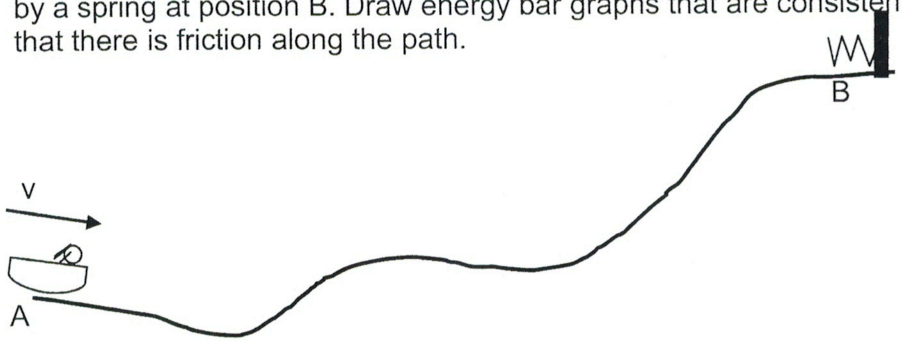
Start Time: ____________

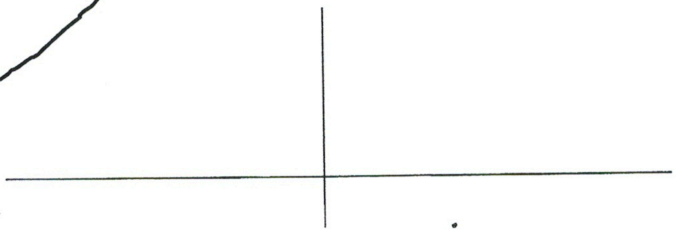
Physics 14 - Quiz 6 - Summer 2013

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

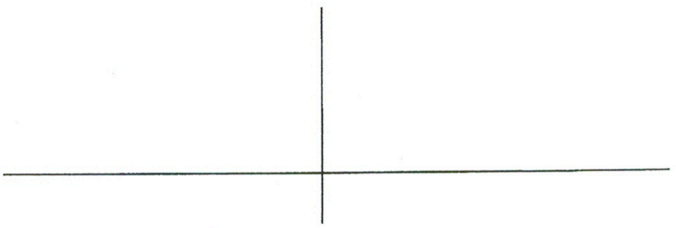
SHOW ALL YOUR WORK AND REASONING

1. (3 pts) A sled is moving with some speed at position A. It slides up a rough hill until it is stopped by a spring 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, but with the sled now moving with *twice* the speed at position A as it had in Q1. It is still stopped by the spring at B. Make sure your energies are consistent with what you used in Question 1.



3. (3 pts) Two people push a sled (m = 10 kg) up a slope from rest until it is moving at 5.0 m/s and is 3.0 m higher than where it started. Assume there is *no* friction.

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

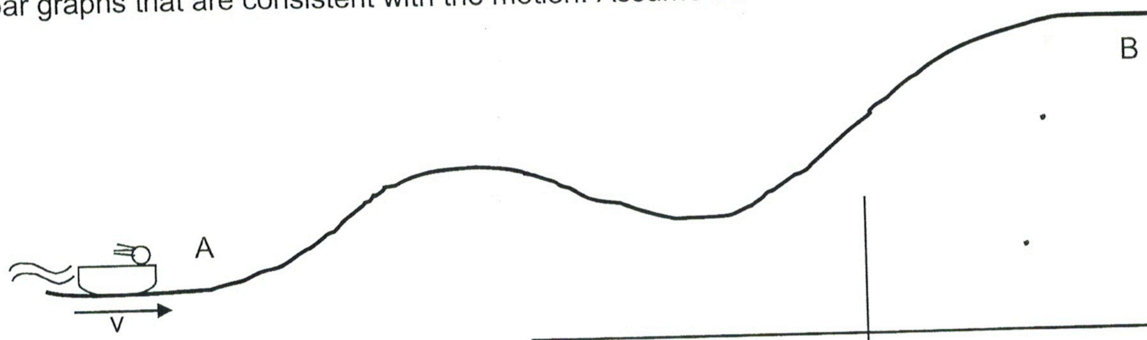
b) (1 pt) If there was friction, what would be different about this problem? (You do not have to calculate, just describe.)

Finish Time: __________ Total Time: ____________

Physics 14 - Quiz 6 - Summer 2012

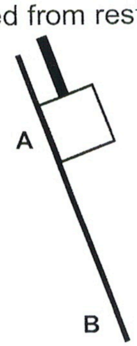
$W = F_{\parallel} \Delta x$ $K = \frac{1}{2} mv^2$ $U_g = mgy$ Weight = mg $g = 10\ m/s^2$ **START TIME:** ______

1. A sled is moving and located as shown at position A and stops at position B. Draw energy bar graphs that are consistent with the motion. Assume that there is friction along the path.



