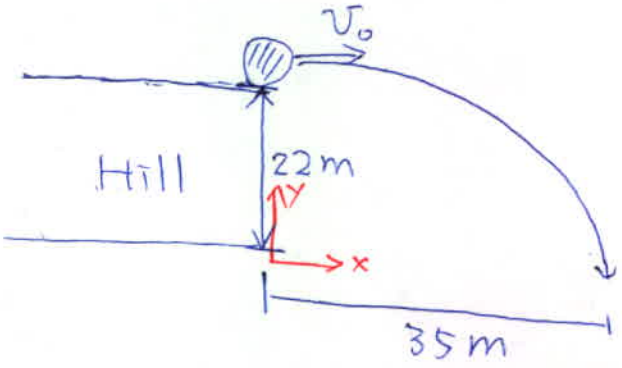
Physics 1A (a) Fall 2010 Quiz 2. Ver. A

Solutions

(1)



The ball is kicked horizontally $\Rightarrow v_0 = v_x$

$v_x = \frac{35}{t}$, need t.

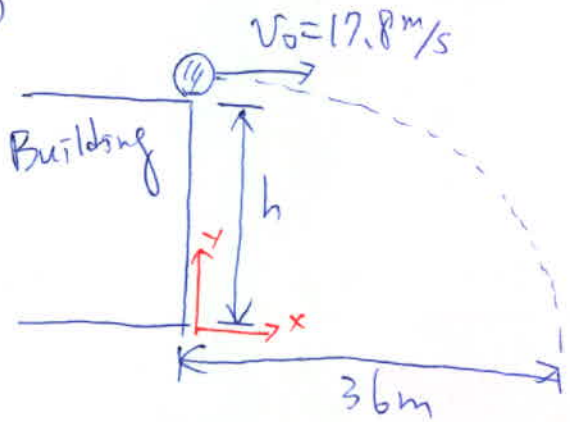
In y- direction $y_f = 0$, $y_i = 22$, $v_{yi} = 0$

use $\boxed{y_f = y_i + v_{yi} t - \frac{1}{2} g t^2}$

$0 = 22 + 0 - \frac{1}{2} \times 9.8 \times t^2$ $\quad t = 2.12$ (Sec)

$v_x = \frac{35}{2.12} = 16.5 \ (m/s) \Rightarrow$ (d.)

(2)



In x- direction

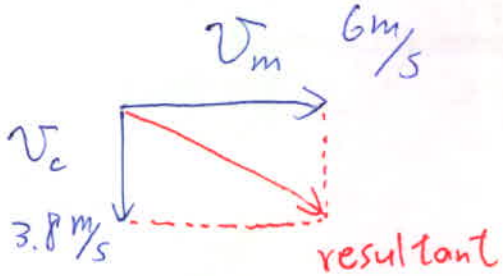
$v_0 = \frac{36}{t}$ $\quad t = 2.02$ (sec)

In y- direction

use $y_f = y_i + v_{yi} t - \frac{1}{2} g t^2$

$0 = h + 0 - \frac{1}{2}(9.8)(2.02)^2 = 20 \ (m) \Rightarrow$ (C)

(3)

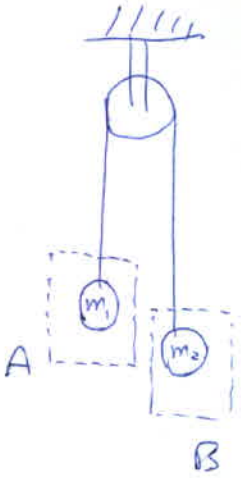


magnitude of resultant velocity :

$$\sqrt{6^2+3.8^2} = 7.1\ (m/s)$$

$\Rightarrow$ (d)

(4)



For system A.

Use $F = ma$

$$(m_1 g - T) = m_1 a \quad \cdots\cdots ①$$

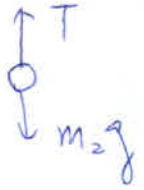
The "magnitude" of m_1 displacement is the same as that of m_2 $\Rightarrow x_1(t) = x_2(t)$.

Take derivative.

$\frac{dx}{dt} = v_1(t) = v_2(t)$, $a_1(t) = a_2(t)$

Their accelerations have same magnitude!

For system B.



$$T - m_2 g = m_2 a \quad \cdots\cdots ②$$

① + ② eliminate T : $(m_1 - m_2) g = m_1 + m_2 a$

$$a = \frac{m_1 - m_2}{m_1 + m_2} g = \frac{0.02\ kg}{0.2\ kg}(9.8\ m/s) = 0.98\ (m/s)$$

$\Rightarrow$ (e)

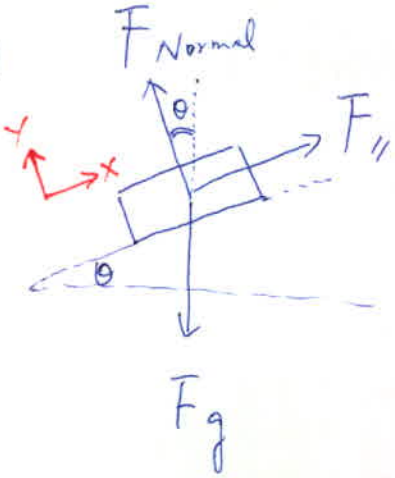
(5.) In x-direction

$F_x = m a_x$

$20 \cos 37^\circ = 2 \cdot a_x$ $\quad a_x = 10 \cos 37^\circ$

$= 8\ m/s \Rightarrow (a.)$

(6.)



In x-direction

$F_g \sin\theta = F_{//}$

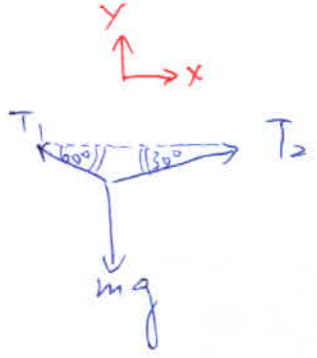
In y-direction

$F_g \cos\theta = F_{Normal}$

$F_{Normal} = 25 \cos 25^\circ = 23\ (N)$

$\Rightarrow (e)$

(7.)



In x-direction

$T_1 \cos 60^\circ = T_2 \cos 30^\circ$ ---- ①

In y-direction

$T_1 \sin 60^\circ + T_2 \sin 30^\circ = mg$ ---- ②

From ①: $T_1 = \frac{\cos 30^\circ}{\cos 60^\circ} T_2$ insert back to ②

$T_2 \frac{\cos 30^\circ}{\cos 60^\circ} \sin 60^\circ + T_2 \sin 30^\circ = mg \Rightarrow T_2 = 14\ (N)$

8.

$$F = ma$$

$$m = \frac{F}{a} = \frac{500}{7} = 71\ (kg) \Rightarrow (a.)$$