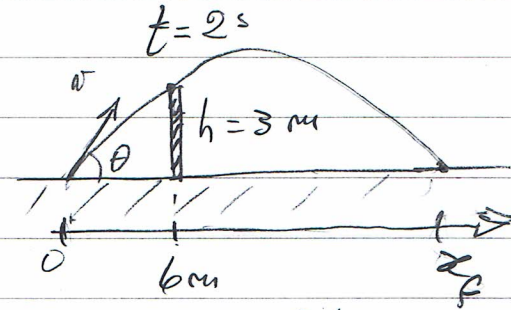
EXAMEN FISICA I TECNÓLOGOS 18/12/2020

Ejercicio 1

$v_x = v_0 \cos\theta \qquad x(t) = v_x t$

$6\,m = v_x \, 2\,s \Rightarrow v_x = 3\,m/s$



$y(t) = y_0 + v_{oy} t - \frac{1}{2} g t^2 \Rightarrow$

$3\,m = v_{oy} \cdot 2\,s - \frac{1}{2} 9{,}8 \cdot 2^2 \Rightarrow v_{oy} = \frac{3 + 9{,}8 \cdot 2^2/2}{2}$

$v_{oy} = 11.3\,m/s = v_0 \operatorname{sen}\theta$

$\frac{v_{oy}}{v_x} = \frac{v_0 \operatorname{sen}\theta}{v_0 \cos\theta} = \tan\theta = \frac{11.3}{3} \Rightarrow$ **a) $\theta \cong 75^{\circ}$**

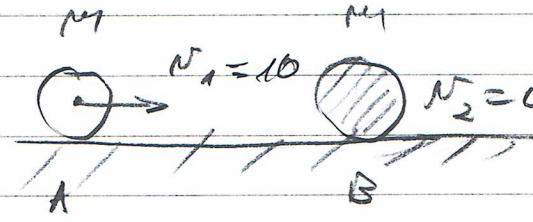
t_v = tiempo de vuelo $\Rightarrow y(t_v) = 0 = v_{oy} t_v - \frac{1}{2} g t_v^2$

$\Rightarrow t_v = \frac{2 v_{oy}}{g} = \frac{2 \times 11.3}{9{,}8} = 2{,}31\,s \qquad x_f = v_x t_v \Rightarrow$

b) $x_f = 3 \times 2{,}31 = 6.92\,m$

Ejercicio 2

$P_{sistema}$ = constante.



$$m v_1 = m v_1' + m v_2' \Rightarrow$$

$$10 = v_1' + v_2' \quad (i)$$

$$\frac{m v_1^2}{2} = \frac{m v_1'^2}{2} + \frac{m v_2'^2}{2} + 3,20\ J \Rightarrow$$

$$10^2 = v_1'^2 + v_2'^2 + \frac{3,20 \times 2}{0,20} \Rightarrow 100 = v_1'^2 + v_2'^2 + 32 \quad (ii)$$

De (i) y (ii) $100 = v_1'^2 + (10 - v_1')^2 + 30 \Rightarrow$

$$\Rightarrow v_1'^2 - 10 v_1' + 16 = 0 \Rightarrow v_1' = \begin{cases} 8\ m/s \\ 2\ m/s \end{cases}$$

$$v_2' = v_1 - v_1' = 10 - \begin{cases} 8 \\ 2 \end{cases} = \begin{cases} 2\ m/s \\ 8\ m/s \end{cases}$$

$v_2' < v_1'$ (según dice la letra) $\Rightarrow$ **a)** $\begin{cases} v_1' = 8\ m/s \\ v_2' = 2\ m/s \end{cases}$

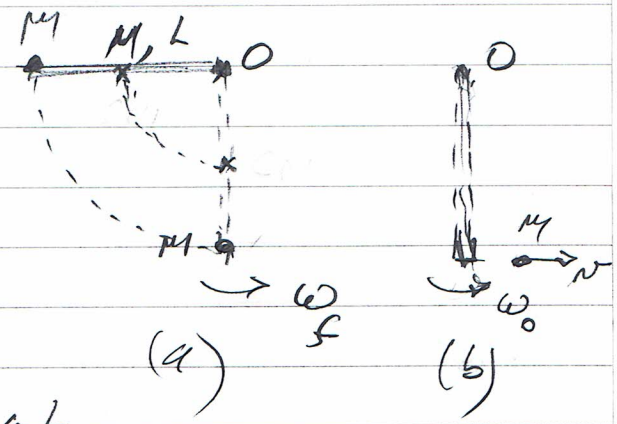
$$F_m = \frac{\Delta P}{\Delta t} \qquad \Delta P_B = m v_2' - 0 = 0,20 \times 2 = 0,40\ kg\,m/s$$

