B-Day Due Thurs., Nov 11
A-Day: Due Fri., Nov 12

2010 PreAP Energy 1

1. A person holds onto an object for 2 minutes, but doesn't move the object. Is work done on the object?

2. What kind of energy is being described: Ek, Ep, W, or PEel?

   A. _____ Friction stopping an object from moving.
   B. _____ An object is going 6 m/s.
   C. _____ A spring is compressed.
   D. _____ A moving car.
   E. _____ An object is pushed for 3 m.
   F. _____ An object on top of a 3 meter table.

3. In the following situations is energy added (gained) or subtracted (lost)?

   A. _____ An object is lifted up from the ground.
   B. _____ An object is lowered back to the ground.
   C. _____ Friction slows down an object.
   D. _____ A spring is compressed.
   E. _____ An object speeds up.
   F. _____ An object slams into the ground.

4. A 200 kg object is going 4 m/s. Find its kinetic energy.

5. A 3 N force pushes on a object for 20 meters. Find the work done.

6. A 4 kg object compresses a spring 0.12 meters. The spring constant for this spring is 2.3 N/m. Find the elastic potential energy stored in the spring.

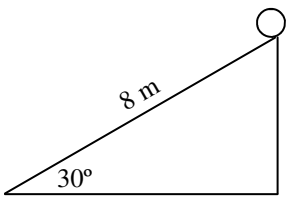
7. A 10 kg object is 15 meters up a hill. Find its potential energy.

8. A 4 kg object has 400 J of potential energy. Find how high off the ground the object is.

9. A 6 kg object has 350 J of kinetic energy. Find the velocity of the object.

10. A 2 kg object is on spring that is compressed 1.5 meters. If the spring has 2 Joules of Elastic Potential energy, find the spring constant of the spring.

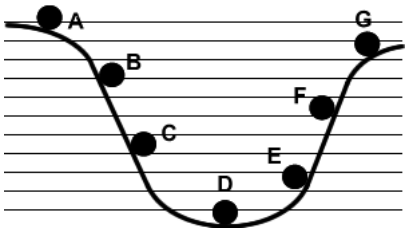
11. A force did 80 Joules of work on an object in 4 m. How big was the force?

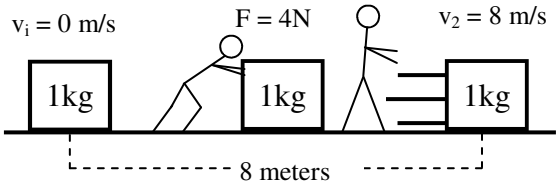


In the equation for potential energy h is VERTICAL HEIGHT, not distance.

12. Find the potential energy for a 5 kg ball that is 8 m up a 30º ramp. (*Use the hint above.)*

13. The graphic at the right shows a ball being released at position A.
    A. At which position does the ball have the most kinetic energy?
    B. At which position does the ball have the most potential energy?
    C. As it rolls from A to D the ball loses:
    D. As it rolls from D up to G the ball gains:

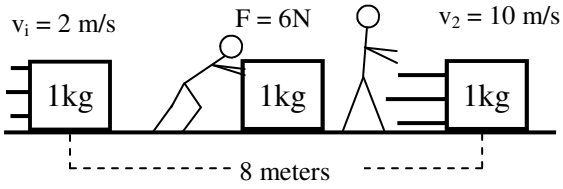




KE_{before} = W = KE_{after} =

14. Slim Jim pushes a box for 8 m with a 4 N force.
    A. * Under the diagram calculate and label the kinetic energy before and after and the work Slim Jim does on the box.

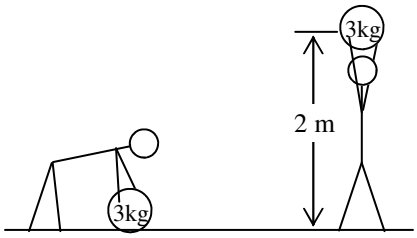
    B. So, where does the kinetic energy come from?



KE_{before} = W = KE_{after} =

15. This time Slim Jim pushes on a box that is already moving.
    A. Again, calculate and label the kinetic energy before and after and the work done on the object.

    B. So, what did the work become?



16. Slim Jim lifts an object above the ground.
    A. * Since the object is laying motionless on the ground, how much energy does the object start with?

    B. * How much force does Slim Jim need to lift the object?

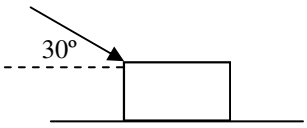
    C. * Using this force, calculate how much work Slim Jim does to lift the object.

    D. * Calculate the potential energy of the object at the top.

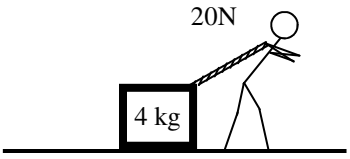
    E. * So, once again, the work done equals what?

Lecture time

Work is how forces change energy. While a force acts on an object the object accelerates. Since kinetic energy increases with velocity, while a force acts on the object the force changes the object's energy. Also, a force can lift an object higher into the air (increasing PE) or lowering the object (decreasing PE). If the force does not move the object, it does no work on the object. So only the portion of the force that moves the object does work. A force pushing down on an object on a table increases normal force, but does not change the object's energy and W = 0. If there is a change of energy for an object, work was done on the object



17. A 25 N force pushes a box 3.2 meters at an angle of 30º to the surface.
    A. * Which portion of the force moves the object: x or y?
    B. * Find the work done by this force.



18. Slim Jim pulls on a box with 20N for 15m. His force pulls at an angle of 40º.
    A. Calculate the work done on the box.

    B. Remembering what you learned in Q14 and 15, how much kinetic energy does the box have afterwards?

    C. * Calculate the final velocity of the box.

19. A 3 kg ball is thrown upward into the air. The ball reaches a height of 20 m.
    A. What kind of energy does it have just after it is thrown?
    B. What kind of energy does it have after (up in the air)?
    C. Calculate the energy at the top.

    D. If there was no air friction, how much energy did it have when it was thrown?

Power is how fast energy is transferred. If two forces transfer energy and one transfers it faster, the faster one uses more power.

P	watts	Power	Rate (how fast) work is done

$$P = \frac{W}{t}$$

20. Motor A has a rating of 300 W. Motor B has a rating of 200 W.
    A. Which motor is more powerful?
    B. How long would it take Motor A to do 6000 J of work?

    C. How long would it take Motor B to do 6000 J of work?

    D. Which motor did the work quicker?
    E. Which motor did more work?

21. True or false (and why)?: "*A more powerful object does more work.*"

Q14: KE before = 0 J; W = 32 J; KE after = 32 J
Q16: A: 0 J; B: 30 N (weight of the object); C: 60 J D: 60 J (mgh); E. W = change of energy.
Q17: W = (Fcos30º)3.2 = 69.3 joules
Q18C: $230 = (1/2)mv^2$ v = 10.7 ms