2. Draw the energy bar graphs for the same starting situation as Question 1 above, except now there is *HALF* the friction acting. The sled has the same mass and initial speed as above, and the hill has the same shape.

3. A box is lowered from rest at A down a rough slope by a rope. The box is moving at B.



4. You push on a mass (20 kg, initially at rest) with a force of 200 N while it moves a distance of 3.5 m in the direction you push. At the end, it is moving at 5 m/s and is 1 meter higher than initially.
a) How much work did you do on the box?

b) What is its kinetic energy at the end?

c) Was there any frictional heating?

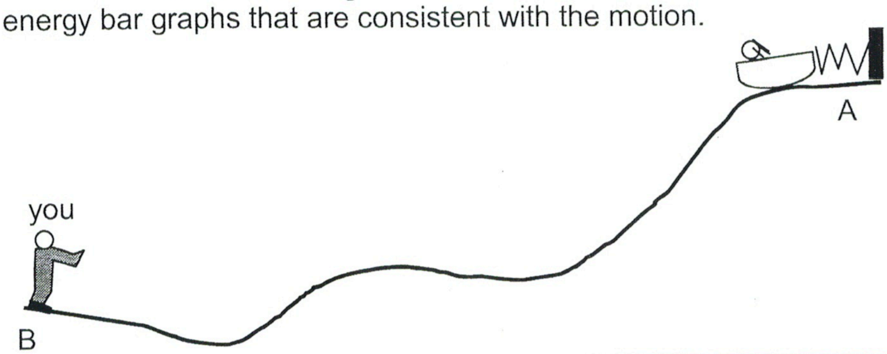
END TIME: ______ TOTAL TIME: ______

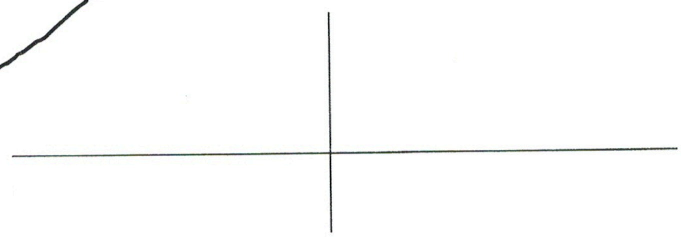
Physics 14 - Quiz 6 - Winter 2013

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

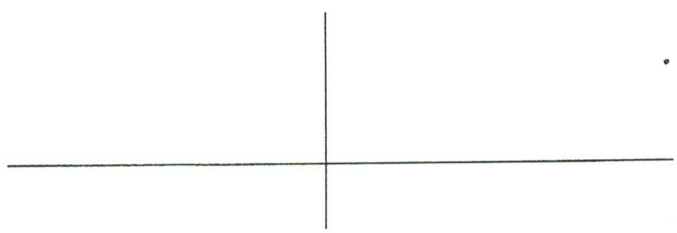
SHOW ALL YOUR WORK AND REASONING

1. (3 pts) A sled is at rest against a compressed spring at position A. The spring is released and the sled slides down a rough hill until it is stopped by you pushing against it at position B. Draw energy bar graphs that are consistent with the motion.





2. (3 pts) Draw the energy bar graphs for the same situation as above, but with the sled now has two times the mass as in Q1. It is still stopped by you at B, and the spring is the same as in Q1. Make sure your energies are consistent with what you used in Question 1.



3. (3 pts) You pull a sled (m = 5 kg) up a slope from rest until it is moving at 4.0 m/s and is 1.5 m higher than where it started. Assume 35 joules of frictional heating occurs along the way.
a) How much work did you do on the sled?

