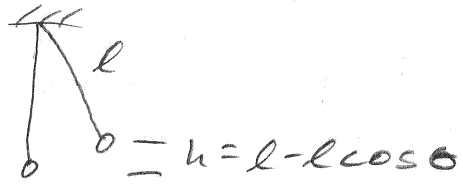
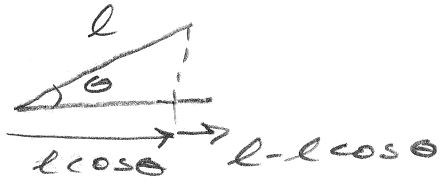
HW - due Tues. 2-1-11 - Energy Conservation

58, 63, 43, 62, 64
friction

58)




$l = 2\,m$
$\theta = 25°$
$v_f = \_\_\_\ \frac{m}{s}$

$K_i + U_{gi} = K_f + U_{gf}$

$2mgl(1-\cos\theta) = \frac{1}{2}mv_f^2$

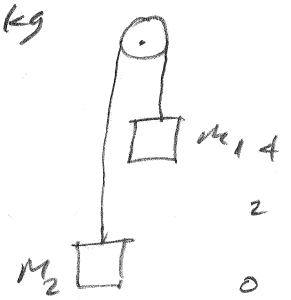
$v_f = \sqrt{2gl(1-\cos\theta)}$

$= \sqrt{2(9.8\frac{m}{s^2})(2m)(1-\cos 25°)}$

$\boxed{v_f = 1.82\frac{m}{s}}$

63) $m_1 = 5\,kg$ $m_2 = 3\,kg$

$h_{1i} = 4m$
$h_{2i} = 0m$
$v_{f\,pass} = \_\_\_\ \frac{m}{s}$
$v_{f\,ground} = \_\_\_\ \frac{m}{s}$
$h_{max\,2} = \_\_\_ m$

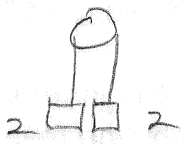



$K_i + U_{gi} = K_f + U_{gf}$

$2m_1gh_{1i} = \frac{1}{2}m_Tv_f^2 + 2m_1gh_{1f} + 2m_2gh_{2f}$

$v_f = \sqrt{\frac{2g(m_1h_{1i} - m_1h_{1f} - m_2h_{2f})}{m_T}}$

$= \sqrt{\frac{2(9.8\frac{m}{s^2})(5kg(4m) - 5kg(2m) - 3kg(2m))}{5kg+3kg}}$

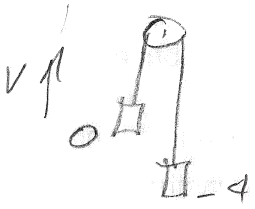



a) $\boxed{v_{f\,pass} = 3.13\frac{m}{s}}$

$v_f = \sqrt{\frac{2g(m_1h_{1i} - m_2h_{2f})}{m_T}}$

b) $\boxed{v_{f\,ground} = 4.43\frac{m}{s}}$

$= \sqrt{\frac{2(9.8\frac{m}{s^2})(5kg(4m) - 3kg(4m))}{8kg}}$




$K_i + U_{gi} = K_f + U_{gf}$

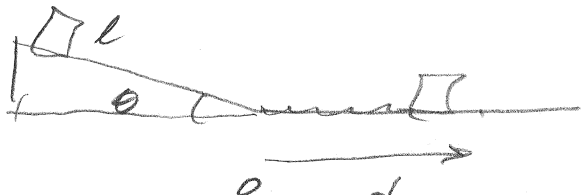
$\frac{1}{2}m_2v^2 = 2m_2gh$

$h = \frac{v^2}{2g}$

$= \frac{(4.43\frac{m}{s})^2}{2(9.8\frac{m}{s^2})}$

$\boxed{h = 1.00\,m}$

43)




$l = 3m$

$\theta = 30°$

$\mu_k = \_\_ N$

$v_f = \_\_ \frac{m}{s}$

$E_{LOST} = \_\_ J$

$h = l \sin\theta$ (2)

$= 3m(\sin 30°)$

$h = 1.5m$

$K_i + U_{gi} = K_f + U_{gf}$

$\frac{1}{2}mv_f^2 = mgh$

$v_f = \sqrt{2gl\sin\theta}$

$= \sqrt{2(9.8\frac{m}{s^2})3m(\sin 30°)}$

a) $\boxed{v_f = 5.42\frac{m}{s}}$

$K_i + U_{gi} = K_f + U_{gf} + E_{LOST}$

$\frac{1}{2}mv^2 = f_k d$

$\frac{1}{2}mv^2 = \mu_k mgd$

$\mu_k = \frac{v^2}{2gd}$

$= \frac{(5.42\frac{m}{s})^2}{2(9.8\frac{m}{s^2})(5m)}$

b) $\boxed{\mu_k = 0.300}$

$E_{LOST} = U_{gi}$

$= mgl\sin\theta$

$= (10kg)(9.8\frac{m}{s^2})(3m)\sin 30°$

c) $\boxed{E_{LOST} = 147J}$

62) $m = 0.0053kg$

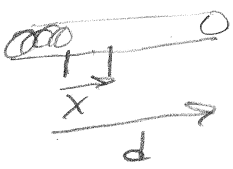
$k = 8\frac{N}{m}$

$d = 0.15m$

$f_k = 0.032N$

$v_f = \_\_ \frac{m}{s}$

$x = 0.05m$




$K_i + U_{si} = K_f + U_{sf} + E_{LOST}$

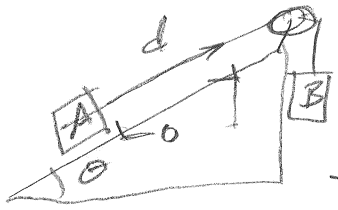
$\frac{1}{2}kx^2 = \frac{1}{2}mv_f^2 + 2f_k d$

$v_f = \sqrt{\frac{kx^2 - 2f_k d}{m}}$

$= \sqrt{\frac{8\frac{N}{m}(0.05m)^2 - 2(0.032N)(0.15m)}{0.0053kg}}$

$\boxed{v_f = 1.40\frac{m}{s}}$

64)




$\theta = 37°$

$M_A = 50kg$

$M_B = 100kg$

$\mu_K = 0.25$

$\Delta K = \_\_\_ J$

$d = 20m$

$f_k = \mu_A g \cos\theta$

$h_{Af} = d \sin\theta$

$\Delta K = K_f$

$\Delta K = -E_{LOST}$

$K_i^{0} + U_{gi} = K_f + U_{gf} + E_{LOST}$

$M_B g h_{Bi} = K_f + M_A g h_{Af} + \mu_K M_A g \cos\theta$

$K_f = M_B g h_{Bi} - M_A g d \sin\theta - \mu_K M_A g \cos\theta$

$\frac{1}{2} M_T V^2 = 100kg(9.8\frac{m}{s^2})(20m) - 50kg(9.8\frac{m}{s^2})(20m)\sin 37° - 0.25(50kg)(9.8\frac{m}{s^2})\cos 37°$

where $M_T = 150kg$ $\therefore$ $V_f = 12.5\frac{m}{s}$

$K_A = \frac{1}{2} M_A V^2$

$= \frac{1}{2}(50kg)(12.5\frac{m}{s})^2$

$\boxed{\Delta K_A = 3910J}$