## 1º Problema

$\Pi = Q^{a_1}\phi^{a_2}\rho^{a_3}\Gamma^{a_4} = (L^3T^{-1})^{a_1}L^{a_2}(L^{-1}MT^{-2})^{a_3}(L^{-3}M)^{a_4} = L^0M^0T^0$

$[Q] = L^3T^{-1}$
$[\phi] = L$
$[\Gamma] = L^{-1}MT^{-2}$
$[\rho] = L^{-3}M$

L: $3a_1 + a_2 - a_3 - 3a_4 = 0$
M: $a_3 + a_4 = 0$
T: $-a_1 - 2a_3 = 0$

$\begin{pmatrix} 3 & 1 & -1 & -3 \\ 0 & 0 & 1 & 1 \\ -1 & 0 & -2 & 0 \end{pmatrix}$ $\begin{matrix} h=3 \\ i=1 \end{matrix}$

$a_1 = 1 \Rightarrow a_2 = -2 ; a_3 = -\frac{1}{2} ; a_4 = +\frac{1}{2}$

$\Pi = Q\,\phi^{-2}\,\rho^{-1/2}\,\Gamma^{1/2} = (Q/\phi^2)\sqrt{\Gamma/\rho}$

$F(\Pi) = 0 \Leftrightarrow \Pi = K \Rightarrow (Q/\phi^2)\sqrt{\frac{\rho}{\Gamma}} = K \rightarrow \boxed{Q = K\phi^2\sqrt{\frac{\Gamma}{\rho}}}$

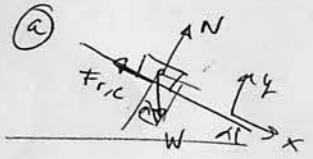
| MODELO | PROTOTIPO |
|---|---|
| $\phi_M = \frac{\phi_P}{5}$ | $\phi_P$ |
| $Q_M = \frac{Q_P}{10}$ | $Q_P$ |
| $\rho_M$ | $\rho_P = \rho_M$ |
| $\Gamma_M = ?$ | $\Gamma_P = 10\,Pa$ |

$\Pi_M = \Pi_P \Rightarrow \frac{Q_M}{\phi_M^2}\sqrt{\frac{\rho_M}{\Gamma_M}} = \frac{Q_P}{\phi_P^2}\sqrt{\frac{\rho_P}{\Gamma_P}}$

$\Rightarrow \frac{Q_P/10}{\phi_P^2/25}\sqrt{\frac{\rho_M}{\Gamma_M}} = \frac{Q_P}{\phi_P^2}\sqrt{\frac{\rho_P}{10}} \Rightarrow \boxed{\Gamma_M = 625\,Pa}$

## 2º Problema

ⓐ




$\Sigma F_x = W_x - F_{r,c} = M \cdot a$
$\Sigma F_y = W_y - N = 0$
$F_{r,c} = \mu_c \cdot N = \mu_c \cdot mg\cos(30°)$

$\Rightarrow a = g[\sin(30°) - \mu_c \cdot \cos(30°)] = 3{,}27\ m/s^2$

ⓑ Nivel $m_1$: $V_B^2 = V_0^2 + 2as = 2 \times 3{,}27 \times 6\ (m/s)^2$

$s = h/\sin 30° = 6\,m$

Antes del choque: $V_B = V_C = 6{,}26\ m/s$

Choque: ($\rightarrow V>0$) $m_1V_1 + m_2V_2 = m_1V_1' + m_2V_2'$

$m_1 = m_2 \Rightarrow V_1 = V_1' + V_2' = 6{,}26\ m/s$

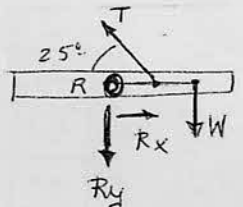
$e = -\frac{V_2' - V_1'}{V_2 - V_1} = 1 \Rightarrow V_2' - V_1' = V_1 = 6{,}26\ m/s$

$\Rightarrow V_1' = 0 , V_2' = 6{,}26\ m/s$

ⓒ $E_{MEC} = cte \rightarrow \frac{1}{2}mV^2 = \frac{1}{2}Kx^2 \Rightarrow \boxed{x = 0{,}8\,m}$

## 3º Problema

ⓐ




$\Sigma \vec{M}_R = 0 \Rightarrow$

$W \cdot \frac{2}{3}L - T \cdot \frac{L}{5} \cdot \sin(25°) = 0$

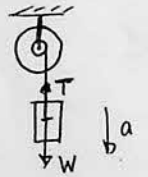
$\Rightarrow \boxed{T = \frac{10 \cdot W}{3\sin(25°)} = \frac{10 \times 3 \times 10}{3 \times \sin(25°)} = 236{,}6\,N}$

ⓑ $R_x - T\cdot\cos(25°) = 0 \Rightarrow \boxed{R_x = 214{,}4\,N}$

$R_y + W - T\cdot\sin(25°) = 0 \Rightarrow \boxed{R_y = 69{,}9\,N}$

## 4º Problema

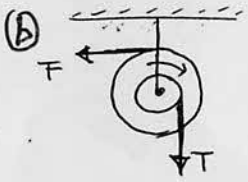
ⓐ




$s = v_0t + \frac{1}{2}at^2 \quad \boxed{a = \frac{2 \times 8}{4} = 4\,m/s^2}$

$\vec{\Sigma F} = m \cdot \vec{a}$
$W - T = m \cdot a \Rightarrow \boxed{T = m(g-a) = 600\,N}$

ⓑ




$\Sigma M_{ext} = I \cdot \alpha$
$T \cdot R_1 - F \cdot R_2 = \frac{1}{2}M_1R_1^2 \cdot \alpha$
$a = \alpha \cdot R_1$
$I = \frac{1}{2}M_1R_1^2 + \frac{1}{2}M_2R_2^2$

$\boxed{\alpha = \frac{a}{R_1} = \frac{4}{0{,}05} = 80\,rad/s^2}$
$\boxed{R_2 = 10\,cm}$

ⓒ $\boxed{E_{c,cabina} = \frac{1}{2}mV^2 = \frac{1}{2} \times 100 \times 64 = 3200\,J}$

$V^2 = V_0^2 + 2as = 2 \times 4 \times 8 = 64\ (m/s)^2$

$\boxed{E_{c,polea} = \frac{1}{2}I\omega^2 = \frac{1}{2}I\left(\frac{V}{R_1}\right)^2 = \frac{1}{4}M_1V^2 = 800\,J}$