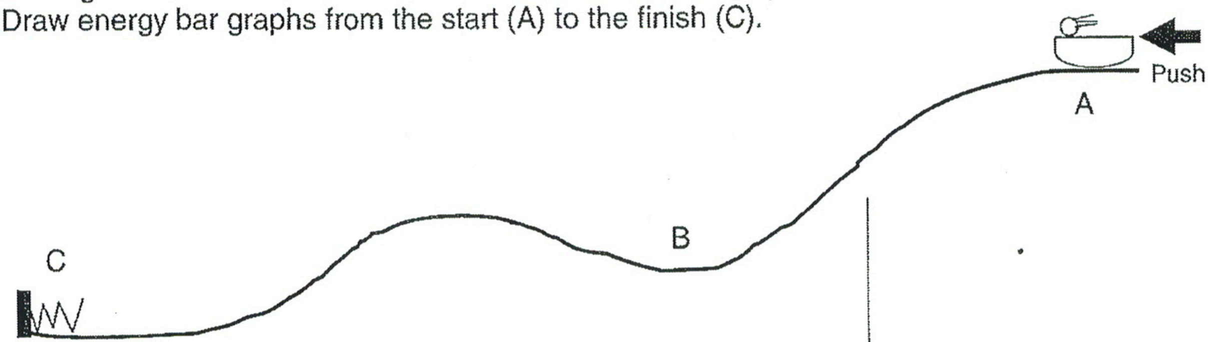
b) (1 pt) Now assume there is *no* friction and you pull on the sled with the same tension as in Q3a. Describe what would be different about the sled when it reaches the height of 1.5 m.

Physics 14 - Quiz 6 - Summer 2010

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

SHOW ALL YOUR WORK AND REASONING

1. A sled starts from rest at position A and is pushed for a short distance so it starts moving down the hill. There is friction between A and B only. A spring stops the sled at C. Draw energy bar graphs from the start (A) to the finish (C).



2. Draw the energy bar graphs for exactly the same situation as Question 1 above except now the sled is pushed by the same force but for twice the distance.

3. You carry a 5 kg box across a room at a constant speed of 1 m/s. Then you carry a 3 kg box across the room at a constant speed of 2 m/s. In which case did you do more work on the box while carrying it? Explain.

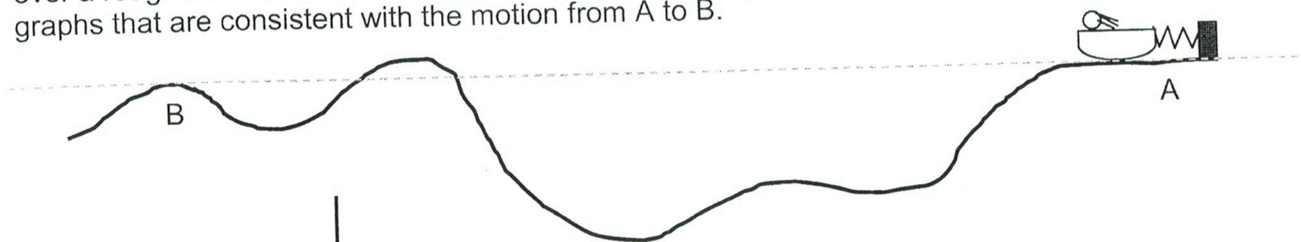
4. You lift a 5 kg box up a distance of 1 m. Then you lift a 3 kg box up a distance of 2 m. In which case did you do more work on the box while lifting it? Explain.

Physics 14 - Quiz 6 - Fall 2010[a]

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

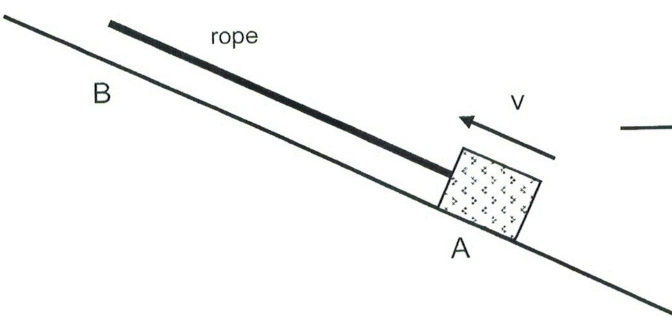
SHOW ALL YOUR WORK AND REASONING

1a. (3 pts) A sled is at rest against a compressed spring as shown at position A. It slides over a rough surface and is still moving when it reaches position B. Draw energy bar graphs that are consistent with the motion from A to B.



1b. (2 pts) Draw energy bar graphs for the same situation *except* that now the sled has two times the mass of 1a.

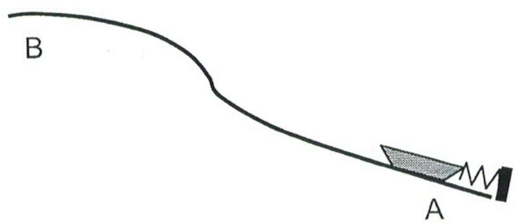
2. (3 pts) A box on a rough surface is moving uphill at position A. A rope with tension is attached as shown, and the box is moving uphill but is slowing as it passes position B. Draw the energy bar graphs going from A to B.



