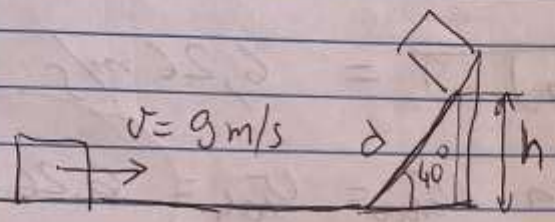
GABARITO PROVA P2 - FÍSICA 06/07/23

Questão 1



não existem forças externas agindo a energia se conserva

$K = U$

$K_f - K_i = U_f - U_i$ considerando $K_i = 0$ $U_i = 0$

$K_f = U_f$

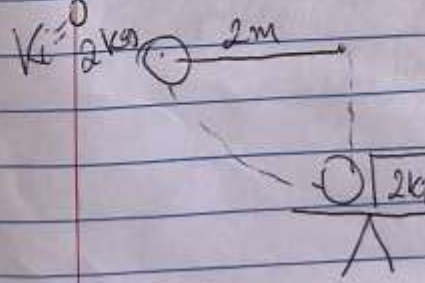
$\frac{1}{2} m v_f^2 = mgh$

$h = \frac{v_f^2}{2g}$ $\quad d = \frac{h}{\text{sen}\theta} \Rightarrow h = d\,\text{sen}\theta$

$d\,\text{sen}\theta = \frac{v_f^2}{2g}$ $\quad d = \frac{v_f^2}{2g\,\text{sen}\theta} = \frac{(9\,m/s^2)^2}{2(9{,}8\,m/s^2)\,\text{sen}\,40^\circ}$

$d = \frac{81}{12{,}6} = 6{,}42\,m$

Questão 2



$\Delta K + \Delta U = 0$

$K_f - K_i + U_f - U_i = 0$

$K_i = 0$

$U_f = 0$

$$\frac{1}{2} m_b v_b^2 + m_b g \Delta h = 0$$

$$v_b = \sqrt{2 g \Delta h}$$

$$v_b = \sqrt{2 (9{,}8\ m/s^2)(2\ m)} = 6{,}26\ m/s$$

Colisão é elástica $v_{bloco} = v_{bola} = 6{,}26\ m/s$

$$v_f^2 = v_i^2 + 2 a_{bloco} \Delta x$$

$$v_f = 0$$

$$\Delta x = \frac{-v_i^2}{2 a_{bloco}} = \frac{-v_{bloco}^2}{2 a_{bloco}}$$

$$\vec{\Sigma F} = m\vec{a} \Rightarrow \Sigma f_x = -f_k = m a_{bloco}$$

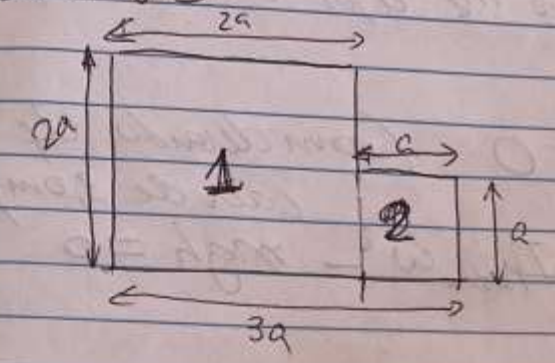
$$\Sigma F_y = F_N - m_{bloco} g = 0$$

$$a_{bloco} = \frac{-f_k}{m_{bloco}} = \frac{-\mu_k F_N}{m_{bloco}} = \frac{-\mu_k m_{bloco} g}{m_{bloco}} = -\mu_k g$$

$$\Delta x = \frac{-v_{bloco}^2}{-2 \mu_k g} = \frac{v_{bloco}^2}{2 \mu_k g} = \frac{(6{,}26\ m/s)^2}{2(0{,}2)(9{,}8\ m/s^2)}$$

$$\Delta x = \frac{39{,}2}{3{,}92} = 10\ m$$

Questão 3



$m_1 = kA_1$

$m_2 = kA_2$

$A_1 = 4a^2$

$A_2 = a^2$

$A_1 = 4A_2$

$M_{xcm} = m_1 x_{1,cm} + m_2 x_{2,cm}$

$M_{ycm} = m_1 y_{1,cm} + m_2 y_{2,cm}$

$$x_{cm} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2} = \frac{kA_1 x_1 + kA_2 x_2}{kA_1 + kA_2}$$

