Name _____

$W_{nc} = E_f - E_0 = KE_f + PE_f - KE_0 - PE_0, \quad KE = \frac{1}{2}mv^2, \; PE = mgh$

Centripetal Force: $F_c = \frac{mv^2}{r}$

1. (20pts) A ball with mass $m = 0.03kg$ is placed on a track at a height h and encounters a loop-the-loop with radius $R = 0.12m$.

(a) Which force plays the role of the centripetal force at the top of the track, if the ball just barely loses contact with the track?

(b) What is the minimum speed the ball must have at the top of the loop-the-loop such that it stays on the track?

(c) Based on the above, what is the minimum kinetic energy of the ball at the top of the loop?

What is the potential energy of the ball at the top of the loop?

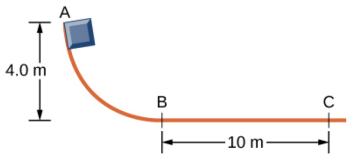
What is the total energy of the ball at the top of the loop?

(d) Let's experimentally measure the minimum height at which the ball just loses contact with the track at the top of the track.: $h =$
What is the initial total energy of the ball?

(e) How much energy was lost due to friction? What percentage of the initial energy was lost to friction?

$W_{nc} = E_f - E_0 = KE_f + PE_f - KE_0 - PE_0, \quad KE = \frac{1}{2}mv^2, \; PE = mgh$
$Work = F\cos\theta d$
Power $= P = \frac{\text{Work}}{t} = \frac{\text{Energy Expended}}{t}$ (measured in Watts ($W = 1J/s$))
Energy = Pt (kW*hr is a unit of Energy)

2. A child with mass $32kg$ starts from rest at A and slides on a frictionless slide to B, and then slows down on the ground due to friction and comes to rest at point C.



(a) What is the kinetic energy of the child at point B?

(b) What is the work done by friction on the child from B to C?

(c) What is the coefficient of kinetic friction along the horizontal surface?

3. The average cost of electricity in Grand Junction is \$0.115/kW*hr.

(a) Suppose you forgot to turn the 60W light bulb off in your room when you left for 12hours. How much will this cost you?

(b) If you run your 3.5kW air conditioner an extra 2 hours per day for 30 days, how much extra will you pay in your energy bill?