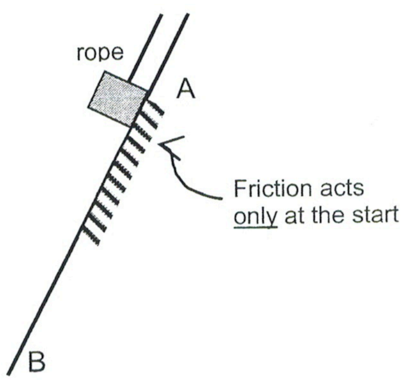
3. (2 pts) How high must a 2 kg mass be so that its gravitational potential energy is the same as the kinetic energy of a 6 kg mass moving at a speed of 10 m/s at zero height?

9. (15 pts) Complete energy bar graphs for the following situations, with the initial situation at position A and the final situation being at B.

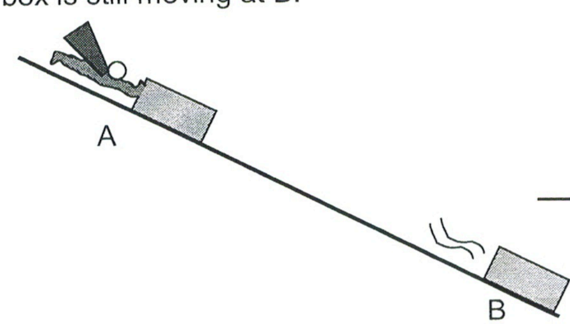
a) A sled is at rest against a spring at A. The spring is released and the sled slides on a rough surface and is still moving at B.



b) A mass, initially moving slowly, is lowered by a rope down the slope between A and B. It is moving _faster_ at B. There is only friction in the *start* of the slope, as indicated.



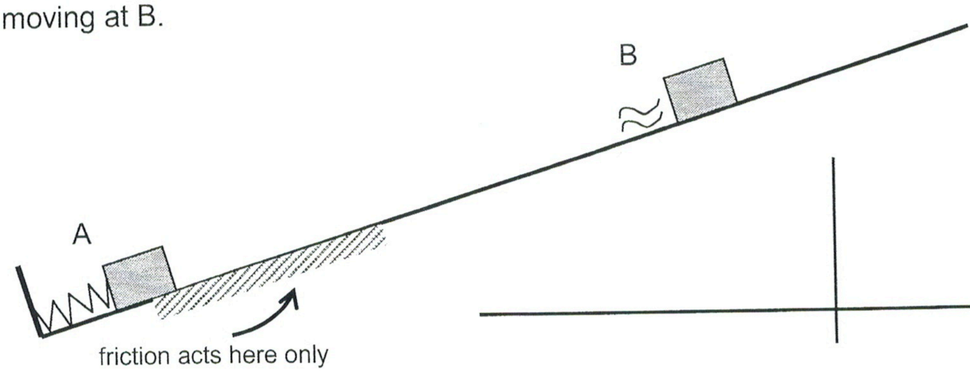
c) A box, initially at rest at A, is pushed *downhill* by Superman over a rough surface. The box is still moving at B.



d) Repeat (c), except now the box has twice the mass as in (c), but Superman pushes with the _half_ the force, but for the same distance as in (c). "B" is the same place as in (c), and the coefficient of friction between box and surface is the same.

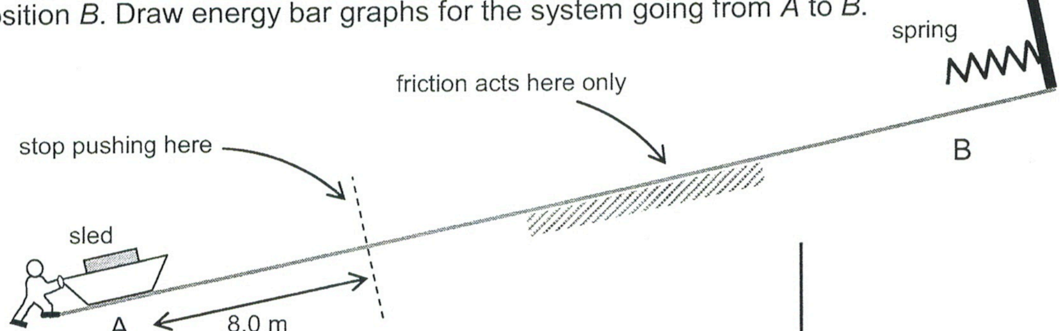
12. (12 pts) Complete energy bar graphs for the following situations, with the initial situation at position A and the final situation being at B.

a) A mass starts from rest, touching on a compressed spring. The spring is released, and the block moves up along a surface that is smooth *except* for the region shown. The block is still moving at B.



b) Draw energy bar graphs for the same spring and mass situation as above, except the now make the *new* position B be where the mass stops on the slope. Make sure your energy bars are consistent with your choices in part (a).

