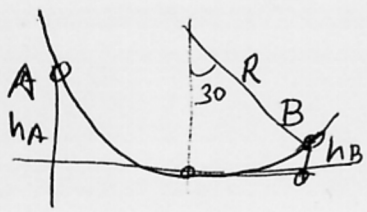
SOLUCIONES FÍSICA I SEPTIEMBRE 2007

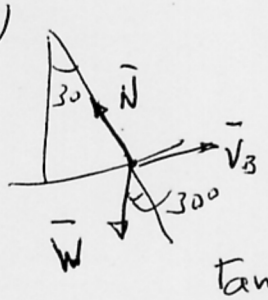
① a) 

$E_{MA} = E_{MB} \Rightarrow m g h_A = \frac{1}{2} m v_B^2 + m g h_B \Rightarrow$

$\Rightarrow v_B^2 = 2g(h_A - h_B)$

$h_B = R - R\cos 30 = R(1-\cos 30) = 0'67\,m$

$v_B = \sqrt{2g(h_A - h_B)} = \sqrt{2 \cdot 9'81 (2 - 0'67)} = 5'12\,m/s$

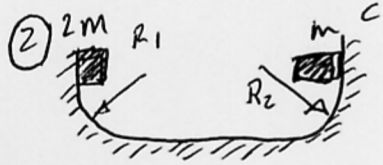
b) 

$\Sigma F_n = m a_n \Rightarrow N - mg\cos 30 = m\frac{v_B^2}{R} \Rightarrow$

$\Rightarrow N = m\left(\frac{v_B^2}{R} + g\cos 30\right) = 686'9\,N$

c) $W_{TOTAL} = \Delta E_C = \frac{1}{2} m v_B^2 = \frac{1}{2} 50 \cdot 5'12^2 = 655'3\,(J)$

También $W_T = W_{peso} + \cancel{W_{Normal}}^{0} = -\Delta E_p = mg(h_A - h_B)$

② 

CHOQUE ~~TOTALMENTE~} ELÁSTICO

$m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2' \Rightarrow 2m \cdot 4 - 1 \cdot m \cdot 10 = 2m\, v_1' + m\, v_2'$

$\Rightarrow \boxed{-2 = 2v_1' + v_2'}\ (*)$ $\quad e = 1 = \frac{v_2' - v_1'}{4 - (-10)} \Rightarrow \boxed{14 = v_2' - v_1'}\ (**)$

Resolviendo (*) y (**) $\Rightarrow \boxed{v_1' = -\frac{16}{3}\,(m/s)}\ \boxed{v_2' = \frac{26}{3}\,(m/s)}$

v_1' hacia la izqda. y v_2' hacia la derecha

CHOQUE TOTALMENTE INELÁSTICO

$2m \cdot 4 - m \cdot 10 = 3m\, v' \Rightarrow \boxed{v' = -\frac{2}{3}\,m/s}$ hacia la izqda

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③ a) $\Sigma M = I\alpha \Rightarrow \Sigma F R = \frac{1}{2} m R^2 \alpha \Rightarrow 10 \cdot 0'5 = 1 \cdot 0'5^2 \cdot \alpha \Rightarrow \boxed{\alpha = 20\,rad/s^2}$

$I = \frac{1}{2} M R^2$ b) $\omega(t=15s) = \cancel{\omega_0}^{0} + \alpha t = 20 \cdot 15 = 300\,(rad/s)$

c) $\omega(2) = \alpha t = 20 \cdot 2 = 40\,rad/s \Rightarrow \boxed{E_{CR} = \frac{1}{2} I \omega^2 = \frac{1}{2} 1 \cdot 300^2 = 45.000\,J}$

d) $\theta = \cancel{\theta_0}^{0} + \cancel{\omega_0}^{0} t + \frac{1}{2}\alpha t^2 \Rightarrow \theta(15s) = \frac{1}{2} 20 \cdot 15^2 = 10 \cdot 225 = 2250\,rad$

$n = \theta / 2\pi = 2250/2\pi$

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④ a) $Q = v_a S_a \Rightarrow v_a = Q/S_a = \frac{(360/60) \cdot 10^{-3}}{10 \cdot 10^{-4}} = 6\,m/s$

BERNOULLI ENTRE "A y B"

$P_A + \frac{1}{2}\rho v_A^2 + \cancel{\rho g z_A} = P_B + \frac{1}{2}\rho v_B^2 + \cancel{\rho g z_B} \Rightarrow v_B^2 = \frac{2}{\rho}(P_A - P_B) + v_A^2 = \frac{2}{10^3}(0'21 \cdot 10^5) + 36$

$z_A = z_B$ $\quad P_B = 1\,atm = 10^5\,Pa$ $\Rightarrow v_B = 8'83\,(m/s)$

b) $Q = v_A S_a = v_B S_b \Rightarrow S_b = Q/v_B = 6 \cdot 10^{-3}/8'83 = 0'22 \cdot 10^{-3}\,(m^2)$

c) $P_A = P_0 + \rho g h \Rightarrow \boxed{h = \frac{P_A - P_0}{\rho g}} = \frac{1'21 \cdot 10^5 - 10^5}{10^3 \cdot 9'8} = \boxed{2'14\,m}$