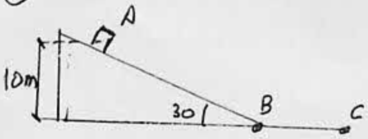
(1º) FISICA I - PLAN 2000



1º/ $mg \sin 30 = m a_{AB} \Rightarrow a_{AB} = g \sin 30 = 10 \frac{1}{2} = 5 \, m/s^2$

$- \mu m g = m a_{BC} \Rightarrow a_{BC} = -\mu g = -0'1 \cdot 10 = -1 \, m/s^2$

2º/ $V_B^2 - V_A^2 = 2 a_{AB} e \quad V_B = \sqrt{2 a_{AB} e} = \sqrt{2 \cdot 5 \cdot 20} = \sqrt{200}$

3º/ $t_{AC} = t_{AB} + t_{BC}$

$e = 2m = \frac{1}{2} a_{AB} t_{AB}^2 \rightarrow t_{AB} = \sqrt{\frac{2 \cdot 20}{5}} = \sqrt{8} = 2'82 s$

$a_{BC} = -1 \, m/s^2 = \frac{\Delta v}{\Delta t} = \frac{v_C - v_B}{t_{BC}} = \frac{0 - \sqrt{200}}{t_{BC}} \Rightarrow t_{BC} = \sqrt{200} = 14'14 s$

$\boxed{t_T = 2'82 + 14'14 = 16'96 s}$

$V_C^2 - V_B^2 = 2 a_{BC} \overline{BC} \Rightarrow \boxed{\overline{BC} = \frac{V_C^2 - V_B^2}{2 a_{BC}} = \frac{0 - 200}{2(-1)} = 100 m}$

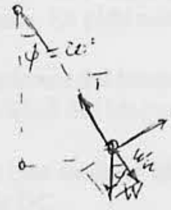
2º (a) $V_{F,A} = \sqrt{2gh} = \sqrt{2 g l (1 - \cos\varphi)} =$

$= [2 \times 10 \times 10 (1 - 1/2)]^{1/2} = \boxed{10 \, m/s}$

Choque $p = cte \Rightarrow m_A V_{F,A} = (m_A + m_B) \cdot V_F$

$\boxed{V_F = \frac{m_A}{m_A + m_B} V_{F,A} = \frac{1}{2} V_{FA} = 5 \, m/s}$

(b)



$\Sigma \vec{F} = m \vec{a} \Rightarrow \Sigma F_n = m a_n$

$T - W_n = m \frac{V_C^2}{l}$

$T = m \left(g \cos\varphi + \frac{V_C^2}{l} \right) = 2 \cdot 70 \left(10 \cos 20 + \frac{36}{10} \right) = 1497 N$

Para hallar v_C, $E_m = cte \Rightarrow$

$\Rightarrow \frac{1}{2}(m_A + m_B) V_F^2 = (m_A + m_B) g h + \frac{1}{2}(m_A + m_B) V_C^2$

$\boxed{V_C^2 = V_F^2 - 2gh = V_F^2 - 2 g l (1 - \cos\varphi) = 36 \, m/s}$

~~(c) $y = y_0 + V_{0y} t + \frac{1}{2} g t^2 = 15 + 1.23 t - 5 t^2 = 0$ ... $t = 1'86$~~ ~~$t < 0$~~ (NO SIRVE)

4º

Fa = EMPUJE
M_Hg = PESO HIDROGENO
M_Bg = PESO BARQUILLA

$F_a - m_H g = m_B g$

$F_a = \rho_{aire} V_{aerost.} g$

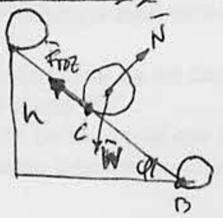
$V = \frac{4}{3} \pi r^3$

$\rho_a V g - \rho_{H_2} V g = 10^3 \cdot 9'8 = 9800$

$V g (\rho_a - \rho_{H_2}) = 9800 = \frac{4}{3} \pi r^3 g (\rho_a - \rho_{H_2})$

$\boxed{r = \frac{9800}{\frac{4}{3} 3'14 \cdot 9'8 (1'293 - 0'09)}} = 5'83$

(3)



$W \sin\varphi - F_r = M a$
$N = W \cos\varphi$
$R F_r = I \alpha = I \frac{a}{R}$

$F_r = \frac{I a}{R^2} \Rightarrow$

HUECA $\Rightarrow F_r = \frac{\frac{2}{3} M R^2}{R^2} a = \frac{2}{3} M a$

MACIZA $\Rightarrow F_r = \frac{2/5 M R^2 a}{R^2} = \frac{2}{5} M a$

Sustituyendo para obtener aceleraciones

$W \sin\varphi - \frac{2}{3} M a = M a \Rightarrow W \sin\varphi = \frac{5}{3} M a = M g \sin\varphi \Rightarrow a = \frac{3}{5} g \sin\varphi$ (HUECA)

$W \sin\varphi - \frac{2}{5} M a = M a \Rightarrow m g \sin\varphi = \frac{7}{5} M a \Rightarrow a = \frac{5}{7} g \sin\varphi$ (MACIZA)

$\boxed{F_{r_{Hue}} = \frac{2}{3} M a = \frac{2}{3} M \frac{3}{5} g \sin\varphi = \frac{2}{5} M g \sin\varphi \qquad F_{r_{Mac}} = \frac{2}{5} M a = \frac{2}{5} M \frac{5}{7} g \sin\varphi = \frac{2}{7} M g \sin\varphi}$

~~$W_N = 0$ La normal no realiza trabajo pues en todo momento~~ $N \perp$ DESPLAZ.

$W_{FROZ} = 0$ pues $V_C = 0$ (centro instantáneo rotación) $\Rightarrow$ C: punto (no desliza)

BALANCE ENERGETICO (A - B) $\Rightarrow E_A = E_{CA} + E_{PA} = M g h = \frac{1}{2} m V_B^2 + \frac{1}{2} I \omega_B^2 = \frac{1}{2} m V_B^2 + \frac{1}{2} \frac{2}{3} M R^2 \frac{V_B^2}{R^2}$

$\Rightarrow M g h = \frac{5}{6} M V_B^2 \rightarrow V_B^2 = \frac{6}{5} g h \rightarrow \boxed{V_B = \sqrt{\frac{6}{5} g h}}$ $\qquad M g h = \frac{1}{2} m V_B^2 + \frac{1}{2} \frac{2}{5} M R^2 \frac{V_B^2}{R^2} \rightarrow \boxed{V_B = \sqrt{\frac{10}{7} g h}}$