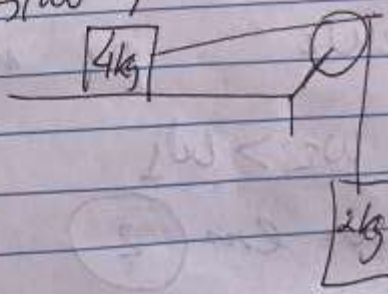
$$x_{cm} = \frac{A_1 x_1 + A_2 x_2}{A_1 + A_2} \qquad A_1 = 4a^2 \quad A_2 = a^2 \quad x_1 = a \quad x_2 = 2{,}5a$$

$$x_{cm} = \frac{4a^2 \cdot a + a^2\, 2{,}5a}{4a^2 + a^2} = 1{,}3a$$

$$y_{cm} = \frac{A_1 y_1 + A_2 y_2}{A_1 + A_2} = \frac{4a^2 a + a^2\, 0{,}5a}{4a^2 + a^2} = 0{,}9a$$

Resposta (1,3a , 0,9a)

Questão 4



$m_1 = 4kg$

$m_2 = 2kg$

Roldana 0,1m 0,7kg

a) Velocidade do bloco m_2 após cair de 3,0m

$\Delta K + \Delta U = 0$

$K_i = 0 \quad U_f = 0$ (considerando U_f após cair de 3,0m)

$$\frac{1}{2}(m_1 + m_2)v^2 + \frac{1}{2} I_{roldana}\omega^2 - mgh = 0$$

$$\frac{1}{2}\left(m_1 + \frac{m_2}{2}\right)v^2 + \frac{1}{2}\left(\frac{1}{2}M_{Rold.}R^2\right)\frac{v^2}{R^2} - mgh = 0$$

$$v = \sqrt{\frac{2mgh}{m + m + \frac{1}{2}M_{rold}}} = \sqrt{\frac{2(2kg)\,9,8\,m/s^2\,(3,0m)}{4kg + 2kg + \frac{1}{2}(0,7kg)}}$$

$$v = \sqrt{\frac{117,6}{6,35}} = \sqrt{18,5} = 4,3\ m/s$$

b) $\omega = \frac{v}{R} = \frac{4,3\ m/s}{0,1\ m} = 43\ rad/s$

Questão 5

a)

$L_1 = I_1\omega_1 \qquad L_2 = I_2\omega_2$

Momento se conserva

$L_1 = L_2$

$I_1\omega_1 = I_2\omega_2$

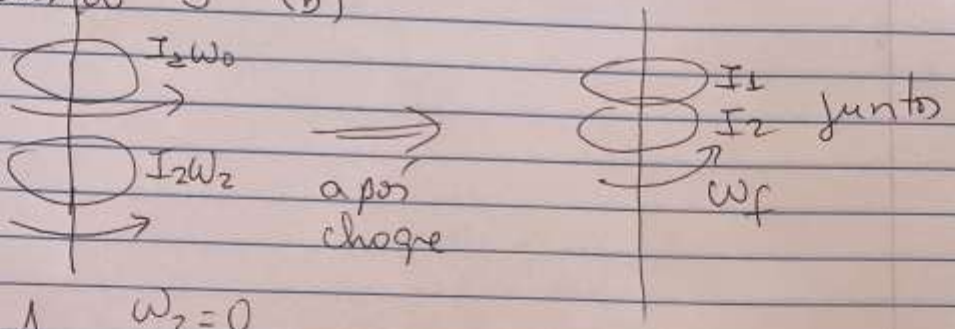
r diminui em 2 então

$I_1 > I_2$

Como $I_1\omega_1 = I_2\omega_2$ p/ manter a igualdade $\omega_2 > \omega_1$

Velocidade é maior em (2)

Questão 5 (b)



1 $\omega_2 = 0$

Conservação momento angular

$$L_1 = L_2$$

$$I_1\omega_0 = \omega_f (I_1 + I_2)$$

$$\omega_f = \frac{I_1\omega_0}{(I_1 + I_2}$$

Energia → conservação

$$K = \frac{1}{2} I\omega^2 = \frac{1}{2}\frac{I^2\omega^2}{I} = \frac{1}{2}\frac{L^2}{I}$$

$$K_i = \frac{L_i^2}{2I_1}$$

$$K_f = \frac{1}{2}\frac{L_f^2}{(I_1 + I_2)} \qquad \text{como } L_f = L_i$$

ou seja $K_f < K_i$

Energia não se conserva