

$$J = N \cdot m$$

$$N = \frac{kg \cdot m}{s^2}$$

Name _____ Date _____ Pd _____

UNIT VI: WS 2b Quantitative Bar Graphs and Problems

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?

$$m = 8.0 \text{ kg}$$

$$v = 5.0 \text{ m/s}$$

$$k = 50 \frac{\text{N}}{\text{m}}$$

$$v = 0$$

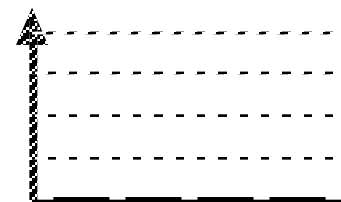
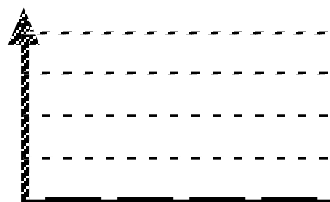


Initial Energy + work

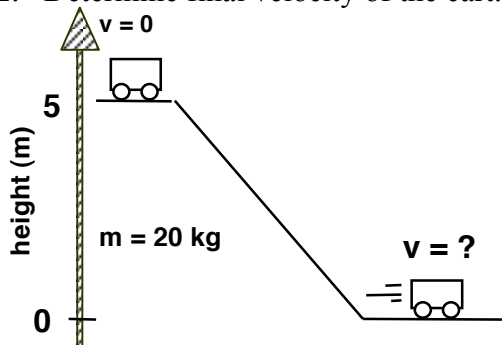
$$KE + GPE + EPE + W$$

= Final Energy

$$KE + GPE + EPE + \text{Heat}$$



2. Determine final velocity of the cart.

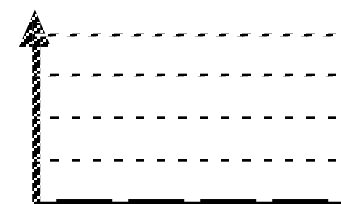
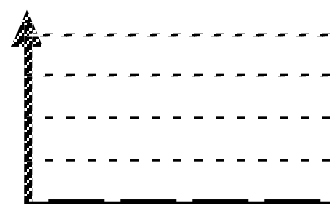


Initial Energy + work

$$KE + GPE + EPE + W$$

= Final Energy

$$KE + GPE + EPE + \text{Heat}$$



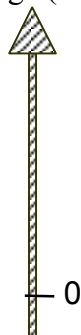
3. A 500 g block is placed on a spring, compressing it 0.30m. What height does the block reach when launched by the spring? (Hint: remember your units!)

$$k = 100 \frac{\text{N}}{\text{m}}$$

$$\Delta x = 0.30 \text{ m}$$



Initial



Final

$$m = 500 \text{ g}$$

$$v = 0$$

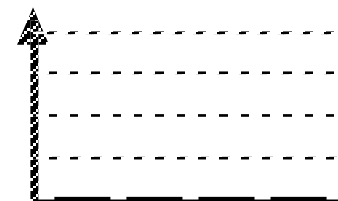
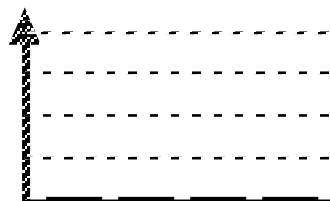


Initial Energy + work

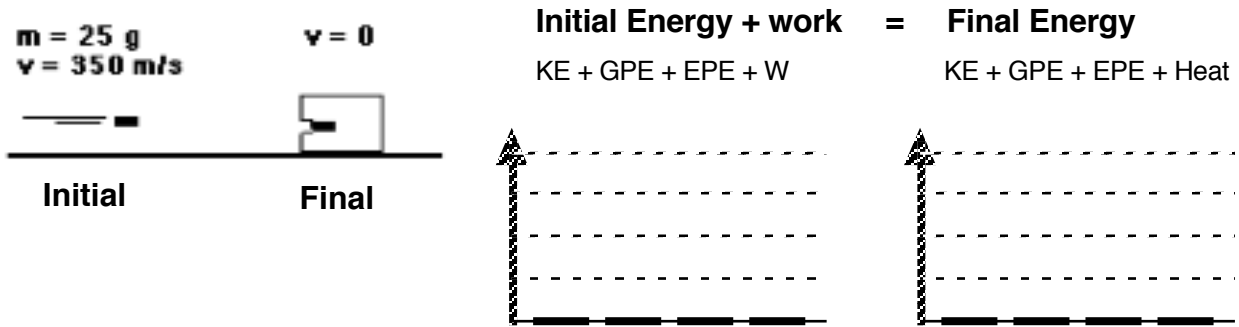
$$KE + GPE + EPE + W$$

= Final Energy

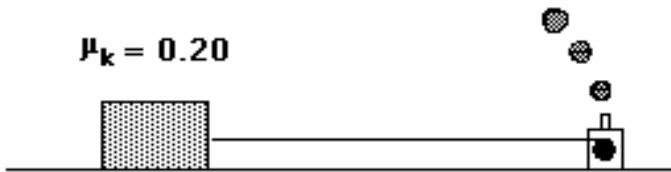
$$KE + GPE + EPE + \text{Heat}$$



4. The 25 g bullet strikes a block of wood that exerts a force of 50,000N opposing the motion of the bullet. How far does the bullet penetrate? (Hint: Use the units to solve the problem!)



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 coefficient of kinetic friction is 0.20.



- In the space to the right of the picture, draw a force diagram of all forces acting on the box.
- Calculate the Force of the Earth on the Box and the Force of the Ground on the Box.
- Remembering that physics is $F = \mu N$, where F represents the force of friction and N represents the Normal (Force of Ground on the box), calculate the Force of Friction on the Box.
- If the engine is pulling the box at a constant speed, how much force is the cable attached to the engine pulling?
- How much energy is transferred by the engine over the 2.5 m distance?
- How far could the box in problem 5 be pulled *at constant velocity* with the expenditure of 8,000 J of energy?