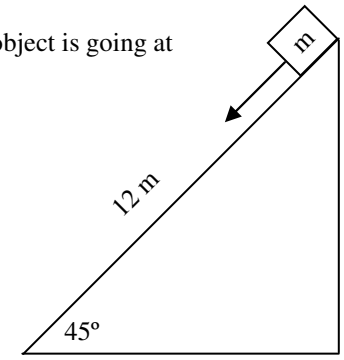
Due Nov 14 (Wed)

2007 PreAP Energy 4

1. A ball is dropped from 35 meters up. How fast is it going 15 meters above the ground?

2. A 4 kg ball is dropped. If air friction exerts 3 N of force and the ball is going 8 m/s just before it hits the ground, find how high up the ball was when it was dropped.

3. An object is at the top of a 12 m long ramp at a 45° angle. If $\mu_k = .25$, find how fast the object is going at the bottom of the ramp?



4. A 8600 N hedgehog (do you want a snail, instead?) is dropped from 1.5 m onto a spring (k = 2.34 N/m).
   A) How far is the spring compressed?

   B) If the spiny little pig insectivore rebound to a glorious 1.45 m, how much energy was lost?

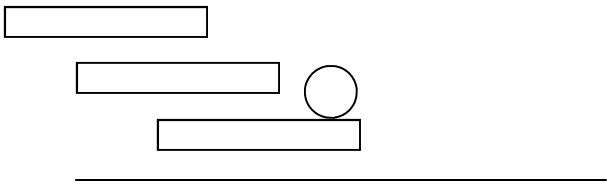
   C) How efficient was the energy transfer?

5. In order to lure Tarzan into a trap, Jane is captured by swarthy entrepreneurs. Gallant, though a little torpid, Tarzan grabs a 25 m tall vine. If the vine is at an angle of 35° to begin with and he pushes off going 2 m/s,

   A) how fast is he moving at the very bottom of the swing?

   B) In an unexpected spark of genius, Tarzan lets go of the vine at the very bottom of the swing. If, at this point, he is 20 m above the ground, how far away does he land?

6. The diagram at the right shows a 2 kg ball at rest on the first of three platforms above a table. The first platform is 1 m above the table. Each platform is 1 m above the other.
   A) How much energy is necessary to raise the ball to the second platform?

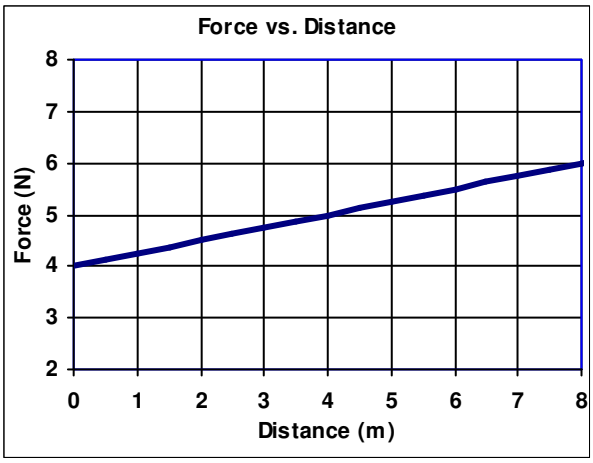


   B) So, relative to the second platform, how much potential energy does the ball have when sitting on the first platform?

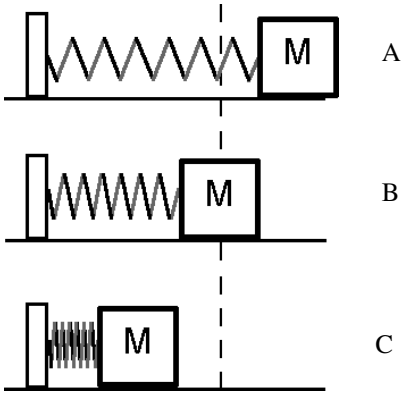
   C) How much potential energy does the ball have relative to the table?

   D) How much potential energy does the ball have relative to the top platform?

7. From the graph at the right, how much work is done on the object in the first 4 seconds?



8. The diagram at the right shows a mass-spring system sliding back and forth on a frictionless surface. The spring is fully stretched at position A and fully compressed at position C.



A) What kind of energy does it have at position A?
B) What kind of energy does it have at position B?
C) How does the amount of energy compare at B and C?

D) How does the amount of total energy compare at A, B, and C?

9. A 4 kg object is at rest on table. If it is pushed by a 6 N force for 8 m …

A) How much energy is given the object?

B) How fast should the object be going?

C) If there was friction on the table ($\mu = 0.12$), how fast is it going?

D) How much energy was converted to the heat due to friction?

E) How efficient was the energy transfer?