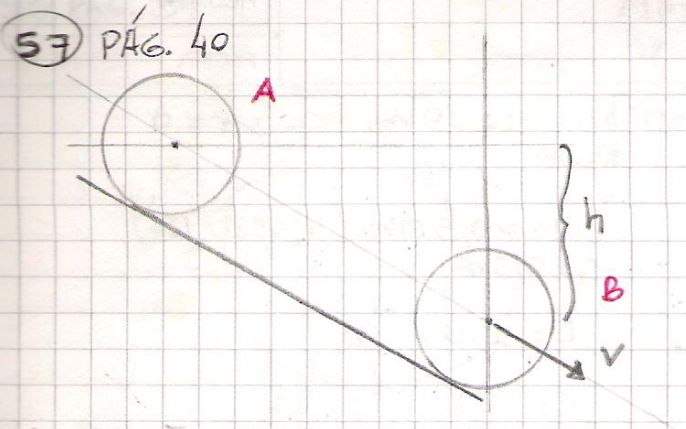


CONSERVACIÓN DE ENERGÍA MECÁNICA

57 PÁG. 40



$$h = 10 \text{ cm}$$

$$A \begin{cases} E_P \neq 0 \\ E_C \neq 0 \\ E_{Ch} \neq 0 \end{cases}$$

$$B \begin{cases} E_P = 0 \\ E_C \neq 0 \\ E_{Ch} \neq 0 \end{cases}$$

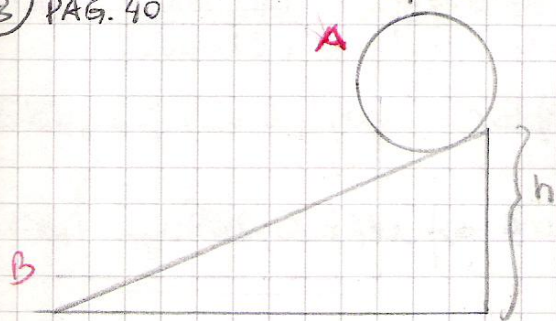
100 cm - 50

$$E_{m0} = E_{mf}$$

$$mgh = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2 \Rightarrow mgh = \frac{1}{2} m v^2 + \frac{1}{2} \left(\frac{1}{2} m R^2 \right) \frac{v^2}{R^2}$$

$$gh = v^2 \left(\frac{1}{4} + \frac{1}{2} \right) \Rightarrow \sqrt{\frac{gh}{\frac{3}{4}}} = v \Rightarrow \boxed{v = 11,43 \text{ m/s}}$$

58 PÁG. 40



$$m = 1000 \text{ kg}$$

$$r = 0,5 \text{ m}$$

$$h = 5 \text{ m}$$

$$A = \begin{cases} E_P \neq 0 \\ E_C = 0 \\ E_{Ch} = 0 \end{cases}$$

$$B = \begin{cases} E_P = 0 \\ E_C \neq 0 \\ E_{Ch} \neq 0 \end{cases}$$

$$E_{m0} = E_{mf}$$

$$mgh = \frac{1}{2} m v^2 + \frac{1}{2} \left(\frac{1}{2} m r^2 \right) \frac{v^2}{r^2}$$

$$\frac{gh}{\frac{1}{2} + \frac{1}{4}} = v \Rightarrow \sqrt{\frac{49}{3/4}} = v \Rightarrow \boxed{v = 8,08 \text{ m/s}}$$

$$mgh = \frac{1}{2} m (\omega r)^2 + \frac{1}{2} \left(\frac{1}{2} m r^2 \right) \omega^2 \Rightarrow \sqrt{\frac{gh}{\frac{1}{2} \left(\frac{r^2}{2} + \frac{1}{2} r^2 \right)}} = \omega \Rightarrow \boxed{\omega = 16,15 \text{ s}^{-1}}$$

