Quiz 4 – PH241 **Name**________________________ ☐ **Pledged**

$\vec{g} = 9.81 m/s^2$ downward, for a constant force $W = \vec{F} \cdot \vec{d}$

$K = .5mv^2 \quad U_g = mgh \quad E = K + U \quad f_k = \mu_k F_N \quad \vec{F} = m\vec{a}$

$\Delta E = W_{ext} + W_{friction} \quad \Delta K = W_{Net}$

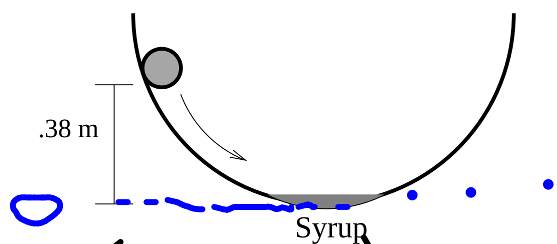
A small marble (mass = .085 kg) is released in a bowl at a height .38 m from the bottom. There is a puddle of maple syrup at the bottom which slows the marble down, the rest of the bowl is frictionless. The marble passes through the syrup 6.5 times before it rests at the bottom of the bowl.

(A) What is the coefficient (μ_k) of friction for the syrup-marble system? Assume that $F_N \approx mg$ and the length of the syrup puddle is .065 m.

(B) How high does the marble go the first time after it crosses the puddle?

(C) Does this problem depend on mass? What if the marble was m=.19 kg?

Energy is not conserved!



$W_{syrup} = \Delta E$

once through: $W_{syrup} = \mu_k mg(.065m)$

so 6.5 times through $= (6.5)(\mu_k mg)(.065m)$

$E_0 \rightarrow$ only potential: $E_0 = mgh$

$E_f \rightarrow$ Nothing $E_f = 0$

so $\Delta E = -6.5(\mu_k mg)(.065m) = E_f - E_0$

mass cancels $= -mg(.38m)$

$\mu_k = \dfrac{.38m}{(6.5)(.065m)} = .90$

(B) ΔE once is $-\mu_k mg(.065m)$

so $E_0 + \Delta E = mgh - \mu_k mg(.065m)$

(other side high point No kinetic)

$= mgh'$ (again m + g cancel)

so $h' = h - (.90)(.065m)$

$= .32m$

(C) Not dependent on m or g