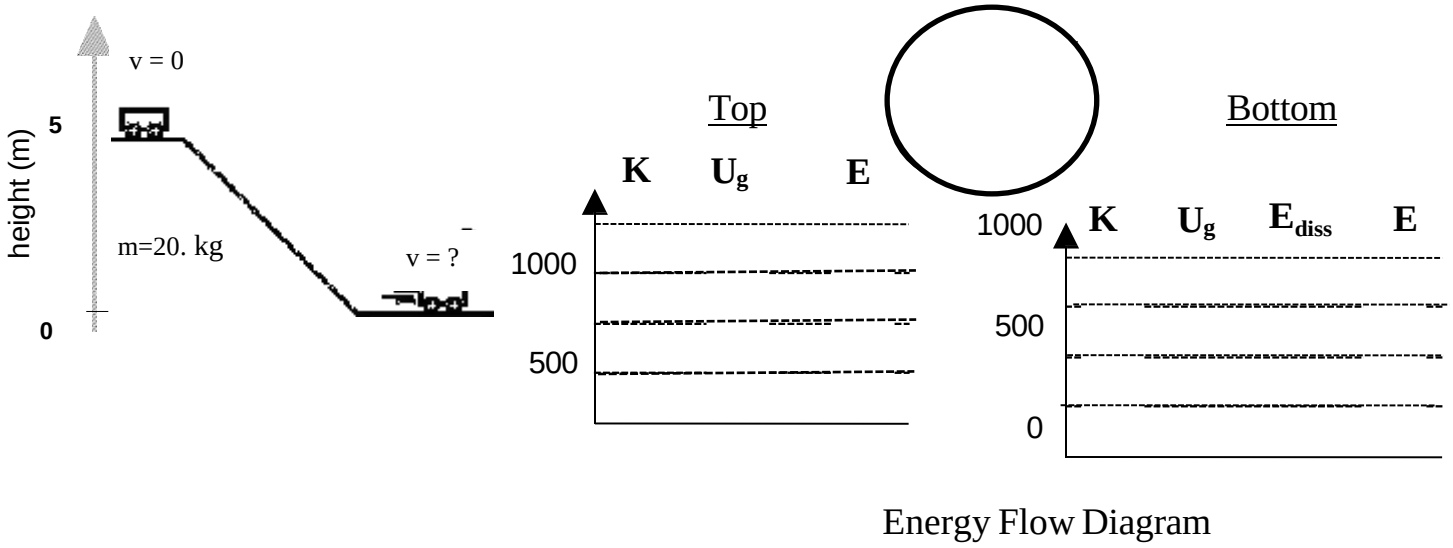
e. How much higher would the platform have to be in order for her speed to be twice as great?

2. A 24 kg child descends a 5.0 m high slide and reaches the ground with a speed of 2.8 m/s. How much energy was dissipated due to friction in the process?



