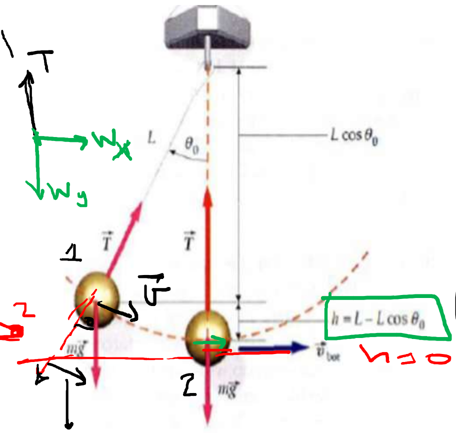
①



$w_x = mg \operatorname{sen}\theta$

3.Un péndulo consiste en una masa m conectada a una cuerda de longitud L. La masa se desplaza de modo que la cuerda forma un ángulo de θ₀ con la vertical, y luego se libera la masa describe un semiarco. Encuentre la expresión para la velocidad y la tensión de la cuerda cuando la masa pasa por la parte inferior.

$\vec{A}\cdot\vec{B} = AB\cos\theta$

$\vec{T} = T\hat{j}$ $\quad \theta = 90°$

$\vec{v} \quad \vec{v}\hat{i}$

$\vec{T}\cdot\vec{v} = 0$

$W_{Ext} = 0$

$\delta W_{NC} = \int \vec{T}\cdot d\vec{l}$

$d\vec{l} = \vec{v}\,dt$

1: $h_1 = h$, $v_1 = 0$

2: $v_2 = ?$, $h_2 = 0$

$W_{NC} = 0$

$F_{conservativa}$ $\quad \underline{w_x}$

$\int_W w_{nc} = \int_1^2 \vec{T}\cdot\vec{v}\,dt$

$\Delta E_{mec} = 0$

$E_{mec\,1} = E_{mec\,2}$

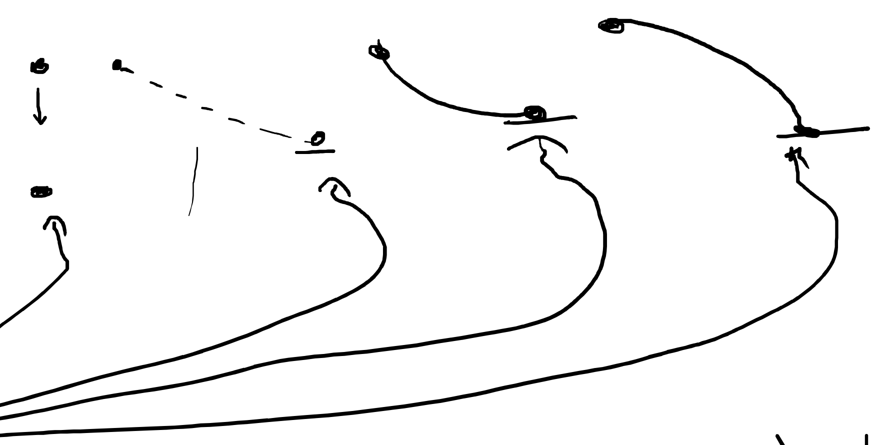
$U_{g1} + K_1 = U_{g2} + K_2$

$\cancel{m}gh_1 + \frac{1}{2}\cancel{m v_1^2} = \cancel{mgh_2} + \frac{1}{2}\cancel{m}v_2^2$

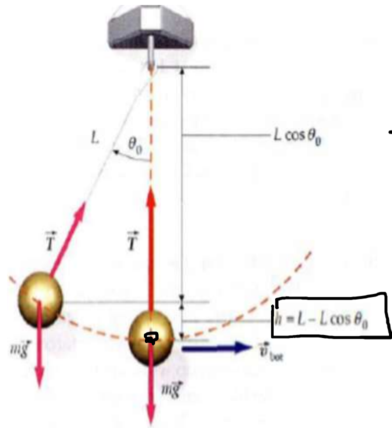
$\cos\theta = \frac{L}{L+h}$

$(L+h)\cos\theta = L$

$gh_1 = \frac{1}{2}v_2^2 \Rightarrow \sqrt{2gh_1} = v_2$



F_G unica que hace trabajo



$v_0 = 1$ (1)

