A-Day Due Tues., Oct 30 (Assigned: 10/24)
B-Day: Due Wed., Oct 29 (Assigned: 10/27)

2008 PreAP Energy 1

Ep	J	Potential Energy	Must have height
Ek	J	Kinetic Energy	must be moving
PEel	J	Elastic Potential Energy	must be a spring acting on the object
k	N/m	Spring constant	How strong a spring is
W	J	work	must be a force acting on the object.

$E_p = mgh$
$E_k = \frac{1}{2}mv^2$
$PE_{el} = \frac{1}{2}kx^2$
$W = Fd\cos\theta$

VERY Useful Study Helps are available.

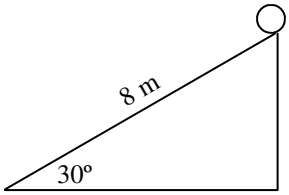
1. A person holds onto an object for 2 minutes, but doesn't move the object. Is work done on the object?
2. What kind of energy is being described: Ek, Ep, W, or PEel?
   A. _____Friction stopping an object from moving.
   B. _____An object is going 6 m/s.
   C. _____A spring is compressed.
   D. _____A 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 an object down.
   D. _____A spring is compressed.
   E. _____An object speeds up.
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.

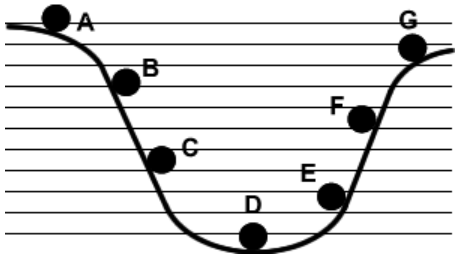
11. A force did 80 Joules of work on an object in 4 m. How big was the force?

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?



Lecture time

Read the chapter about energy, work, kinetic energy, potential energy, etc.

Energy is the ability to cause motion. An object that is moving could hit something else and cause it to move, so moving objects have energy. An object in the air could drop and hit something, causing it to move, so objects above the ground have energy.

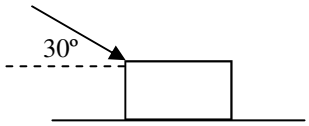
Work is how forces change energy. While a force acts on an object the object accelerates. Since kinetic energy increases with velocity, while a force acts on the object the force changes the object's energy. Also, a force can lift an object higher into the air (increasing Ep) or lowering the object (decreasing Ep). If the force does not move the object, it does no work on the object. So only the portion of the force in the direction of motion 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 in an object work was done on the object

Power is the rate of doing work. Power is how fast you add or subtract energy from an object. If a stronger force lifts an object, the object will gain the same amount of potential energy, just faster: more power!

P	watts	Power	Rate (how fast) work is done

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

14. A 25 N force pushes a box 3.2 meters at an angle of 30º to the surface. Find the work done by this force.



15. Label the following as Work (W), Kinetic Energy (E_k), Potential Energy (E_p), Elastic Potential Energy (PE), or no Energy (N):(*could be more than one):*

A. _____A car going 20 m/s.
B. _____Due to motion.
C. _____A rubber ball is compressed.
D. _____An object at rest at the top of a hill.
E. _____Needs an elastic object.
F. _____How forces transfer energy.
G. ____ An object at rest on the ground.
H. ____ A dish is at the edge of a 1.4 m table.
I. ____ Friction acting on an object for 3 m.
J. ____ Energy due to position.
K. ____ An object moving on a spring.
L. ____ An object thrown thru the air.

16. If the energy of an object changes _____ was done on the object.

17. How can you prove something has energy?

18. +W, –W, or no Work?

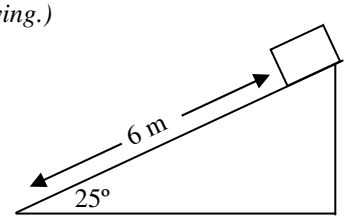
A. ____ An object slows down .
B. ____ An object is raised up.
C. ____ An object rolls down a hill.
D. ____ The sin component of a force.
E. ____ An object at rest on a hill.
F. _____Compressing a spring.
G. _____Lowering an object down to the ground.
H. _____Speeding up an object.
I. _____Friction acting on an object.
J. _____Holding onto an object.

19. A 3 kg ball is thrown up into the air. The ball goes 20 m up into the air.
A. What kind of energy does it have when 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?

20. For potential energy h must be v_____. *(Using this knowledge, answer the following.)*

21. A 2 kg object is 6 m up a ramp tilted at an angle of 25º (*see diagram*).
A. Find the potential energy of the object.



B. If there is no friction on the ramp, how much kinetic energy must it have at the bottom?

22. For each of the pairs of objects, circle the one with the most energy?

A. A 2 kg object at rest or a 2 kg object moving.
B. A 4 kg object 3 m up; a 6 kg object 3 m up.
C. A 3 kg object going 2 m/s; a 3 kg object going 6 m/s.
D. A full moving train or an empty moving train.

23. Prove that a rolling ball has energy.

24. How fast you transfer energy to an object is called:

25. Two people decide to ride their bikes to work. Person A rides to work in 10 minutes. Person B takes 30 minutes to go the same distance.
    A. Which one did more work?
    B. Which one is more tired?
    C. Which one used more power?

26. 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?

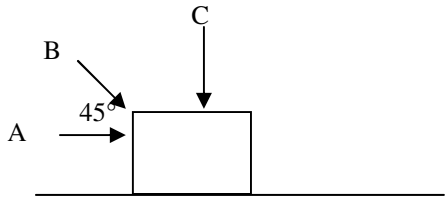
    C. How long would it take Motor B to do 6000 J of work?

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

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

28. Mechanical, Chemical, Radiant, Nuclear, Electrical, or Thermal Energy?

    A. _____Runs your refrigerator.
    B. _____What a refrigerator removes.
    C. _____Given off by a light bulb.
    D. _____What a space heater gives off.
    E. ____ A rolling object.
    F. ____ Energy from eating.
    G. ____ An atom bomb comes from this.
    H. ____ Stored in a spring.



29. Of the forces at the left
    A. Which does no work.
    B. Which does only some work.
    C. 100% of it does work.
    D. The angle of C is _____
    E. The angle of A is _____.
    F. What % of B does work on the object?