**7. Work & Energy homework problems**

Name and date submitted (3 pts):

Create space in the Word document below, and write or type your answers. Turn in your completed work as an email attachment. YOU MUST SHOW ALL YOUR WORK to get credit.

(7 questions; 100 points)

Equations: W = F x d Work = force in the direction of the displacement x displacement

KE = ½ mv2 (K = ½ mv2) Kinetic energy formula

PE = mgh (Ugrav = mgh) Potential energy formula for gravity

P = ∆W/∆t Power = work ÷ time

Units: Work and energy both use Joules (N · m). Power uses Watts (J/sec).

1. A 750-N physics student walks up ten flights of stairs, covering a total vertical distance of 35.0 m.
2. If, as is typical, only 20% of the caloric (food) energy is converted to work by the muscles, how many food calories of energy did the person use? (food calorie = 4186 J)
3. What happened to the other 80% of the food energy?
4. If a running house cat has 10.0 J of kinetic energy at speed *v*,
5. At what speed (in terms of *v*) will she have 20.0 J of kinetic energy?
6. What would her kinetic energy be if she ran half as fast as the speed in part (a)?
7. The driver of a 2,000 kg car traveling at 25.0 m/s (about 55 mph) slams on the brakes, locking the wheels on the dry pavement. The coefficient of kinetic friction between rubber and dry concrete is 0.70.
8. Use the work-energy principle to calculate how far the car will travel before stopping. The work-energy principle states that the work done on a moving object equals its change in kinetic energy, or W = ∆KE.
9. What happened to the car’s original kinetic energy?
10. A 325-kg roller coaster starts from rest at point A and slides down the frictionless loop-the-loop as shown.
11. How fast is the roller coaster moving at point B?
12. How hard does it press against the track at point B?



1. The car travels without friction along the track shown below, starting from rest at point A. If the loop has a radius of 20.0 m, find the minimum height *h* such that the car will not fall off the track at the inside-top of the loop.



1. A sled with a rider having a combined mass of 100 kg travels over the zero-friction, icy hill shown below. How far does the sled land from the foot of the cliff? (it lands in a fluffy snow pile so the kid is okay)



1. One gallon of gasoline contains 1.3 x 108 J of energy. A 1500-kg car accelerates from rest to 40 m/s (about 90 mph) in 10.0 s. The car’s engine is only 15% efficient (which is typical), meaning that only 15% of the theoretical energy contained in the fuel goes into accelerating the car.
2. How much gasoline in gallons does the car use during its acceleration?
3. What horsepower is necessary to accelerate the car in this manner? 1 hp = 746 watts, and 1 watt = 1 J/s.