$V_2 =$

$h = L(1-\cos\theta)$

$v_2 = \sqrt{2gh}$

$$\boxed{v_2 = \sqrt{2g(L - L\cos\theta)}} \rightarrow$$

cinemático

$\exists F \Rightarrow$ Constante. $\Rightarrow$ MUA

$T = ?$

$\sum F_{y_2} = ma_y$

$T - mg = ma_y$

$T = m(a_y + g)$

$T = m(g(1-\cos\theta) + g)$

$T = mg(1 - \cos\theta + 1)$

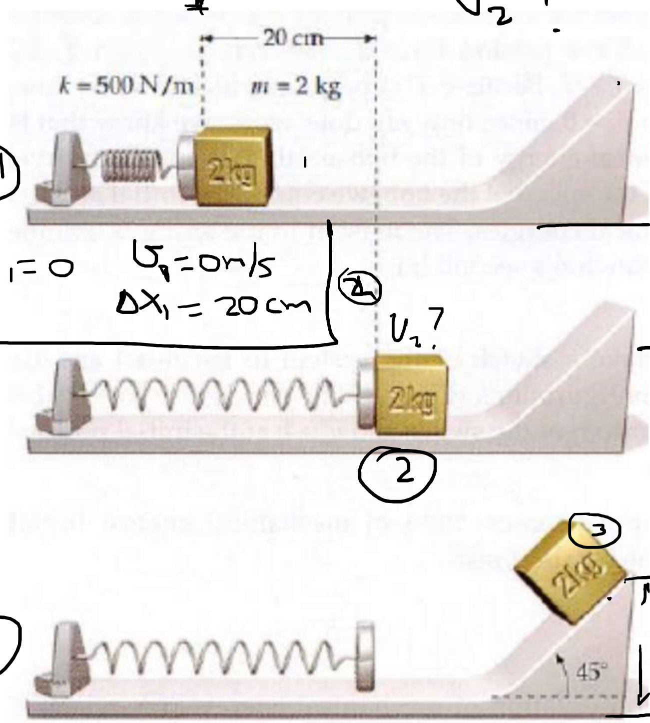
$T = mg(2 - \cos\theta)$

$v_2^2 - \cancel{v_1^2}^{\,0} = 2\Delta y\, a_y$

$$\frac{v_2^2}{2\Delta y} = a_y = \frac{2gL(1-\cos\theta)}{2L}$$

$a_y = g(1-\cos\theta)$

1 $\qquad V_2\,?$

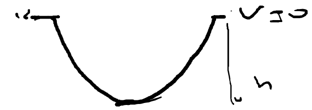


① $h_1 = 0 \quad V_1 = 0\,m/s \quad \Delta x_1 = 20\,cm$

② $V_2\,?$ $\quad h = 0$

$V_2 = ?$ $\quad h_2 = 0$ $\quad \Delta x = 0$

③ $h_3 = ?$ $\quad V_3 = 0$



$\Delta E_{me} = 0$

$E_{mec\,1} = E_{mec\,2}$

$E_{mec\,2} = E_{mec\,3}$

$E_{mec\,1} = E_{mec\,3}$

$U_{R_1} + U_{g_1} + K_1 = U_{R_3} + K_3 + U_{g_3}$

$\frac{1}{2}k\Delta x_1^2 + \cancel{mgh_1}^{0} + \cancel{\frac{1}{2}mV_1^2}^{0} = \cancel{\frac{1}{2}k\Delta x_2^2}^{0} + \cancel{mgh_2}^{0} + \frac{1}{2}mV_2^2$

$\cancel{\tfrac{1}{2}}k\Delta x_1^2 = \cancel{\tfrac{1}{2}}mV_2^2$

$V_2 = \sqrt{\frac{k\Delta x_1^2}{m}} = \sqrt{\frac{500\frac{N}{m} \times (0.2m)^2}{2kg}}$

