

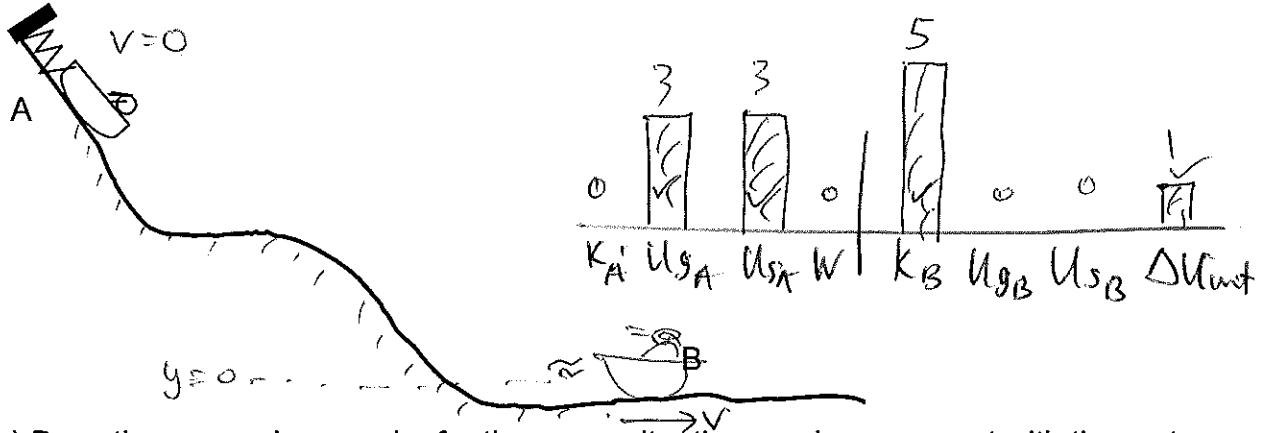
# Physics 14 - Quiz 5 - Spring 2009<sup>b</sup>

$(K = \frac{1}{2}mv^2)$      $U_g = mgh$      $W = F \cdot d$     Weight =  $mg$     Use  $g = 10 \text{ m/s}^2$

KEY

**SHOW ALL YOUR WORK AND REASONING**

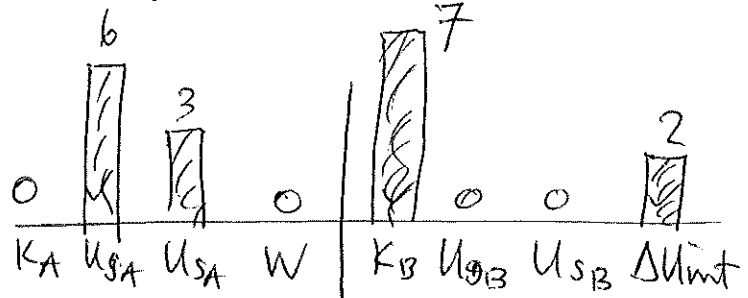
1. (3 pts) A sled starts at rest against a compressed spring, as shown at position A. The spring is released and the sled is pushed and slides down the hill. It is still moving at position B. Draw energy bar graphs that are consistent with the motion. Assume that there is friction along the path.



2. (3 pts) Draw the energy bar graphs for the same situation as above, except with the cart mass twice (2x) as much as in Question 1. Assume the sled still starts at the same height and make sure your energies are consistent with what you used in Question 1.

if  $m \times 2$

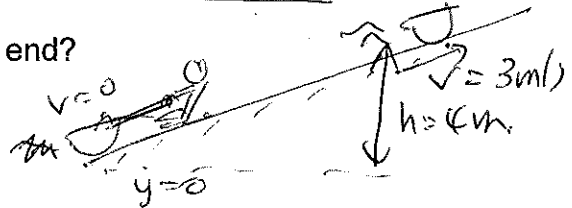
$$(U_g = mgh \Rightarrow U_g \times 2)$$



3. (4 pts) You use a rope to pull a sled ( $m = 20 \text{ kg}$ ) from rest up a slope until it is moving at  $3.0 \text{ m/s}$  and is  $4.0 \text{ m}$  higher than where it started. Assume there is 400 joules of frictional heating.

a) How much kinetic energy does the sled have at the end?

$$K = \frac{1}{2}mv^2 = \frac{1}{2}(20)(3)^2 = 90 \text{ J}$$



b) How much gravitational potential energy does the sled have at the end?

$$U_g = mgh = (20)(10)(4) = 800 \text{ J}$$

c) How much work did the people do on the sled?

$$W = K + U_g + \Delta U_{int} = 90 + 800 + 400 = 1290 \text{ J}$$

d) If there was no friction, what could possibly change in this problem?

The sled could reach that height with greater speed (greater  $K$ )  
 or/ You could do less work to get it there with the same speed.