$\Rightarrow$ **b)** $F_m = \frac{0,40}{0,02} = 20\ \frac{kg\,m}{s}$ La fuerza media sobre la bola A es opuesta

Ejercicio 3

$M = 0.500\ kg$ $m = 0,013\ kg$

$L = 0.600\ m$ $V = 20,00\ \frac{m}{s}$



Parte (a) → conservación de la energía

$$Mg\frac{L}{2} + mgL = \frac{I_0 \omega_f^2}{2} + mg\frac{L}{2}$$

$$\Rightarrow \left(M + m\right)\frac{3}{2}gL = \frac{I_0 \omega_f^2}{2}$$

$I_0 = I_{oM} + I_{om}$ (barra + sólo masa)

$$I_{oM} = \frac{ML^2}{12} + M\left(\frac{L}{2}\right)^2 = \frac{1}{3}ML^2$$

$$I_{om} = mL^2 \Rightarrow I_0 = \frac{1}{3}ML^2 + mL^2 = \left(\frac{M}{3} + m\right)L^2 \Rightarrow$$

$$\frac{3}{2}(M+m)gL = \frac{1}{2}\left(\frac{M}{3} + m\right)L^2\omega_f^2 \Rightarrow \omega_f = \sqrt{\frac{3(M+m)g}{\left(\frac{M}{3} + m\right)L}}$$

a) $\omega_f = 11.83\ rad/s$

Parte (b) → conservación del momento angular:

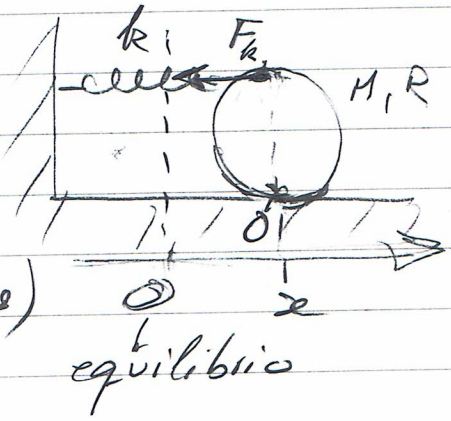
$$I_0\omega_f = I_0\omega_0 + mVL \Rightarrow \omega_0 = \frac{I_0\omega_f - mVL}{I_0}$$

$$I_0 = \frac{ML^2}{3} + mL^2 = 0.065\ kg\,m^2/s \Rightarrow$$

$$\omega_0 = \frac{0.065 \times 11.83 - 0.013 \times 20 \times 0.6}{0.065} \Rightarrow$$

b) $\omega_0 = 9.43\ rad/s$

Ejercicio 4



$\tau_o = F_k\, 2R = -kx\, 2R$

$\tau_o = I_o \alpha = I_o \ddot{\theta}$

$x \simeq 2R\theta$ (pequeñas oscilaciones)

$I_o \ddot{\theta} + 2kR\, 2R\theta = 0$

$I_o = I_c + MR^2 = \frac{1}{2}MR^2 + MR^2 = \frac{3}{2}MR^2 \Rightarrow$

$\frac{3}{2}MR^2\ddot{\theta} + 4kR^2\theta = 0 \rightarrow \ddot{\theta} + \frac{8}{3}\frac{k}{M}\theta = 0$

$\Rightarrow \Omega = \sqrt{\frac{8}{3}\frac{k}{M}} \rightarrow$ **a)** $f = \frac{1}{2\pi}\sqrt{\frac{8}{3}\frac{k}{M}}$

$x(t) = A\cos\Omega t \Rightarrow v = \dot{x} = -\Omega A \operatorname{sen}\Omega t \Rightarrow$

$v_{max} = \Omega A$

b) $v_{max} = A\sqrt{\frac{8}{3}\frac{k}{M}}$