$$gh = \frac{1}{2} (\omega^2 r^2 + \frac{1}{2} \omega^2 r^2)$$

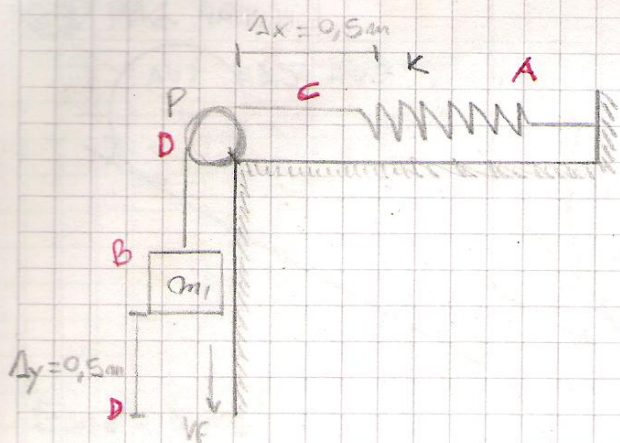
$$gh = \frac{1}{2} \omega^2 \left(r^2 + \frac{1}{2} r^2 \right)$$

⊗ TAMBIÉN SE PODÍA USAR
 $\boxed{\omega = \frac{v}{r}}$

$$E_C = E_{Ct} + E_{Cr} \Rightarrow E_C = \frac{1}{2} m v^2 + \frac{1}{2} \left(\frac{1}{2} m r^2 \right) \omega^2 \Rightarrow E_C = 32643,2 \text{ J} + 16200,6 \text{ J}$$

$$\Rightarrow \boxed{E_C = 48843,8 \text{ J}} \text{ ó } 49 \text{ kJ}$$

60 PÁG. 40



$$I_P = 0,5 \text{ kg m}^2$$

$$E_{pe} = \frac{1}{2} k x^2$$

$$R = 0,3 \text{ m}$$

$$k = 2 \text{ N/m}$$

$$m_1 = 0,1 \text{ kg}$$

$$\Delta y = 0,5 \text{ m}$$

$$B \{ E_P, A=0 \Rightarrow E_{mi} = m_1 g h$$

$$C \{ E_{pe}, D \{ E_{ch} + E_{ct} \Rightarrow E_{arf} = \frac{1}{2} k x^2 + \frac{1}{2} I \frac{v^2}{R^2} + \frac{1}{2} m_1 v^2$$

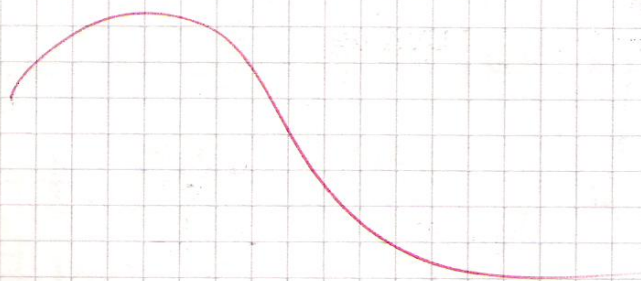
$$\Delta E_M = 0 \Rightarrow E_{mi} = E_{arf}$$

$$m_1 g h = \frac{1}{2} k x^2 + \frac{1}{2} I \frac{v^2}{R^2} + \frac{1}{2} m_1 v^2$$

$$2 m_1 g h = k x^2 + I \frac{v^2}{R^2} + m_1 v^2$$

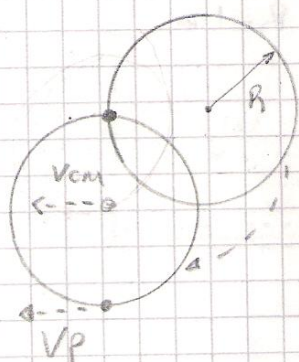
$$2 m_1 g h - k x^2 = v^2 \left(\frac{I}{R^2} + m_1 \right)$$

$$\sqrt{\frac{2 m_1 g h - k x^2}{\frac{I}{R^2} + m_1}} = v \Rightarrow v = \sqrt{\frac{0,98 - 0,5}{5,55 + 0,1}} \Rightarrow \boxed{v = 0,29 \text{ m/s}}$$



