# SOLUCIONES - EXAMEN FÍSICA I - 21-IX-09

**1º**

(a) $\sum \vec{F} = m\vec{a} \;//\; \sum F_n = m\,a_n$

$T - W = m \cdot V_B^2 / \ell$

$T = m\left(g + V_B^2/\ell\right)$

$E_{m,A} = E_{m,B} \Rightarrow m\,g\,h = \frac{1}{2} m V_B^2$

$V_B^2 = 2gh = 2g\ell\,[1-\cos(60°)] = 2\times 10\times 2 = 40\ (m/s)^2$

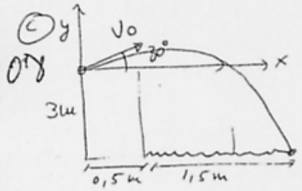
$T = 70\left(10 + \frac{40}{4}\right) = \boxed{1400\ N}$

(b) $E_{m,B} = E_{m,C}$

$\frac{1}{2} m V_B^2 = E_{c,C} + m\,g\,h_C$, $h_C = \ell\,[1-\cos(30°)]$

$\boxed{E_{c,C} = \frac{1}{2}\times 70\times 40 - 70\times 10\times 4\,[1-\cos(30°)] = 1024{,}8\ J}$

(c)



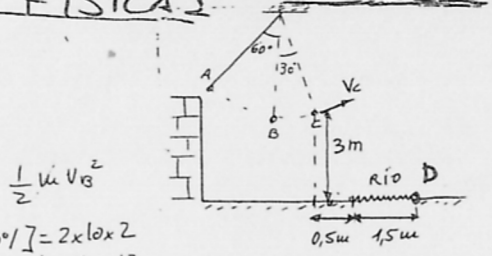

$x = V_{ox}\cdot t = V_o\cos(30°)\cdot t$

$y = V_{oy}\,t - \frac{1}{2} g t^2 = V_o \operatorname{sen}(30°)\cdot t - 5t^2$

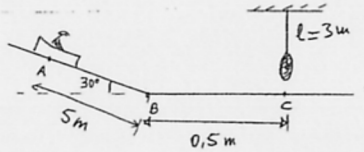
$2 = V_o \cdot \frac{\sqrt{3}}{2}\cdot t$

$-3 = V_o \cdot \frac{1}{2}\cdot t - 5\cdot t^2$ $\Rightarrow$

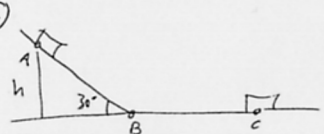
$\boxed{V_o = 2{,}53\ m/s}$




**2º**




(a)




$h = 5\cdot \operatorname{sen}(30°) = 2{,}5\ m$

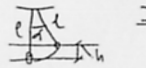
$E_{m,i} = E_{m,f} + W_{roz}$

$m\,g\,h = \frac{1}{2} m V_c^2 + \mu_c\, m\, g\cos 30°\cdot \overline{AB} + \mu_c\, m\, g\cdot \overline{BC}$

$V_c^2 = 2gh - 2\mu_c\, g\,(\cos(30°)\cdot \overline{AB} + \overline{BC}) \Rightarrow$

$\boxed{V_c = 3{,}37\ m/s}$

(b)




Dcha: $m\,g\,h = \frac{1}{2} m v^2$ $\quad \boxed{V = \sqrt{2gh} = 4{,}79\ m/s}$

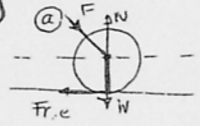
$h = \ell\,[1-\cos(52°)] = 1{,}15\ m$

Choque: $\vec{p} = cte \Rightarrow \quad m_1 V_c = m_1 V_1' + m_2 V_2'$ (tiene tras el choque)

$\boxed{V_1' = \frac{40\times 3{,}37 - 10\times 4{,}79}{40} = 2{,}17\ m/s}$

**3º**

(a)




Movimiento del c.m. (M.R.U.A.)

$s = v_o\,t + \frac{1}{2} a_{cm}\, t^2$

$5 = 1{,}5\times 2 + \frac{1}{2}\times a_{cm}\times 4$

$\boxed{a_{cm} = 1\ m/s^2}$

$\sum \vec{F}_{ext} = m\cdot \vec{a}_{cm} \Rightarrow \quad F\cos(60°) - F_{r,e} = m\cdot a_{cm}$

Mom. cm $= I\cdot\alpha \Rightarrow \quad R\cdot F_{r,e} = I\cdot\alpha$

Rueda sin deslizar $\Rightarrow \quad a_{cm} = \alpha R$

$I = \frac{1}{2} m R^2$

$\Big\} \Rightarrow$

$\boxed{F = \frac{3/2\, m\cdot a_{cm}}{\cos(60°)} = \frac{3}{2}\times 80\times\frac{1}{1/2} = 240\ N}$

(b) $\boxed{F_{r,e} = \frac{I}{R^2} a_{cm} = \frac{1}{2} m\cdot a_{cm} = 40\ N}$

(c) $E_c = \frac{1}{2} m V_{cm}^2 + \frac{1}{2} I\omega^2 = \frac{1}{2} m V_{cm}^2 + \frac{1}{2} I\left(\frac{V_{cm}}{R}\right)^2 =$

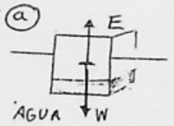
$= 3/4\ m V_{cm}^2$

$E_{c,i} = 135\ J$ $\quad E_{c,f} = \frac{3}{4}\cdot 80\cdot(1+a+)^2 = \frac{3}{4}\cdot 80\cdot 3{,}5^2$

$\boxed{\Delta E_c = 735 - 135 = 600\ J}$

**4º**

(a)




$W = E$

$\rho_{sol}\cdot g\cdot V_{sol} = \rho_{H_2O}\cdot g\cdot V_{sum}$

$\rho_{sol}\cdot \ell^2\cdot\frac{\ell}{10} = \rho_{H_2O}\cdot 0{,}75\cdot \ell^3$

$\boxed{\rho_{sol} = 7{,}5\cdot \rho_{H_2O} = 7{,}5\ g/cm^3}$