A-Day: Due Fri., Nov 20
B-Day: Due Mon., Nov 30

2009 PreAP Energy 4

$E_{before} \pm W = E_{after}$
$Eff = \frac{W_{out}}{W_{in}}$

Remember to use your notes and follow the steps exactly!
YOU MUST SHOW ALL YOUR WORK!

1. Give the conservation of energy equation for the following situations.

   A) An object is thrown into the air. Find how high it goes.

   B) An object at rest is moved.

   C) A moving object slows down due to friction.

   D) An object is dropped. How fast is it going part way down?

   E) A spring is compressed.

   F) A compressed spring shoots an object into the air.

   E) A moving object is stopped.

2. An object is 45 m above the ground when it is dropped. How fast is the object going just before it hits the ground?
   A) Conservation of energy equation:
   B) Solve:

3. A 4 kg object is moving 2 m/s when it is pushed by a 5 N force for 7 m. How fast is it going afterwards?
   A) Conservation of energy equation:
   B) Solve:

4. A 3 kg object is moving 2 m/s. It comes to rest by compressing a spring 0.8 meters.
   Find the spring constant of the spring.
   A) Conservation of energy equation:
   B) Solve:

5. A 10 kg object is at rest on the ground. It is lifted up 8 m. How much work was done to lift the object?
   A) Conservation of energy equation:
   B) Solve:

   C) If it was lifted up in 4 seconds, how much power was used to lift it.

So the "work" in the power formula could be the "energy" that the work created.

6. A 6 kg object is at rest on the ground. A 25 N force pushes on the object for 4 m. The object ends up moving 5 m/s. (*See "Energy Transfers" for the efficiency equation.)*
   A) How much work was done on the object?

   B) How much kinetic energy does it have afterwards?

   C) How efficient was the energy transfer?

   D) Where did the energy probably go?

   E) What kind of energy did the lost energy turn into?

7. Two people are riding bicycles. Person A stops at the bottom of the hill and pushes hard all the way up. Person B starts a long way back and gains speed, coasting all of the way up.
   A. Both bikers have what kind of energy after they climb the hill?
   B. What kind of energy did Person A use to get up the hill?
   C. What kind of energy did Person B use to get up the hill?
   Notice: Person B transferred energy!

8. An object is at rest on a ledge 25 meters above the ground. If it is pushed off the ledge, how high above the ground will it be going 20 m/s?

   A) E_{before} = _____ Work? = _____ E_{after} = _____
   B) Conservation of Energy Equation:

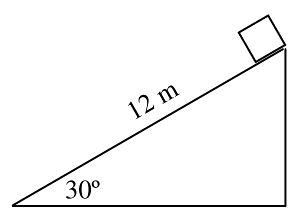
   C) Solve for the height.

9. An object slides down a frictionless ramp shown at the right.

   A) E_{before} = _____ Work? = _____ E_{after} = _____
   B) Conservation of Energy Equation:

   C) What is the height of the object (*vertical distance, remember*)?

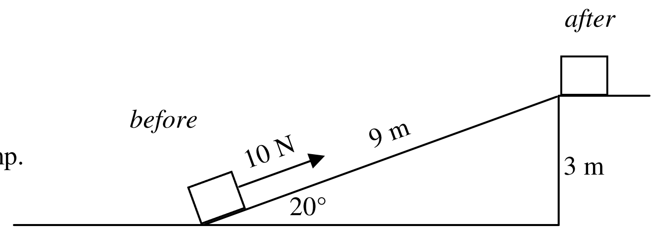
   D) Solve for the velocity at the bottom of the ramp.



10. A spring is compressed 0.3 m and has a spring constant of 35 N/m. If it is released, how fast will it launch a 4 kg object? *(Use the same process as above.)*

Understanding efficiency:

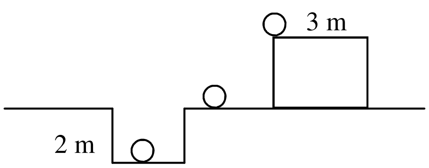
11. A 10 N force pulls a 2 kg object up a 9 m long ramp to get the object to the top of a 3 m tall platform.
    A. Calculate the work done to pull the object up the ramp.



    B. Calculate the potential energy of the object when it is on the table.

    C. Was all of the work transferred to the object?
    D. If energy cannot be created nor destroyed, where did the energy go?

    E. Find the efficiency of the transfer.



12. Three identical 3.5 kg objects are placed as shown in the diagram.
    A. Since the middle object is sitting on the ground, how much potential energy does it have?

    B. How much potential energy does the right object have relative to the middle object?

    C. How much potential energy does the left object have relative to the middle object?

    D. So, potential energy can be:

13. A. Write the equation for power:

    B. For W, substitute Fd.

    C. What is d/t?

    D. Write a new equation for power:

14. A person pushes on a object with 18N at 4 m/s. How much power is being expended?