61) PÁG. 41

$g \downarrow$



$h = 2R$

$$R = 10 \text{ cm}$$

$$M = 2 \text{ kg}$$

$$V_{cm} = ?$$

$$V_p = ?$$

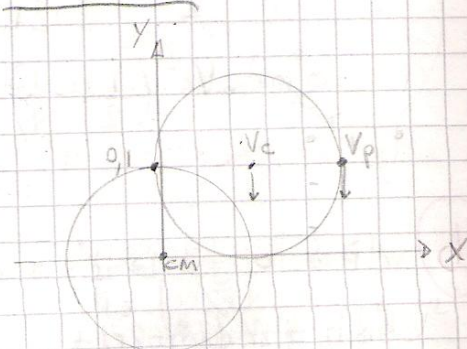
$$\frac{1}{2} m R^2 \omega^2 + m R^2 \omega^2$$

$$\omega_c = 11,43 \text{ rad/s}$$

$$V_c = \omega_c \cdot R \Rightarrow V_c = 1,14 \text{ m/s}$$

$$V_p = \omega_c \cdot 2R \Rightarrow V_p = 2,28 \text{ m/s}$$

$$E_{\text{rot}} = E_{\text{tr}} + E_{\text{tr}}$$

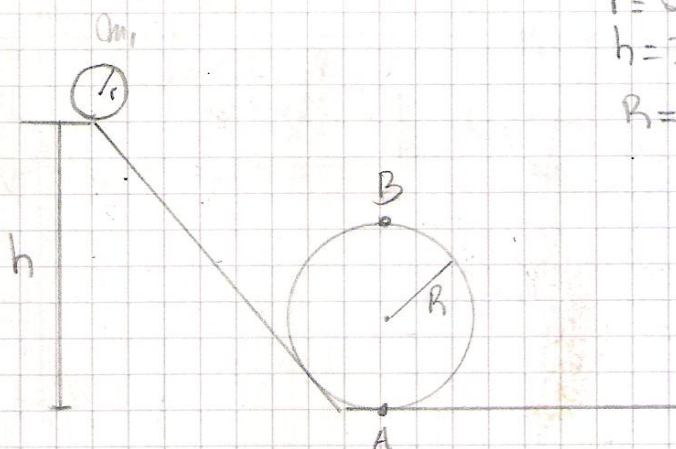


$$I_{\text{cm}} = \frac{1}{2} \left(\frac{3}{2} m R^2 \right) \omega^2$$

$$\sqrt{\frac{I_{\text{cm}}}{\frac{3}{4} m R^2}} = \omega_c \Rightarrow \omega_c = 11,43 \frac{1}{s}$$

62

$$\begin{aligned} m_1 &= 1 \text{ kg} \\ r &= 0,1 \text{ m} \\ h &= 30 \text{ m} \\ R &= 1 \text{ m} \end{aligned}$$



a

$$\Delta E_{\text{me}} = 0 \\ E_{\text{mei}} = E_{\text{mef}}$$

$$m_1 g(h+r) = \frac{1}{2} m_1 v_A^2 + \frac{1}{2} \left(\frac{1}{2} m_1 R^2 \right) \frac{v_A^2}{R^2}$$

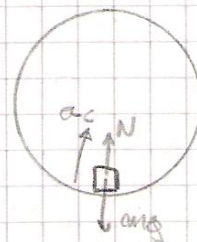
$$g(h+r) = v_A^2 \left(\frac{1}{2} + \frac{1}{4} \right) \Rightarrow \sqrt{\frac{g(h+r)}{3/4}} = v_A \Rightarrow v_A = 19,83 \text{ m/s}$$

b

$$\Delta E_{\text{me}} = 0 \Rightarrow E_{\text{mei}} = E_{\text{mef}}$$

$$m_1 g h = m_1 g(2R-2r) + \frac{1}{2} m_1 v^2 + \frac{1}{2} \left(\frac{1}{2} m_1 R^2 \right) \frac{v^2}{R^2}$$

$$\sqrt{\frac{g h - g(2R-2r)}{3/4}} = v \Rightarrow v_B = 19,19 \text{ m/s}$$



c

$$N_A = m(g + a_c)$$

$$N_A = 486,7$$

$$a_{cA} = \frac{v_A^2}{R-r} \quad N - m_1 g = m_1 a_c$$

$$a_{cA} = 436,9 \text{ m/s}^2 \quad N = m(g + a_c)$$

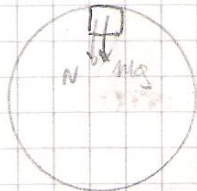
d

$$N_B = m(-g - a_c)$$

$$N_B = 399,2$$

$$a_{cB} = \frac{v_B^2}{R-r}$$

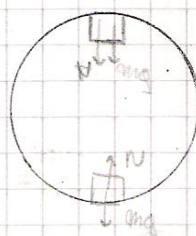
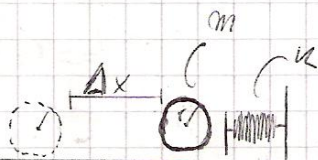
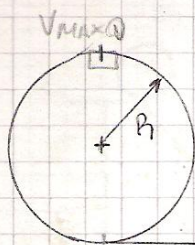
$$a_{cB} = 409,1 \text{ m/s}^2$$



