Energy Test Review

Name KEY

Date _____ Pd _____

1. A 50 kg frictionless cart is traveling horizontally at a constant speed of 10 m/s.
   a. What type(s) of energy does it have?

   Kinetic

   b. Calculate the energy (or energies):

   $E_K = \frac{1}{2}MV^2 = \frac{1}{2}(50kg)(10^m/_s)^2 = \boxed{2500\,J}$

   c. What force of friction would be required to stop the cart in 100 meters?

   $E_K = E_{Therm} = F_f \cdot \Delta x$

   $2500\,J = F_f(100m) \Rightarrow \boxed{F_f = 25N}$

2. An 8kg bowling ball falls down from a 1.0 meter high table.
   a. What is the ball's E_g on top of the table?

   $E_g = M \cdot g \cdot \Delta y = (8kg)(9.8\,^N/_{kg})(1.0m) = \boxed{78.4\,J}$

   b. What will be the speed with which the ball lands on the ground?

   $E_g = E_K = \frac{1}{2}MV^2$

   $78.4\,J = \frac{1}{2}(8kg)V^2$

   $\sqrt{V^2} = \sqrt{19.6\,^{m^2}/_{s^2}}$

   $\boxed{V = 4.4\,^m/_s}$

3. A 50 g pinball rests against a spring-loaded plunger that has been compressed 0.080 meters.
   a. If 2.0 J of energy was transferred to the spring as it was compressed, what is its spring constant?

   $E_{el} = \frac{1}{2}kx^2 \quad 2.0\,J = \frac{1}{2}(k)(0.080m)^2$

   $\boxed{k = 625\,^N/_m}$

   b. What is the maximum velocity of the pinball after the spring has transferred its energy to it?

   $2.0J = \frac{1}{2}MV^2$

   $2.0J = \frac{1}{2}(.050kg)V^2$

   $V^2 = 80\,^{m^2}/_{s^2}$

   $\boxed{V = 8.94\,^m/_s}$

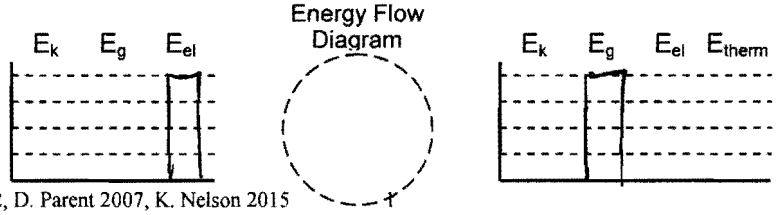
   c. If the ball was fired vertically, how high will it go?

   $E_g = E_e \quad 2.0J = g \cdot M \cdot \Delta y$

   $2.0J = 9.8\,^N/_{kg} \cdot 0.050kg \cdot \Delta y$

   $\boxed{\Delta y = 4.1m}$

   d. Draw an energy bar graph for the above situation, the initial moment being immediately before launch, and the final moment being when it reaches its maximum height. assume no air resistance



Use the energy account options below in order to answer the questions that follow.

a.) $E_{elastic}$ b.) $E_{thermal}$ c.) $E_{chemical}$ d.) $E_{gravitational}$ e) $E_{kinetic}$

Indicate which type(s) of energy are present in each situation:

4. You apply the brakes on your car to slow it down b, e
5. An elevator is stopped on the 10th floor. d
6. A slingshot is pulled back ready to fire. a
7. A candle is burned. c
8. A car is halfway down the big hill on the Wild Thing ride at Valleyfair. b, d, e

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9. Stretching a spring from 2m to 4m, the amount of energy stored in the spring changes by a factor of: 4

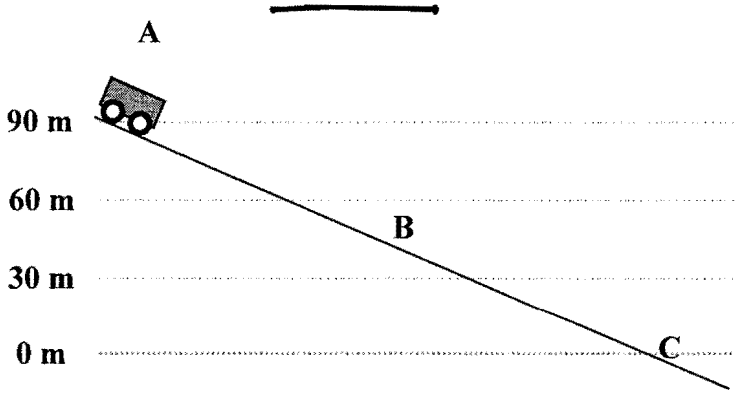
10. Lifting an object from 1m to 2m, the amount of energy stored by the object changes by a factor of: 2

11. Dragging an object on a surface for 10m instead of 5m, the amount of energy stored thermally changes by a factor of: 2

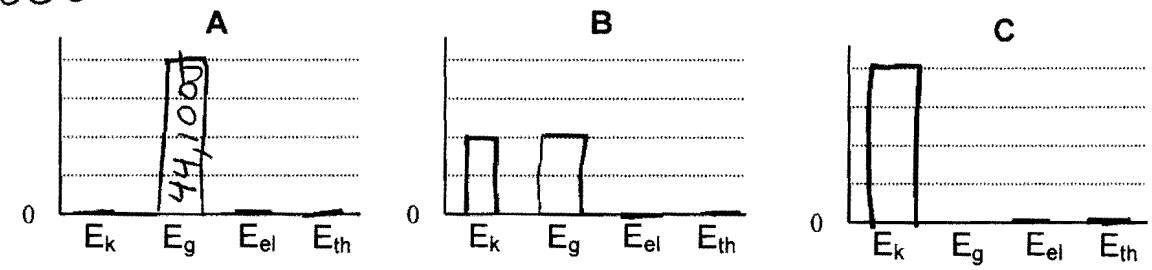
12. Driving 60mph instead of 30mph, the amount of energy stored by the car's motion changes by a factor of: 4

13. A motionless 50 kg car is released from rest at position A. It moves along a ***frictionless*** track as shown in the diagram. Complete the energy bar charts below.
Elevation at point A is 90m, point B is 45m, point C is 0m

No spring, no friction so no E_{el} or E_{Th}



$E_{Total} = 44,100J$



14. For the car above calculate the following:
    a. E_g at point A, point B, point C (3 answers)

A: $E_g = 9.8\,N/kg \cdot 50kg \cdot 90m = 44,100J$

B: $E_g = 9.8\,N/kg \cdot 50kg \cdot 45m = 22,050J$

C: $E_g = 0J$

    b. E_k at point A, point B, point C (3 answers)

A: $E_k = 0J$

B: $E_K = 22,050J$

C: $E_K = 44,100J$

    c. Calculate the car's velocity at point C.

$44,100J = \frac{1}{2}(50kg)v^2$ $\quad v^2 = 1764\,m^2/s^2$ $\quad \boxed{v = 42\,m/s}$