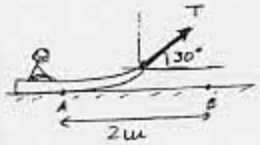
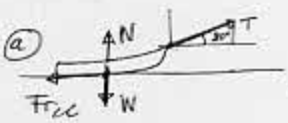
# SOLUCIONES - FISICA I - 17-VI-10

## 1º




$\Sigma \vec{F} = m \cdot \vec{a}$

$\left.\begin{array}{l} \Sigma F_x = m \cdot a \\ \Sigma F_y = 0 \end{array}\right\} \Rightarrow$

$\Rightarrow T \cdot \cos(30°) - F_{r,c} = m \cdot a$

$T_y + N - W = 0 \; ; \; N = W - T_y = 500 - 150 = 350\,N$

$F_{r,c} = \mu_c \cdot N = \mu_c (W - T_y) = 105\,N$

$$a = \frac{T\cos(30°) - \mu_c (mg - T \cdot \mathrm{sen}\,30°)}{m}$$

$$\boxed{a = \frac{T\cos(30°) - F_{r,c}}{m} = \frac{300 \cdot \sqrt{3}/2 - 105}{50} = 3{,}09\,m/s^2}$$


$$V_B^2 = V_0^2 + 2a\,s = 2 \times 3{,}09 \times 2\,(m/s)^2$$

$$\boxed{V_B = 3{,}51\,m/s}$$

$W = \int_A^B \vec{F} \cdot d\vec{r}$

N y W no realizan trabajo porque son $\perp d\vec{r}$.

Tensión: $\boxed{W = \int T \cdot dr \cdot \cos(30°) = T\cos(30°) \cdot s = 519\,J}$

F. rozamiento: $\boxed{W = \int_A^B -F_{r,c}\,dr = -F_{r,c} \cdot s = -210\,J}$

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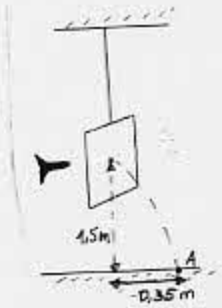
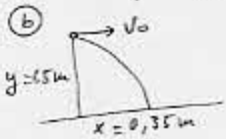
## 2º




a) $E_p = \frac{1}{2} K x^2 \qquad E_c = 0{,}8 \cdot \frac{1}{2} K x^2 = \frac{1}{2} m v$

$$\boxed{v = \sqrt{\frac{0{,}8\,K x^2}{m}} = 11{,}04\,m/s}$$

b)




$x = v_0 t \qquad y = \frac{1}{2} g t^2$

$$\boxed{t = \sqrt{\frac{2y}{g}} = 0{,}545}$$

$$\boxed{v_0 = \frac{x}{t} = 0{,}65\,m/s}$$

c) $e = -\frac{(v_2' - v_1')}{v_2 - v_1} \qquad v_1 = 11{,}04\,m/s \; ; \; v_1' = 0{,}65\,m/s \qquad v_2 = 0$

Choque: $\vec{p} = cte \Rightarrow m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2'$

$$\boxed{v_2' = \frac{m_1 (v_1 - v_1')}{m_2} = 6{,}13\,m/s}$$

$$\boxed{e = -\frac{(6{,}13 - 0{,}65)}{11{,}04} = 0{,}49}$$

d) No se conserva la $E_m$, porque $e < 1$.

Por tanto $E_{c,i} > E_{c,F}$

$E_{c,i} = \frac{1}{2} m_1 v_1^2 = 3{,}59\,J$

$E_{c,F} = \frac{1}{2} m_1 (v_1')^2 + \frac{1}{2} m_2 (v_2')^2 = 1{,}89\,J$

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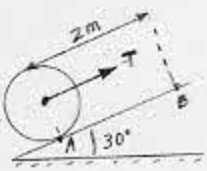
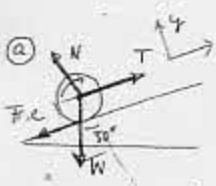
## 3º




M.R.U.A. $v_F^2 = v_0^2 + 2 a_{cm} s$

$$\boxed{a_{cm} = \frac{v_F^2}{2s} = \frac{4^2}{2 \times 2} = 4\,m/s^2}$$

Rotación: $M_{ext,cm} = I \cdot \alpha \; , \; a_{cm} = \alpha R$

$$R \cdot F_{r,c} = \frac{1}{2} M R^2 \cdot \frac{a_{cm}}{R}$$

$$\boxed{F_{r,c} = \frac{1}{2} M \cdot a_{cm} = 30\,N}$$

b) Mov. del cm. $\Sigma \vec{F}_{ext} = m \vec{a}_{cm}$

$\Sigma F_x = m \cdot a_{cm} \Rightarrow T - W_x - F_{r,c} = m \cdot a_{cm}$

$$\boxed{T = m \cdot g \cdot \mathrm{sen}(30°) + F_{r,c} + m \cdot a_{cm} = 165\,N}$$

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

$= \frac{3}{4} m V_{cm}^2 = \frac{3}{4} \cdot 15 \cdot 4^2 = \boxed{180\,J}$

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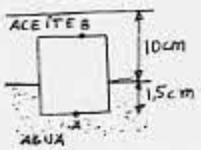
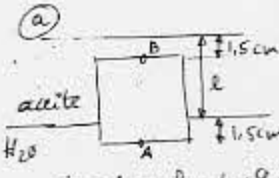
## 4º




a)




$P_B = P_{atm} + \rho_{aceite} g \cdot x_1$

$P_A = P_{atm} + \rho_{aceite} g \cdot \ell + \rho_{H_2O} \cdot g \cdot x_1$

$P_A - P_B = \rho_{aceite} \cdot g (\ell - x_1) + \rho_{H_2O} \cdot g \cdot x_1 =$

$= 790 \times 9{,}8 \times (10 - 1{,}5) \times 10^{-2} + 10^3 \times 9{,}8 \times 1{,}5 \times 10^{-2} =$

$= \boxed{805\,Pa}$

b)


$\Sigma \vec{F} = 0 \Rightarrow W - E_{aceite} - E_{H_2O} = 0$

$m \cdot g = \rho_{aceite} g \cdot \ell^2 (1 - x_1) + \rho_{H_2O} g \cdot \ell^2 x_1$

$m = 0{,}79 \times 10^2 (8{,}5) + 1 \times 10^2 \times 1{,}5 =$

$= 821{,}5\,g$

$$\boxed{\rho = \frac{m}{vol.} = \frac{821{,}5}{10^3} = 0{,}82\,g/cm^3}$$