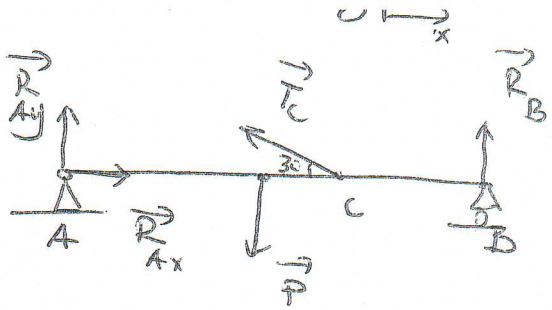
Solution Physique :



0,5

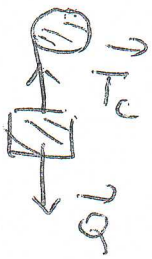
Exo 1 : (07 pts)

1- Les equations scalaires :

En isolant la barre :

$\sum \vec{F}_i = \vec{0}$ (0,5)

$\vec{R}_{Ax} + \vec{R}_{Ay} + \vec{P} + \vec{T}_C + \vec{R}_B = \vec{0}$



ox : $R_{Ax} - T_C \cos 30 = 0$ — (1) (0,5)

oy : $R_{Ay} - P + T_C \sin 30 + R_B = 0$ — (2) (0,5)

* En isolant la poulie :

(0,5) $\sum \vec{F}_i = \vec{0} \Leftrightarrow \vec{Q} + \vec{T}_C = \vec{0}$

oy : $-Q + T_C = 0 \Rightarrow \boxed{T_C = Q}$ (0,5)

de (1) : $R_{Ax} = T_C \cos 30 \Rightarrow \boxed{R_{Ax} = Q \cos 30}$ (0,5)

(0,5)

$\sum M_{/A}(\vec{F}_i) = 0 \Rightarrow M_{/A}(\vec{R}_{Ax}) + M_{/A}(\vec{R}_{Ay}) + M_{/A}(\vec{P}) + M_{/A}(\vec{T}_C) + M_{/A}(\vec{R}_B) = 0$

(0,5) (0,5) (0,5) (0,5)

$-P\frac{L}{2} + Q \sin 30 \left(L - \frac{L}{3}\right) + R_B L = 0$ (0,5)

(0,5) $\boxed{R_B = \frac{P}{2} - \frac{Q}{3}}$

de (2) : $R_{Ay} = P - Q \sin 30 + \frac{P}{2} + \frac{Q}{3}$

$\boxed{R_{Ay} = \frac{P}{2} - \frac{Q}{6}}$ (0,5)

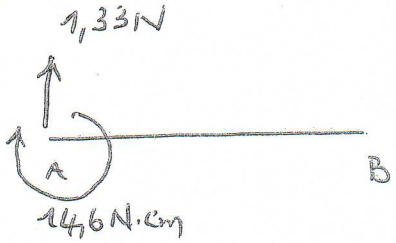
- La somme des forces et des moments au point A.

$ox: 5 - 10\sin 30 = 0\ N$ (0,5)

$oy: 10 - 10\cos 30 = 1,33\ N$ (0,5)

$\Rightarrow \boxed{F_{tot} = 1,33\ N}$ (1)

$\sum M_{/A}(\vec{F}_i) = 10.2 - 10\cos 30.4 = -14,6\ N.cm$ (0,5) (0,5) (0,5)



2- La distance x

$\sum M_{/A}(\vec{F}_i) = 0$ (0,5)

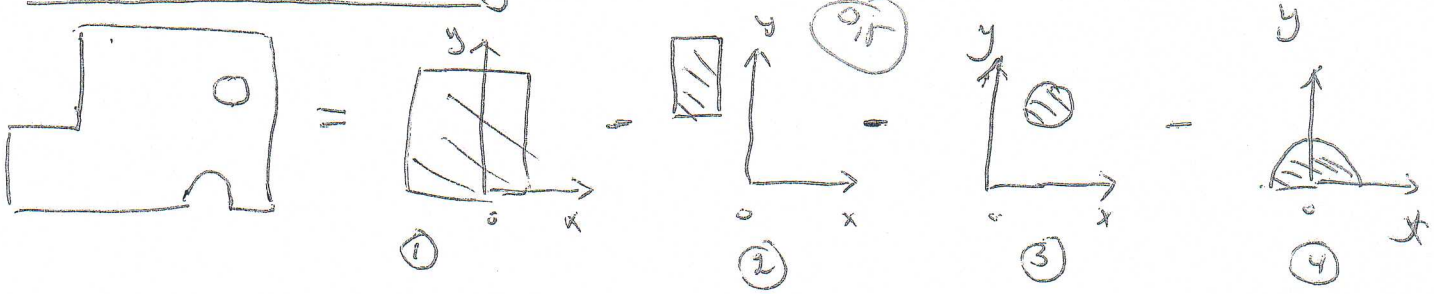
$-14,6 - 1,33.x = 0$ (0,5)

$\Rightarrow x = \frac{-14,6}{1,33}$

$\boxed{x = -11\ cm}$ (0,5)

Exo3: (4pts)

① centre de masse de la Fig 1:



(0,5)

(3pt)	①	②	③	④
x_i	0 (0,25)	-4 (0,25)	3 (0,25)	0 (0,25)
y_i	5 (0,25)	6,5 (0,25)	5 (0,25)	1,27 (0,25)
m_i	6.100 (0,25)	6.14 (0,25)	$6.12,56$ (0,25)	$6.14,13$ (0,25)

(0,5)

$x_G = \frac{x_1 m_1 - x_2 m_2 - x_3 m_3 - x_4 m_4}{m_1 - m_2 - m_3 - m_4}$ (0,5)

$y_G = \frac{y_1 m_1 - y_2 m_2 - y_3 m_3 - y_4 m_4}{m_1 - m_2 - m_3 - m_4}$ (0,5)

$\boxed{x_G = 0,3\ cm}$ (0,5)

$\boxed{y_G = 5,5\ cm}$ (0,5)

② Les coordonnés du centre de masse de Fig 2:

$V = 2\pi S y$ (0,5)

Le volume d'un demi sphère: $V = \frac{2}{3}\pi R^3$ (0,25)

$\frac{2}{3}\pi R^3 = 2\pi S y$; $S = \frac{\pi}{4}R^2$ (0,25)

$\frac{2}{3}\pi R^3 = 2\pi . \frac{\pi}{4} R^2 y \Rightarrow y = \frac{4R}{3\pi}$ (0,5)

$\boxed{x_G = y_G = y\frac{\sqrt{2}}{2}}$ (1)