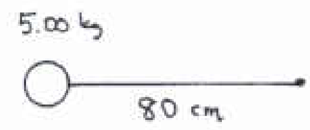
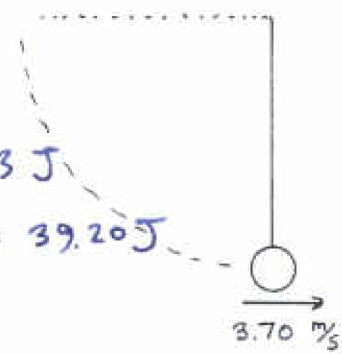
Name______________________________

Phys 121
Quiz #3



1. A 5.00 – kg __Swedish meatball__ is attached to the end of a 80.0 – cm string; it is held such that the string is horizontal and then released (i.e. it is "dropped"). When the __Swedish meatball__ reaches the bottom of its swing, its speed is found to be $3.70\frac{\text{m}}{\text{s}}$.

How much work was done by non–conservative forces during the downward swing?



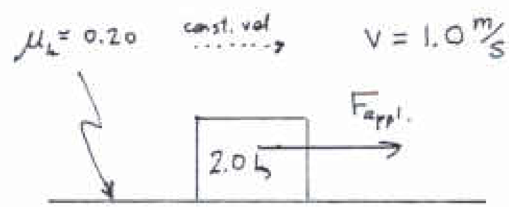
$W_{nc} = \Delta E = E_f - E_o$

$E_f = \frac{1}{2}mv_f^2 + 0 = \frac{1}{2}(5.00\text{ kg})(3.70\frac{\text{m}}{\text{s}})^2 = 34.23\text{ J}$

$E_o = 0 + mgh = (5.00\text{ kg})(9.80\frac{\text{m}}{\text{s}^2})(0.80\text{ m}) = 39.20\text{ J}$

$W_{nc} = E_f - E_o = -5.0\text{ J}$

2. A 2.0 – kg block is being pulled along a horizontal surface with coefficient of kinetic friction $\mu_k = 0.20$ by a horizontal applied force, such that it is moving at a constant velocity.



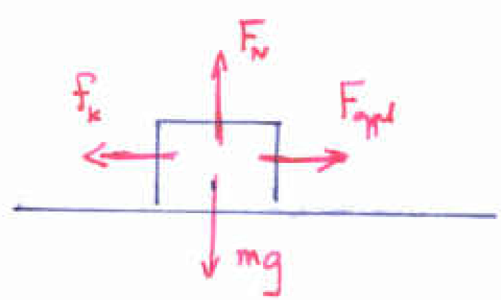
a) What is the applied force being exerted on the block?

Vertical forces cancel, so

$F_N = mg$

Horizontal force *also* cancel here,

since $a_x = 0$ so



$F_{appl} = f_k = \mu_k F_N = \mu_k mg$

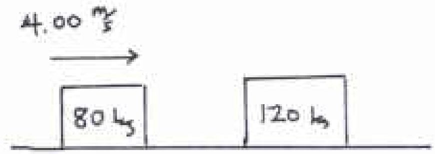
$= (0.20)(2.0\text{ kg})(9.80\frac{\text{m}}{\text{s}^2})$

$= 3.92\text{ N}$

b) What is the power expended by this force?

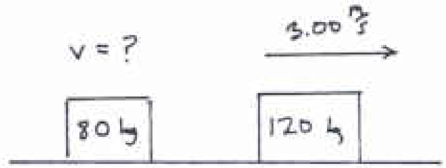
Since F is constant and par. to $\vec{v}$,

$P = Fv = (3.92\ \text{N})(1.00\ \tfrac{\text{m}}{\text{s}}) = 3.92\ \text{W}$



3. An 80.0 − kg WWF wrestler is moving to the right with velocity $+4.00\ \frac{\text{m}}{\text{s}}$; it makes a rapid collision with a stationary 120 − kg WCW wrestler. Immediately after the collision, the 120 − kg WCW wrestler is moving to the right with velocity $3.00\ \frac{\text{m}}{\text{s}}$.

Find the final velocity of the 80.0− kg WWF wrestler immediately after the collision.



Total momentum is conserved: $P_f = P_o$

$P_o = (80\ \text{kg})(4.00\ \tfrac{\text{m}}{\text{s}}) = 320\ \tfrac{\text{kg m}}{\text{s}}$

$P_f = (80\ \text{kg})\, v + (120\ \text{kg})(3.00\ \tfrac{\text{m}}{\text{s}})$

$320\ \tfrac{\text{kg m}}{\text{s}} = (80\ \text{kg})\, v + 360\ \tfrac{\text{kg m}}{\text{s}}$

Solve for v:

$v = -0.50\ \tfrac{\text{m}}{\text{s}}$

I.e. his speed is $0.50\ \tfrac{\text{m}}{\text{s}}$ and he moves to the left.

You must show all your work!

$$f_k = u_k F_N \qquad g = 9.80\frac{\text{m}}{\text{s}^2}$$

$$\text{KE} = \tfrac{1}{2}mv^2 \qquad \text{PE}_{\text{grav}} = mgh \qquad W_{\text{nc}} = \Delta E = \Delta\text{KE} + \Delta\text{PE} \qquad P_{\text{av}} = \frac{W}{t} \qquad P = Fv$$

$$\mathbf{p} = m\mathbf{v} \qquad \mathbf{I} = \Delta\mathbf{p} \qquad \mathbf{F}_{\text{av}} = \frac{\Delta\mathbf{p}}{\Delta t}$$