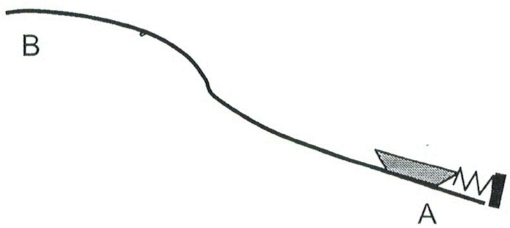
c) A sled is at rest at position *A*. You push it up a slope for 8.0 meters, then stop pushing. It continues to slide, across the rough region, until it is stopped by a spring as shown, at position *B*. Draw energy bar graphs for the system going from *A* to *B*.

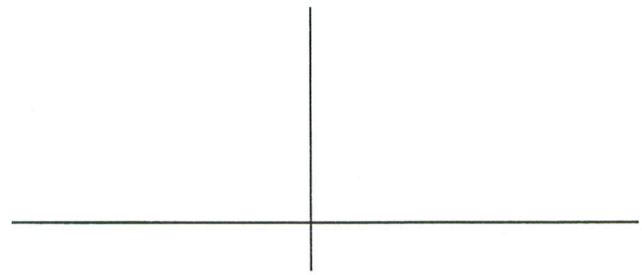


d) Draw energy bar graphs for the same situation as in c) except you push for 16 m. Make sure your energy bars are consistent with your choices in part (c).

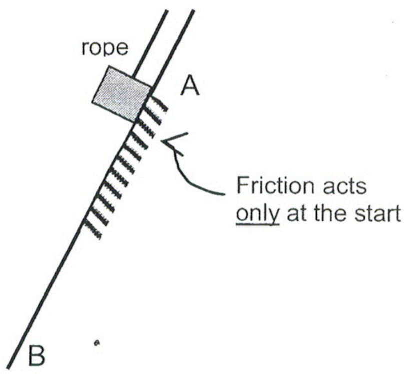
9. (15 pts) Complete energy bar graphs for the following situations, with the initial situation at position A and the final situation being at B.

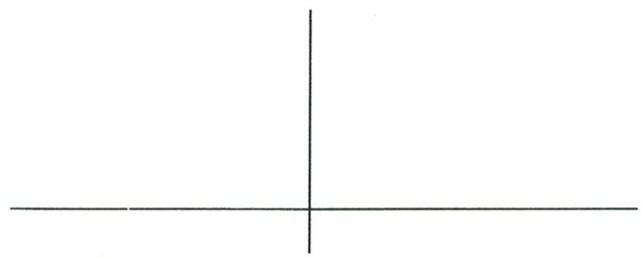
a) A sled is at rest against a spring at A. The spring is released and the sled slides on a rough surface and is still moving at B.



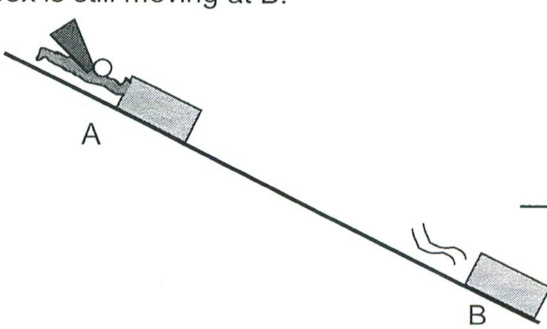


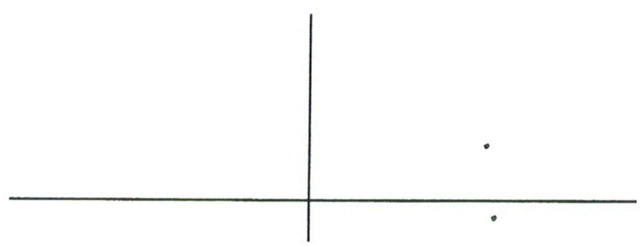
b) A mass, initially moving slowly, is lowered by a rope down the slope between A and B. It is moving <u>*faster*</u> at B. There is only friction in the *start* of the slope, as indicated.





c) A box, initially at rest at A, is pushed *downhill* by Superman over a rough surface. The box is still moving at B.





d) Repeat (c), except now the box has twice the mass as in (c), but Superman pushes with the <u>*half*</u> the force, but for the same distance as in (c). "B" is the same place as in (c), and the coefficient of friction between box and surface is the same.