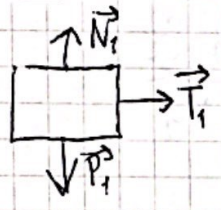
GUIAS

3 Por Notación $F_i = |\vec{F}_i|$

a)

Cuerpo 1



X

$T_1 = m_1 \cdot a_1$

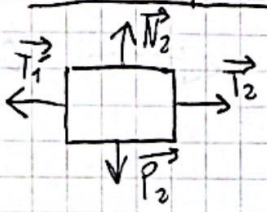
y

$N_1 - P_1 = m_1 \cdot a_x$ ($a_x = 0$)

$N_1 - P_1 = 0$

$N_1 = P_1$

Cuerpo 2



X

$T_2 - T_1' = m_2 a_2$

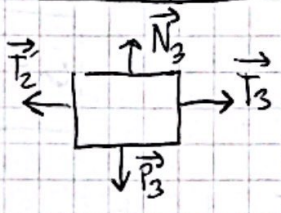
y

$N_2 - P_2 = m_1 a_x$

$N_2 - P_2 = 0$

$N_2 = P_2$

Cuerpo 3



X

$T_3 - T_2' = m_3 \cdot a_3$

y

$N_3 = P_3$

Notemos que: $a_1 = a_2 = a_3$

$|T_1| = |T_1'|$

$|T_2| = |T_2'|$

Por lo tanto:

① $T_1 = m_1 \cdot a$

② $T_2 - T_1 = m_2 \cdot a$

③ $T_3 - T_2 = m_3 \cdot a$

Reemplazo T_1 de ① en ②:

$T_2 - m_1 \cdot a = m_2 \cdot a$

$T_2 = m_2 a + m_1 \cdot a$

Reemplazo T_2 en ③: $T_3 - m_2 \cdot a - m_1 \cdot a = m_3 \, a$

$$-a(m_1+m_2+m_3) = -T_3$$

$$a = \frac{T_3}{m_1+m_2+m_3}$$

$$a = \frac{90\,kg \cdot \frac{m}{s^2}}{60\,kg} \longrightarrow \boxed{a = \frac{3}{2}\frac{m}{s^2}}$$

Finalmente:

① $T_1 = m_1 \cdot a \Rightarrow T_1 = 10kg \cdot \frac{3}{2}\frac{m}{s^2} \Rightarrow \boxed{T_1 = 15N}$

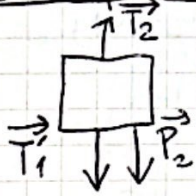
② $T_2 - T_1 = m_2 \cdot a_1 \Rightarrow T_2 - 15N = 20kg \cdot \frac{3}{2}\frac{m}{s^2} \Rightarrow \boxed{T_2 = 45N}$

b)

Cuerpo 1

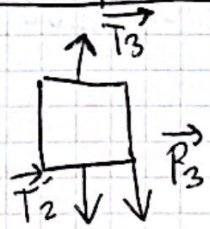
$T_1 - P_1 = m_1 \cdot a$

Cuerpo 2



$T_2 - T_1' - P_2 = m_2 \cdot a$

Cuerpo 3



$T_3 - T_2' - P_3 = m_3 \cdot a$

Notemos que: $|T_1'| = |T_1|$, $|T_2'| = |T_2|$, $P_i = m_i \cdot g$, $g = 10\frac{m}{s^2}$

Por lo tanto:

$$\begin{cases} T_1 = m_1 \cdot a + P_1 \\ T_2 - T_1 = m_2 \cdot a + P_2 \\ T_3 - T_2 = m_3 \cdot a + P_3 \end{cases} \Rightarrow \begin{cases} T_1 = m_1 \cdot a + m_1 \cdot g \\ T_2 - T_1 = m_2 \cdot a + m_2 \cdot g \\ T_3 - T_2 = m_3 \cdot a + m_3 \cdot g \end{cases}$$

Reemplazo T_1 de ① en ②:

$$T_1 - m_1 \cdot a - m_1 \cdot g = m_2 \cdot a + m_2 \cdot g$$

$$T_2 = m_1 \cdot a + m_1 \cdot g + m_2 \cdot a + m_3 \cdot g$$

Reemplazo T_2 en ③

$$T_3 = m_1 \cdot a + m_2 \cdot a + m_3 \cdot a + m_1 \cdot g + m_2 \cdot g + m_3 \cdot g$$

$$T_3 = a(m_1 + m_2 + m_3) + g(m_1 + m_2 + m_3)$$

$$a = \frac{T_3 - g(m_1 + m_2 + m_3)}{m_1 + m_2 + m_3}$$

$$a = \frac{90N - 10\frac{m}{s^2} \cdot 60kg}{60kg}$$

$$a = -\frac{510}{60}\frac{m}{s^2}$$

$$\boxed{a = -\frac{17}{2}\frac{m}{s^2}}$$

Por lo tanto:

$T_1 = 10 \cdot -\frac{17}{2}\ N + 100\ N$

$\boxed{T_1 = 15\ N}$

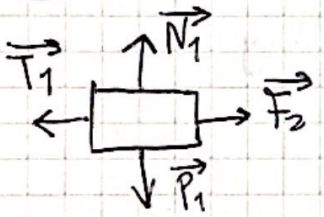
$T_2 = 20 \cdot -\frac{17}{2}\ N + 10 \cdot 20\ N + T_1$