$K_2 = \frac{1}{2}k\Delta x^2 = \frac{1}{2}\,500\frac{N}{m} \times (0.2m)^2$

② → ③ $\quad h\,?$

$\Delta E_{mec} = 0$

$E_{mec_2} = E_{mec\,3}$

$K_2 + U_{g_2} = K_3 + U_{g_3}$

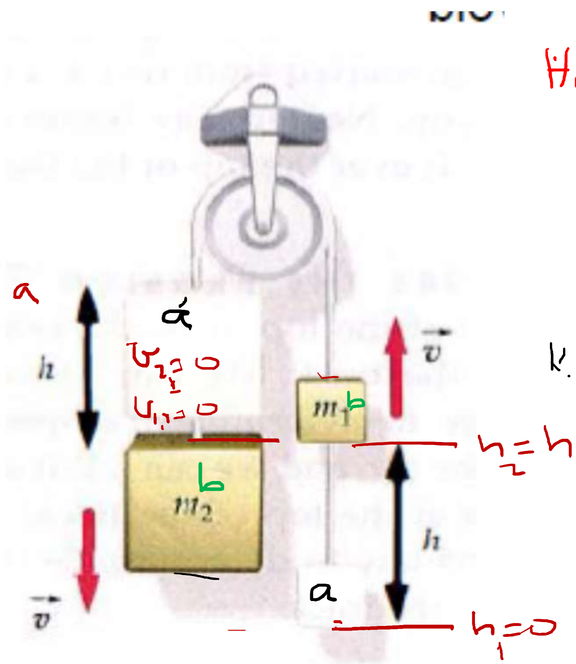
$\frac{1}{2}mV_2^2 + \cancel{mgh_2}^{0} = \cancel{\frac{1}{2}mV_3^2}^{0} + mgh_3$

$\frac{1}{2}\cancel{m}V_2^2 = \cancel{m}gh_3$

$V_2 = \sqrt{2gh_3}$

$K = mgh$

$h = \frac{K}{mg}$



Hay Solamente una Fuerza conservativa F_G

$\Delta E_{mec} = 0$

$E_{mec\,1} = E_{mec\,2}$

$K_{1a} + K_{2a} + U_{g1a} + U_{g2a} = K_{1b} + K_{2b} + U_{g1b} + U_{g2b}$

$\frac{1}{2} m_1 \cancel{v_{a_1}^2}^{0} + \frac{1}{2} \cancel{m_2 v_{a_2}^2}^{0} + m_2 g h_{2a} + \cancel{m_1 g h_{1a}}^{0} =$

$\frac{1}{2} m_2 v_{2b}^2 + \frac{1}{2} m_1 v_{1b}^2 + m_2 \cancel{g h_{b_2}}^{0} + m_1 g h_{1b}$

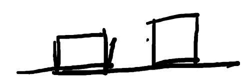
$h_{2a} = h$

$v_{2b} = v_{1b}$

$h_{1b} = h$

$m_2 g h_{2a} = \frac{1}{2} m_2 v_{2b}^2 + \frac{1}{2} m_1 v_{1b}^2 = m_1 g h_{1b}$

$m_2 g h = \frac{1}{2} m_2 v_{1b}^2 + \frac{1}{2} m_1 v_{1b}^2 = m_1 g h$



$h_1 = h$

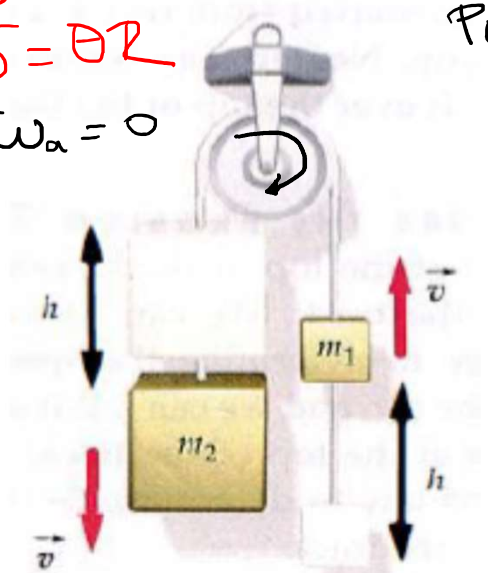
$m_2 g h - m_1 g h = \frac{1}{2} v_{1b}^2 (m_1 + m_2)$

$\sqrt{\frac{2gh\,(m_2 - m_1)}{m_1 + m_2}} = v_{1b} = v_{2b}$

θ

$S = \theta R$

$\omega_a = 0$



Polea es un disco de radio R y masa M

$$I_o = \frac{1}{2} M R^2$$

$$\vec{\omega} = -\omega\, \hat{u}_\theta$$

$$K_{R_{P_a}} + K_{1_a} + K_{2_a} + U_{g_{1a}} + U_{g_{2a}} = K_{R_{P_b}} + K_{1_b} + K_{1_b} + U_{g_{1b}} + U_{g_{2b}}$$

$$\cancel{\tfrac{1}{2} m_1 v_{1a}^2}^{\,0} + \cancel{\tfrac{1}{2} m_2 v_{2a}^2}^{\,0} + \cancel{\tfrac{1}{2} I \omega^2}^{\,0} + \cancel{m_1 g h_{1a}} + m_2 g h_{2a} =$$

