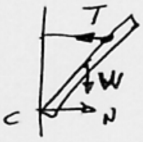
SOLUCIONES FISICA II (22-VI-04)

① $\Sigma F_x = 0 \Rightarrow \boxed{T = N}$ $\quad \Sigma F_y = 0 \Rightarrow \boxed{F_r = W}$ $\quad \Sigma \overline{M}_C = 0 \quad W \frac{l}{2} \operatorname{sen} 60 - T \cdot 1'5 \cos 60 =$



$\Rightarrow 0'5 \cdot 10 \frac{\sqrt{3}}{2} = T \cdot 1'5 \frac{1}{2} \Rightarrow \boxed{T = \frac{10\sqrt{3}}{3} (N) = N}$

$F_r = W = 0'5 \cdot 10 = 5N \Rightarrow \boxed{\mu_{e_{MW}} = \frac{F_r}{N}} = \frac{5}{10\sqrt{3}/3} = \boxed{\frac{\sqrt{3}}{2} = 0'86}$

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② $E_{Mec} = E_c + E_p = \frac{1}{2} Kx^2 + \frac{1}{2} mv^2 = \frac{1}{2} KA^2 = \frac{1}{2} m v_0^2$ como V_0 es igual en ambos $\Rightarrow$ ambos tienen igual energía mecánica (TOTAL)

$\frac{1}{2} m v_0^2 = \frac{1}{2} K_1 A_1^2 = \frac{1}{2} K_2 A_2^2 \Rightarrow K_1 A_1^2 = K_2 A_2^2 \Rightarrow K_1 > K_2 \Rightarrow \boxed{A_2 < A_1}$

$V_1 = \frac{V_0}{2} \Rightarrow E_{P1} = E_{Mec} - \frac{1}{2} m v_1^2 = \frac{1}{2} m v_0^2 - \frac{1}{2} m \left(\frac{V_0}{2}\right)^2 = \frac{1}{2} m v_0^2 - \frac{1}{8} m v_0^2 = \frac{3}{8} m v_0^2 = \frac{3}{4} E_{MEC}$

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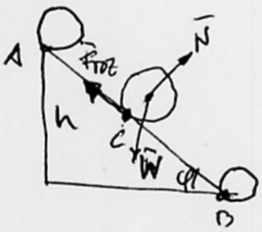
③



$W \operatorname{sen}\varphi - F_r = Ma$
$N = W \cos\varphi$
$R F_r = I\alpha = I \frac{a}{R}$

$F_r = \frac{Ia}{R^2} \Rightarrow$ HUECA $\Rightarrow F_r = \frac{\frac{2}{3} MR^2}{R^2} a = \frac{2}{3} Ma$; MACIZA $\Rightarrow F_r = \frac{\frac{2}{5} MR^2 a}{R^2} = \frac{2}{5} Ma$

Sustituyendo para obtener aceleraciones

$W \operatorname{sen}\varphi - \frac{2}{3} Ma = Ma \Rightarrow W \operatorname{sen}\varphi = \frac{5}{3} Ma = Mg \operatorname{sen}\varphi \Rightarrow a = \frac{3}{5} g \operatorname{sen}\varphi$ (HUECA)

$W \operatorname{sen}\varphi - \frac{2}{5} Ma = Ma \Rightarrow mg \operatorname{sen}\varphi = \frac{7}{5} Ma \Rightarrow a = \frac{5}{7} g \operatorname{sen}\varphi$ (MACIZA)

$\boxed{F_{r_{Hue}} = \frac{2}{3} Ma = \frac{2}{3} M \frac{3}{5} g \operatorname{sen}\varphi = \frac{2}{5} Mg \operatorname{sen}\varphi}$

$\boxed{F_{r_{Mac}} = \frac{2}{5} Ma = \frac{2}{5} M \frac{5}{7} g \operatorname{sen}\varphi = \frac{2}{7} Mg \operatorname{sen}\varphi}$

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

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

BALANCE ENERGÉTICO (A − B) $\Rightarrow E_A = E_{CA} + E_{PA} = Mgh = \frac{1}{2} m v_B^2 + \frac{1}{2} I \omega_B^2 = \frac{1}{2} m v_B^2 + \frac{1}{2} \frac{2}{3} MR^2 \frac{v_B^2}{R^2}$

$\Rightarrow Mgh = \frac{7}{10} M v_B^2 \rightarrow v_B^2 = \frac{10}{7} gh \rightarrow \boxed{V_B = \sqrt{10/7\, gh}}$ $\quad Mgh = \frac{1}{2} m v_B^2 + \frac{1}{2} \frac{2}{5} MR^2 \frac{v_B^2}{R^2} \rightarrow \boxed{V_B = \sqrt{\frac{6}{5} gh}}$

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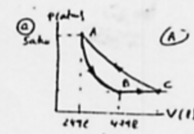
④

ⓐ



(A) $n = 10$ moles, $P_A = 5$ atm, $V_A = 249 l$ $\Big\}$ $pV = nRT$

$\boxed{T_A = \frac{5 \cdot 249}{10 \cdot 0'082} = 1518 K}$

(B) $pV^\gamma = cte \quad P_A V_A^\gamma = P_B V_B^\gamma$

$\gamma = C_p/C_v = \frac{C_v + R}{C_p} = 7/5$

$\boxed{P_B = P_A \left(\frac{V_A}{V_B}\right)^\gamma = 2 atm}$

$\boxed{T_B = \frac{P_B V_B}{nR} = 1168 K}$

(C) $P_C = P_B = 2 atm \quad pV = nRT = cte$ ...

$\boxed{V_C = \frac{P_A V_A}{P_C} = 622.5 l}$

$\boxed{T_C = T_A = 1518 K}$

ⓑ $\boxed{A \rightarrow B}$ $\boxed{Q = 0}$

$\boxed{\Delta U} = n C_v \Delta T = 10 \cdot \frac{5}{2} \cdot 2 \cdot (1168 - 1518) = \underline{-17500 cal}$

$Q = W + \Delta U \Rightarrow \boxed{W = -\Delta U = 17500 cal}$

$\boxed{B \rightarrow C}$ $\boxed{\Delta U} = n C_v \Delta T = 10 \cdot \frac{5}{2} \cdot 2 (1518 - 1168) = \underline{17500 cal}$

$\boxed{W} = p \Delta V = 2 \cdot 1.013 \cdot 10^5 \cdot (622.5 - 498) \cdot 10^{-3} \cdot \frac{1}{4} = \underline{6955.3 cal}$

$\boxed{Q} = W + \Delta U = \boxed{24455 cal}$

$\boxed{C \rightarrow A}$ $\Delta U = 0$

$Q = W = nRT \ln\left(\frac{V_A}{V_C}\right) = 10 \cdot 2 \cdot 1518 \cdot \ln\left(\frac{249}{622.5}\right)$

$= \underline{-27818 cal}$