# SOLUCIONES FISICA I 12/12/05

1)

$$P = \frac{Fa}{T^2} + \frac{mTb}{(l+c)} + \sqrt{\frac{dm^2}{T}} = L^2MT^{-3} = \left[\frac{Fa}{T^2}\right] = \left[\frac{mTb}{(l+c)}\right] = \left[\sqrt{\frac{dm^2}{T}}\right]$$

$$\frac{[F][a]}{T^2} = \frac{LMT^{-2}[a]}{T^2} = L^2MT^{-3} \Rightarrow [a] = \frac{L^2MT^{-3}}{LMT^{-4}} = LT \qquad [l+c] = [L] \qquad [c] = L$$

$$\frac{[m][T][b]}{[L]} = L^2MT^{-3} \Rightarrow [b] = \frac{L^3MT^{-3}}{MT} = L^3T^{-4}$$

$$\frac{[d]M^2}{T} = L^4M^2T^{-6} \Rightarrow [d] = \frac{L^4M^2T^{-6}T}{M^2} = L^4T^{-5}$$

$$P^{a_1} F^{a_2} M^{a_3} T^{a_4} = L^0M^0T^0 = (L^2MT^{-3})^{a_1}(LMT^{-2})^{a_2} M^{a_3} T^{a_4}$$

$$\begin{cases} 2a_1 + a_2 = 0 \\ a_1 + a_2 + a_3 = 0 \\ -3a_1 - 2a_2 + a_4 = 0 \end{cases} \quad \begin{pmatrix} 2 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ -3 & -2 & 0 & 1 \end{pmatrix} \quad \begin{matrix} n = 3 \\ i = 4-3 = 1 \end{matrix} \quad \begin{cases} \text{haciendo } a_1 = 1 \\ a_2 = -2 \quad a_3 = 1 \quad a_4 = -1 \end{cases}$$

$$\boxed{\Pi = PF^2MT^{-1} = \frac{PM}{F^2T}}$$

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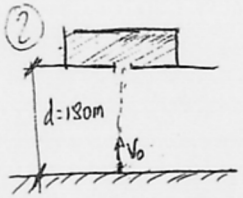
2)




$g \approx 10\ m/s^2$

$$\frac{1}{2}mv_0^2 = \frac{1}{2}mv_p^2 + mgd \rightarrow v_p^2 = v_0^2 - 2gd$$

$$\boxed{v_p = \sqrt{100^2 - 2\cdot 10\cdot 180} = 80\ m/s}$$

$$m_p v_p = (m_p + M)v' \rightarrow \boxed{v' = \frac{0'05\cdot 80}{2} = 2\ m/s}$$

$m_p + M = 50 + 1950 = 2000g = 2kg$

$$\frac{1}{2}(m+M)v'^2 = (m+M)gh \Rightarrow h = \frac{\frac{1}{2}v'^2}{g} = \frac{2^2/2}{10} = 0'2\ m$$

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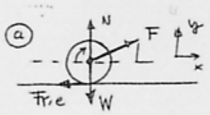
a)




$$\sum \vec{F}_{ext} = m\cdot\vec{a}_{cm} \Rightarrow \begin{cases} \sum F_x = m\cdot a \\ \sum F_y = 0 \end{cases}$$

$$F_x - F_{r.e} = m\cdot a$$

$$F_y + N - W = 0$$

Mentícu: $I\cdot\alpha \Rightarrow R\cdot F_{r.e} = I\cdot\alpha \qquad I = mR_g^2$

Rueda sin deslizar $\rightarrow a = \alpha\cdot R$

$$\Rightarrow F\cdot\cos(60^\circ) = \left[m + m\left(\frac{R_g}{R}\right)^2\right]a$$

$$\bar{a} = \frac{F\cdot\cos(60^\circ)}{m\left[1 + (R_g/R)^2\right]} = 2.14\ m/s^2$$

$$\boxed{\alpha = \frac{a}{R} = 7.13\ rad/s^2}$$

b) $\boxed{F_{r.e} = \frac{I}{R}\cdot\alpha = 48.02\ N}$

c) $$E_c = \frac{1}{2}mv_{cm}^2 + \frac{1}{2}I\omega^2 = \frac{1}{2}mv_{cm}^2 + \frac{1}{2}mR_g^2\cdot\left(\frac{v_{cm}}{R}\right)^2$$

$$= \frac{1}{2}mv_{cm}^2\left[1 + \left(\frac{R_g}{R}\right)^2\right] = 1000'06\ J = E_c$$

M.R.U.A.

$$v_{cm}^2 = v_0^2 + 2a_{cm}s$$

$$= 4'5^2 + 2\cdot 2'15\cdot 3 =$$

$$= 33'5\ (m/s)^2$$

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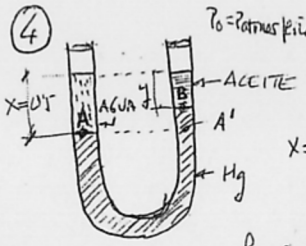
4)




$$P_A = P_0 + \rho_{ag}gx \qquad P_B = P_0 + \rho_{ac}gy \qquad \Big\} \; P_A - P_B = \rho_{ag}gx - \rho_{ac}gy$$

$x = 0'5\ m$

$$P_A = P_{A'} = \cancel{P_0} + \rho_{ag}g\,0'5 = \cancel{P_0} + \rho_{ac}gy + \rho_{Hg}g(0'5 - y)$$

$$\rho_{ag}g\,0'5 - \rho_{Hg}g\,0'5 = \rho_{ac}gy - \rho_{Hg}gy$$

$$y = \frac{0'5(\rho_{ag} - \rho_{Hg})}{(\rho_{ac} - \rho_{Hg})} = \frac{0'5(1 - 13'6)}{0'8 - 13'6} = 0'49\ m$$

$$\boxed{P_A - P_B} = 1000\cdot 9'3\cdot 0'5 - 800\cdot 9'8\cdot 0'49 = 4900 - 3841'6 = 1058'4\ Pa$$