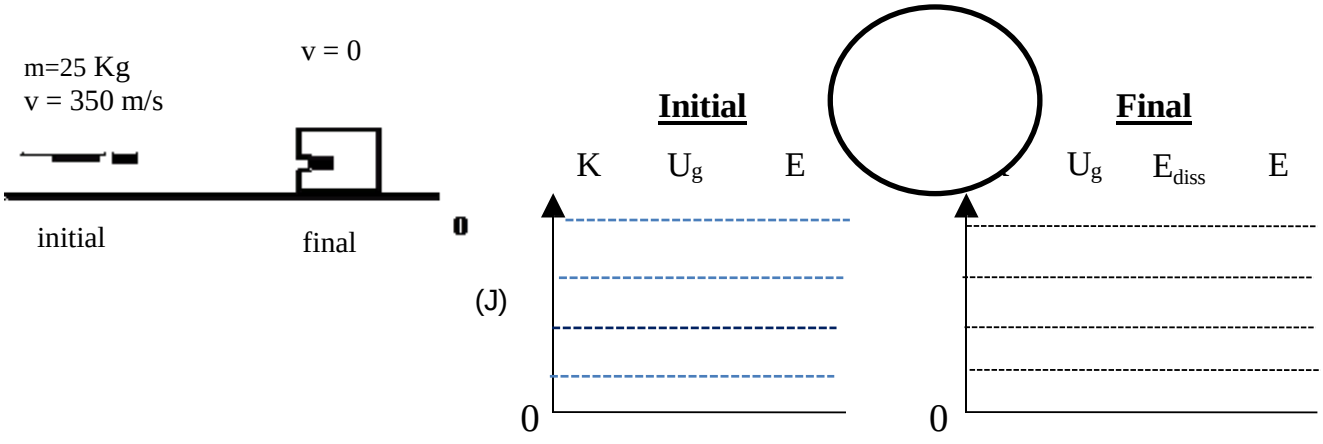
Energy Flow Diagram

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



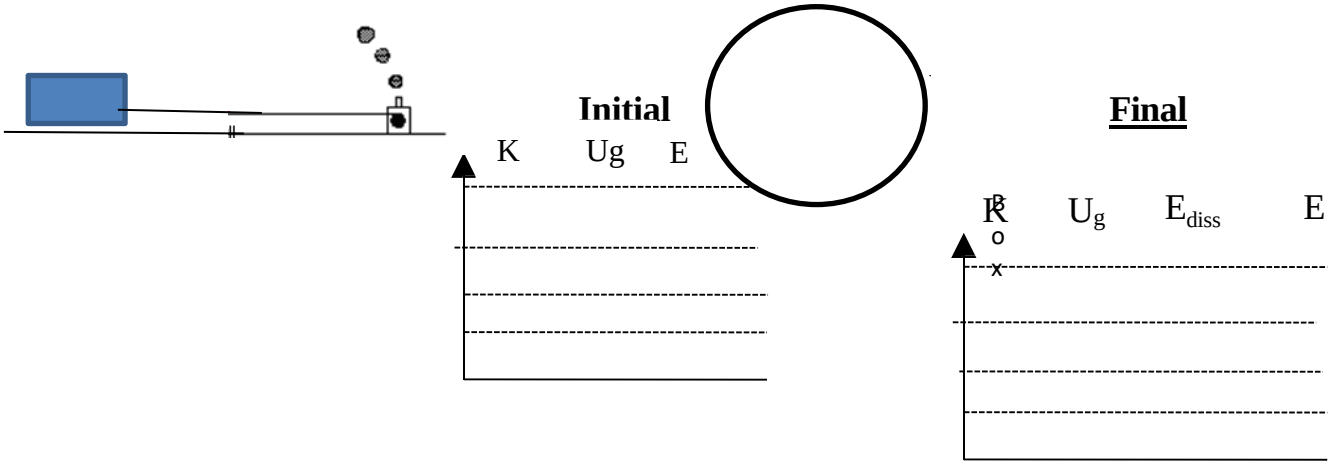
Energy Flow Diagram

4. The bullet strikes a stationary block of wood which exerts, on average, a force of 50,000N opposing the motion of the bullet. How far does the bullet penetrate? Assume that the block is mounted to the surface and does not move after the bullet is embedded in the block. Assume also that the gravitational potential energy of the bullet does not change between right before the bullet penetrates the block and when it comes to rest.



Energy Flow Diagram

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. The force of friction acting on the box is 400 N.



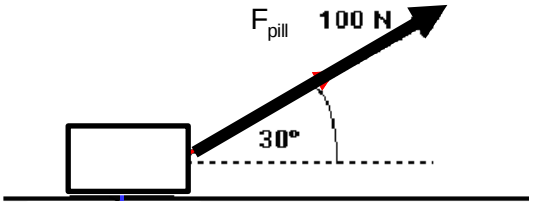
a) Draw a force diagram of all <u>relevant</u> forces acting on the box

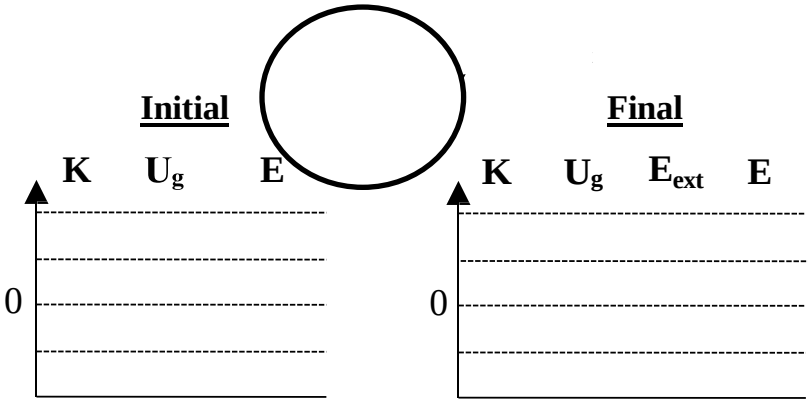
b) How much energy is transferred by the engine?

c) What type of motion would occur if the engine pulled with a force of 500 N?

d) How far could the box be pulled *at constant velocity* with the expenditure of 8,000 J of energy?

6. A person pulls a 50 kg box pictured below with a force of 100 N. The force of friction of friction acting on the box is 75 N.





Energy Flow Diagram

a. Draw all forces acting on the box above.

b. How much energy is transferred (via work) 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 dissipated by friction in the pulling process? Where does this energy "go"?

e. How much energy is "left over," and what does it "do"?

f. Show that energy is conserved in the system using a bar graph, accounting for all the energy stored and transferred in the process.

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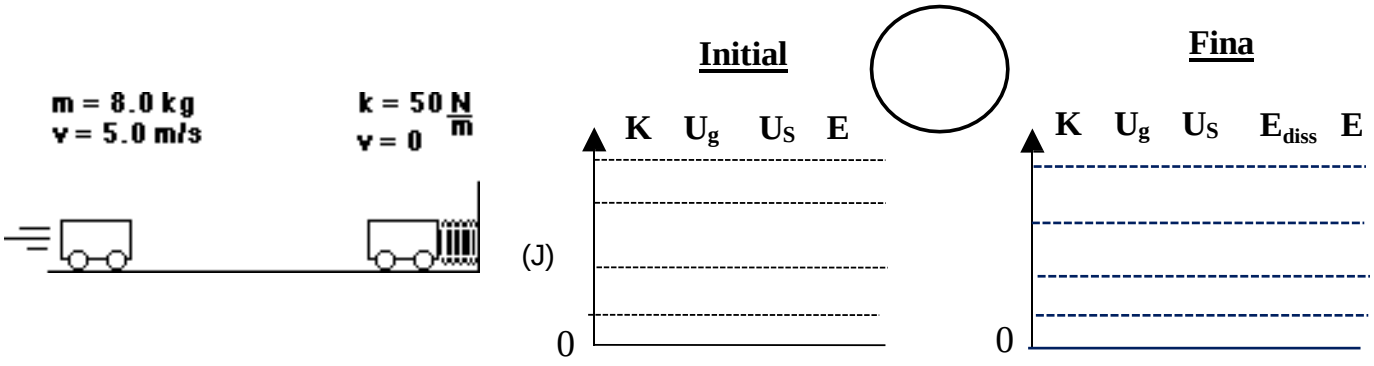
7. A moving cart hits a spring, traveling at 5.0 m/s at the time of contact. At the instant the cart is motionless, by how much is the spring compressed?



Energy Flow Diagram