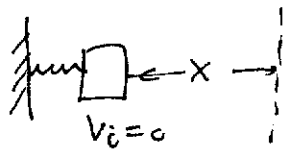
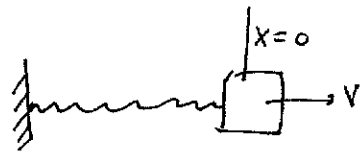
Physics 100 A Exam II

1) a)



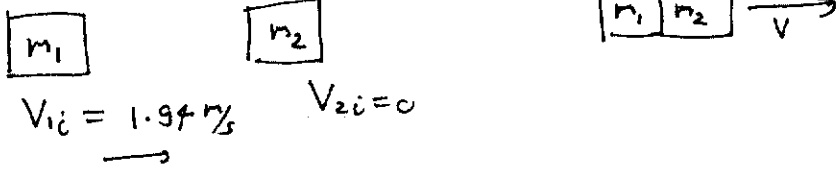


$$K_f + U_{fs} = K_i + U_{is}$$

$$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 \qquad v = \sqrt{\frac{kx^2}{m}} = \sqrt{\frac{(600)(0.05)^2}{0.4}}$$

$$v = 1.94 \text{ m/s}$$

b)

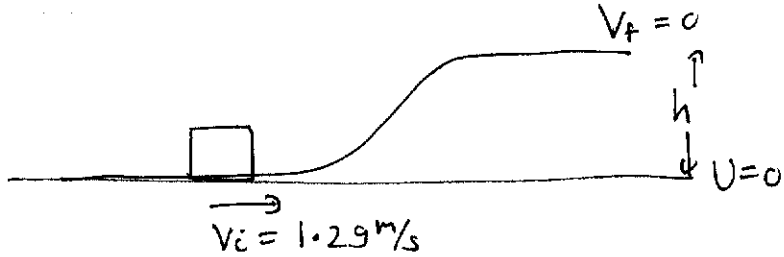


$$p_f = p_i$$

$$(m_1 + m_2)v = m_1 v_{1i} + m_2 v_{2i}$$

$$v = \frac{m_1 v_{1i}}{(m_1 + m_2)} = \frac{(0.4)(1.94)}{(0.4 + 0.2)} = 1.29 \text{ m/s}$$

c)

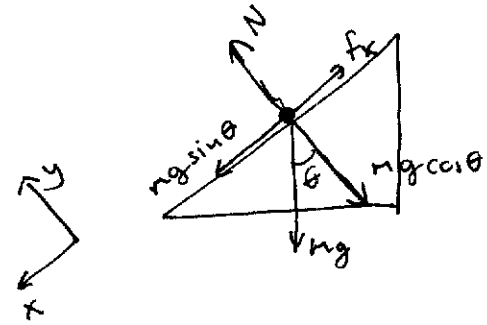


$$K_f + U_{fg} = K_i + U_{ig}$$

$$mgh = \frac{1}{2}mv^2 \qquad h = \frac{v^2}{2g}$$

$$h = \frac{(1.29)^2}{2(9.8)} = 0.085 \text{ m} = 8.5 \text{ cm}$$

2)



a) $f_k = \mu_k N$

$\underline{y}$ $N = mg\cos\theta$

$f_k = \mu_k mg\cos\theta = (0.2)(50)(9.8)\cos 16°$

$f_k = 94.2\ N$

b) $\underline{x}$ $mg\sin\theta - f_{ik} = ma$

$a = \frac{1}{m}(mg\sin\theta - f_k) = \frac{1}{(50)}\left[(50)(9.8)\sin 16° - 94.2\right]$

$a = \frac{(40.85)}{50} = 0.82\ m/s^2$

c) $W_N = 0$

d) $W_{fk} = -f_k d = -(94.2)(1.5) = -141.3\ J$

e) $W_{mg} = (+)\ mgh$ (Going down)

$h = d\sin\theta$

$W_{mg} = (50)(9.8)(1.5)\sin(16°)$

$W_{mg} = 202.6\ J$

f) $K_f - K_i = W_{total}$

$K_f = W_N + W_{fk} + W_{mg} = 0 - 141.3 + 202.6 = 61.3 J$

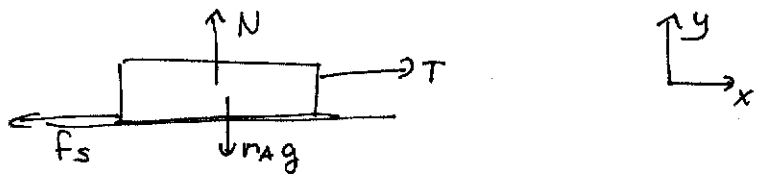
or

$V_f^2 = V_i^2 + 2ad$ $\quad V_f^2 = 2(0.82)(1.5) = 2.46\ \frac{m^2}{s^2}$

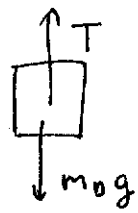
$K_f = \frac{1}{2}mV_f^2 = \frac{1}{2}(50)(2.46) = 61.3\ J$

3)

a)



b)



c) Block A

x $\quad T - f_s = 0$

$f_s = \mu_s N$

y $\quad N - m_A g = 0 \qquad f_s = \mu_s m_A g$

$T = f_s = \mu_s m_A g = (0.6)(8.0)(9.8) =$

$T = 47\ N$

d) Block AB $\quad T - m_B g = 0$

$m_B = \frac{T}{g} = \frac{47.04}{9.8} = 4.8\ kg$

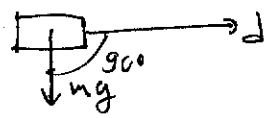
Multiple Choice

C A A D C E A B B E

1) In uniform circular motion the direction of the net force is directed to the center of the circular path (C)

2) $P = \frac{W}{t}$ $\quad P' = \frac{W'}{T'} = \frac{6W}{\frac{1}{2}T} = 12\frac{W}{T} = 12P$

(A)

3) 

$W = (mg)(d)\cos 90° = 0$ (A)

4) $K_f - K_i = W_{total}$

If the velocity is constant $K_f = K_i$ $\quad W_{total} = 0$

(b)

5) The impulse of A on B is equal but opposite to the impulse of B on A (C)

6) The momentum is conserved so if $P_i = 0$, $P_f = 0$. However due to the interaction both canoes have velocity. So the kinetic energy increases. (E)

7) $a_c = r\omega^2$ Child A has larger a_c since it is at a greater distance from the center.

(A)

8)

$$\omega = 2\pi f = \left(2\pi \frac{rad}{rev}\right)\left(210 \frac{rev}{min}\right)\left(\frac{1\,min}{60\,s}\right) = 21.99 \frac{rad}{s}$$

$$\omega = 22.0 \frac{rad}{s}$$

(B)

9) $\omega_f = \omega_i + \alpha t$

$$t = \frac{\omega_f - \omega_i}{\alpha} = \frac{(33.3) - (15.5)}{3.45} = 5.159\ s = 5.2\ s$$

(B)

10) Initially the object has all potential and no kinetic energy. As the object falls potential decreases and kinetic increases

(E)