$$\tfrac{1}{2} m_1 v_{1b}^2 + \tfrac{1}{2} m_2 v_{2b}^2 + \tfrac{1}{2} I \omega_b^2 + m_1 g h_{1b} + \cancel{m_2 g h_{2b}}^{\,0}$$

$$\tfrac{1}{2} v_b^2 (m_1 + m_2) + \tfrac{1}{2} I \omega_b^2 + m_1 g h = m_2 g h$$

$$\tfrac{1}{2} v_b^2 (m_1 + m_2) + \tfrac{1}{2} I \frac{v_b^2}{R^2} = m_2 g h - m_1 g h$$

$$\tfrac{1}{2} v_b^2 (m_1 + m_2) + \tfrac{1}{2} M R^2 \frac{v_b^2}{R^2} = g h (m_2 - m_1)$$

$$\tfrac{1}{2} v_b^2 \left(m_1 + m_2 + \frac{M}{2}\right) = g h (m_2 - m_1)$$

$$v_b = \sqrt{\frac{4 g h (m_2 - m_1)}{(2 m_1 + 2 m_2 + M)}}$$

K_T = Energía cinética Traslación

$\boxed{\tfrac{1}{2} m v^2} \longrightarrow \tfrac{1}{2} I \omega^2$

K_R

K_R = Energía Rotacional.

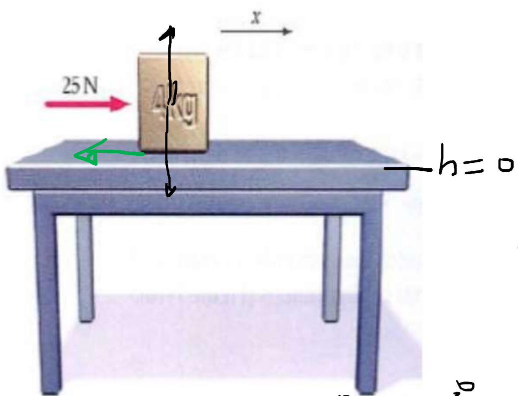
velocidad angular ω

masa ⇒ Momento de Inercia

I

$\left(\omega = \frac{v}{R}\right)$

$\theta = R\omega$



6.Usted empuja una caja de 4 kilogramos, que está al principio descansando sobre una mesa horizontal, con una fuerza horizontal de 25 N se desplaza una distancia de 3 m . El coeficiente de fricción cinética entre la caja y la mesa es 0.35. Encuentre al trabajo externo sobre el sistema de mesa de bloque, (b) la energía disipada por la fricción, (c) la energía cinética final de la caja, y d) la velocidad de la caja, Si Usted empuja una caja desde el reposo.

$F_{NC} = $ 1. f_f 2. F_{ext}

$W_{NC} = W_{ff} + W_{Fext}$

$\vec{F}_{ext} = 25N\,\hat{i}$

$m = 4kg$

$d = \Delta x = 3m\,\hat{i}$

$\mu_k = 0.35$

W_{Fext} ?

Energía disipada por la fricción $= W_{ff}$

$E_{mec} = K + \cancel{U_g} + \cancel{U_k}$

$W_{NC} = \Delta E_{mec}$

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

$K_i = \frac{1}{2} m \cancel{v_i^2} = 0$

$\Delta E_{mec} = \Delta K \Rightarrow W_{NC} = K_f - K_i$

$W_{Fex} = 25N \times 3m = 75\ Nm$

$f_f = \mu N$

$\vec{f}_f = \mu_k m g(-\hat{i})$

$\Delta x = d\,\hat{i}$

$W_{ff} = -d\mu_k m g$

$W_{NC} = W_{ff} + W_{Fex} =$

$W_{NC} = -41{,}20J + 75J = K_f \Rightarrow \frac{1}{2} m v_f^2 = W_{NC}$

$v_f^2 = \frac{2W_{NC}}{m}$

$v_f = \sqrt{\frac{2 \times 33{,}8J}{4kg}}$

$\boxed{v_f = 4{,}11\ m/s}$

$W_{Fex} = \vec{F}_{ext} \cdot \vec{\Delta x} = 25N \times 3m(\hat{i}\cdot\hat{i})$

$W_{ff} = -3m \times 0{,}35 \times 4kg \times 9{,}81 m/s^2 = \boxed{-41{,}20J}$ = Energía disipada por Fricción