$$+mg + N = m \cdot a_c$$

$$N = m(-g - a_c)$$

$m = 1 \text{ kg}$
 $r = 0,25 \text{ m}$
 $k = 10000 \text{ N/m}$
 $h = 1 \text{ m}$



$$E_{pe} = \frac{1}{2} k x^2 \quad \text{②} \quad m g (h-r) ; \frac{1}{2} m v^2 ; \frac{1}{2} \left(\frac{1}{2} m r^2 \right) \frac{v^2}{(h-r)^2}$$

$$\Delta E_m = 0$$

$$\frac{1}{2} k x^2 = m g (h-r) + \frac{1}{2} m v^2 + \frac{1}{4} m r^2 \frac{v^2}{(h-r)^2}$$

$$\Delta x = \sqrt{\frac{m g (2h-r) + \frac{1}{2} m v^2 + \frac{1}{4} m r^2 \frac{v^2}{(h-r)^2}}{\frac{1}{2} k}}$$

$$\Delta x = \sqrt{\frac{17,15 \text{ kg m}^2/\text{s}^2 + 3,67 \text{ kg m}^2/\text{s}^2 + 0,20 \text{ kg m}^2/\text{s}^2}{5000 \text{ kg m/s}^2/\text{m}}}$$

$$\Delta x = 0,064 \text{ m}$$

$$N + m g = m a_c$$

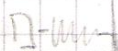
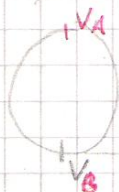
$$g = \frac{v^2}{h-r}$$

$$\sqrt{(h-r) g} = v_{\max 0}$$

$$v_{\max 0} = 2,71 \text{ m/s}$$

$$\frac{1}{2} m v^2 + \frac{1}{4} m r^2 \frac{v^2}{r^2} \Rightarrow \frac{3}{4} m v^2 = 21,02 \Rightarrow \sqrt{\frac{4 \cdot 21,02}{3}} = v$$

$$v_B = 5,29$$



$$\frac{1}{2} m v^2 + \frac{1}{4} m r^2 \frac{v^2}{r^2} = \frac{1}{2} k x^2$$

$$\sqrt{\frac{3}{4} m v^2} = \Delta x \Rightarrow \Delta x = 0,064 \text{ m}$$

EL PROF DIZO DE
 CALCULAR VA PRIMERO,
 LUEGO VB Y LUEGO Δx

AUNQUE LO HICIERA PERO
 SOLO CALCULANDO VA.

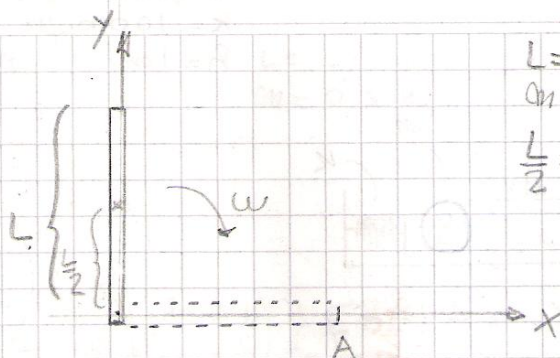
64 PAG. 41

$$I = \frac{1}{12} m L^2 + m L^2$$

HOJA Nº

FECHA

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$$L = 0,5 \text{ m}$$

$$m = 1 \text{ kg}$$

$$\frac{L}{2} = r = 0,25$$

$$\omega_A = ?$$

$$\alpha_A = ?$$

a) $\Delta E_m = 0$

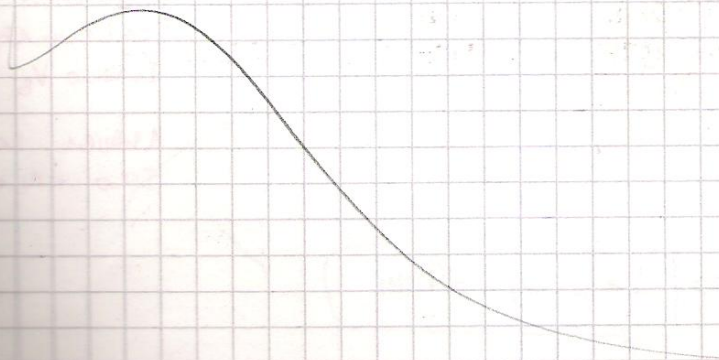
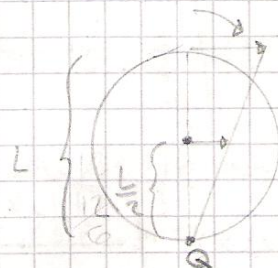
$$mgh = \frac{1}{2} I \omega^2$$

$$mg \frac{L}{2} = \frac{1}{2} \left(\frac{1}{3} mL^2 \right) \omega^2$$

$$\sqrt{\frac{g}{\frac{1}{3}L}} = \omega \Rightarrow \omega = 7,66 \frac{1}{s}$$

b) $mg \frac{L}{2} = \frac{1}{3} mL^2 \cdot \epsilon$

$$\frac{9,8}{2 \cdot \frac{1}{3} \cdot L} = \epsilon \Rightarrow \epsilon = 29,4 \frac{1}{s^2}$$



$$\frac{1}{2} mL^2 + m \frac{L}{2}$$

$$\frac{1}{3} mL^2$$

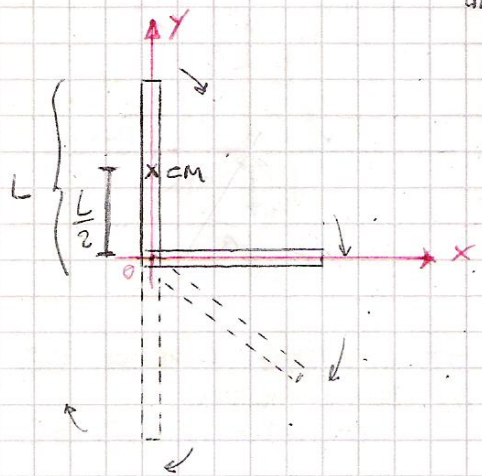
HOJA N°

FECHA

[65] PAG. 42

$$L = 0,3 \text{ m}$$

$$m = 0,5 \text{ kg}$$



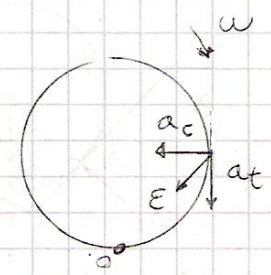
$$\Delta E_m = 0$$

$$E_{mi} \quad E_{mf}$$

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

$$mg \frac{L}{2} = \frac{1}{3} mL^2 \omega^2$$

$$\sqrt{\frac{3g}{L}} = \omega \Rightarrow \omega = 9,89 \frac{1}{s}$$



$$a_c = \omega^2 \cdot r$$

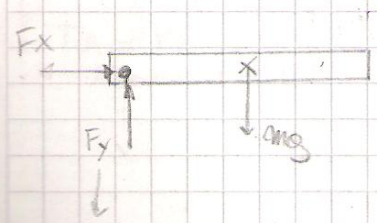
$$a_c = 14,67 \text{ m/s}^2 \quad a_x$$

$$a_t = \omega \cdot r$$

$$a_t = 7,35 \text{ m/s}^2 \quad a_y$$

$$mg \frac{L}{2} = \frac{1}{3} mL^2 \cdot \epsilon$$

$$\frac{8 \cdot \frac{1}{2}}{\frac{1}{3} L} = \epsilon \Rightarrow 49 \frac{1}{s^2}$$



$$\Sigma F_x = m \cdot a_c \Rightarrow F_x = -7,33 \text{ N}$$

$$\Sigma F_y = m \cdot a_t - m \cdot g \Rightarrow F_y = -1,22 \text{ N}$$

(ESTA FUERZA ES PARA AYUDAR POR SUS REACCION)