$\boxed{T_2 = 45\ N}$

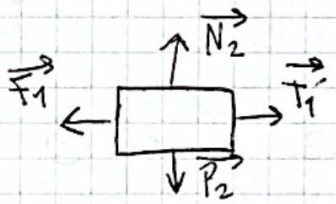
(4) $m_1 = 3Kg$ $\quad |\vec{F_2}| = F_2 = 22N$

$m_2 = 2Kg$ $\quad |\vec{F_1}| = F_1 = 12\ N$

Cuerpo 1



Cuerpo 2



$\sum X$

$F_2 - T_1 = m_1 \cdot a_1$

$\sum X$

$T_1 - F_1 = m_2 \cdot a_2$

Notemos que: $|\vec{T_1}| = |\vec{T_1}|$, $a_1 = a_2 = a$

Por lo tanto:

$$\begin{cases} T = F_2 - m_1 \cdot a & (1) \\ T = F_1 + m_2 \cdot a & (2) \end{cases}$$

$$F_1 + m_2 a = F_2 - m_1 a$$

$$m_1 a_1 + m_2 a = F_2 - F_1 \implies a_1 = \frac{F_2 - F_1}{m_2 + m_1}$$

$$a_1 = \frac{10\ kg \cdot \frac{m}{s^2}}{5\ kg}$$

$$\boxed{a = 2\ \frac{m}{s^2}}$$

Finalmente:

$$T = 22N - 3\ kg \cdot 2\ \frac{m}{s^2}$$

$$T = 22N - 6N$$

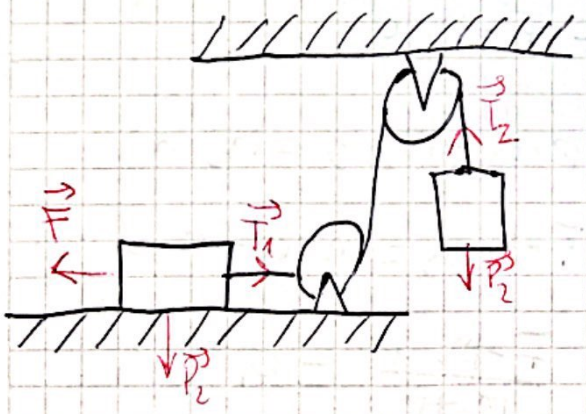
$$\boxed{T = 16N}$$

5) a)

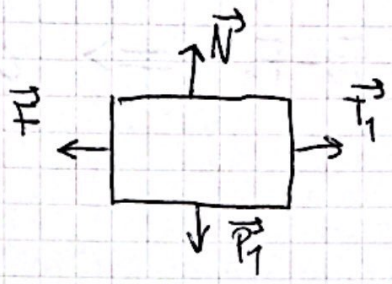
$$\frac{g.cm}{s^2} = 1\ dyna \iff \frac{1000\ g \cdot 100\ cm}{s^2} = 1N$$

$$\iff \frac{g.cm}{s^2} = \frac{1N}{10^5}$$

$$\iff \frac{10^5\ cm.g}{s^2} = 1N$$



Cuerpo 1



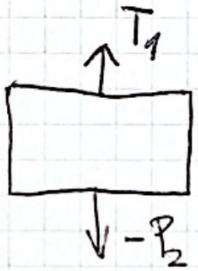
x

$$T_1 - F = m_1 \cdot a_1$$

y

$$N_1 - P_1 = 0$$

Cuerpo 2



x

~~x~~

y

$$T_1 - P_2 = m_2 \cdot a_2$$

Notemos que: $a_2 = -a_1 = a$, $|\vec{T_1}| = |\vec{T_2}| = T$

$$\begin{cases} T - F = -m_1 \cdot a \\ T - m_2 \cdot g = m_2 \cdot a \end{cases}$$

$$T = F - m_1 \cdot a$$

$$F - m_1 \cdot a - m_2 \cdot g = m_2 \cdot a$$

$$F - m_2 \cdot g = m_1 \cdot a + m_2 \cdot a$$

$$\frac{F - m_2 \cdot g}{m_1 + m_2} = a$$

$$\frac{1N - \frac{4}{5}N}{\frac{13}{100}kg} = a$$

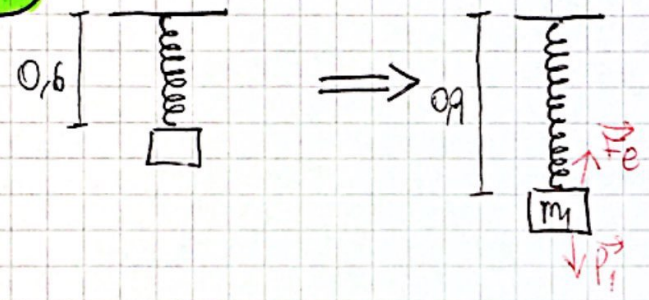
$$\boxed{a = \frac{20}{13}\ \frac{m}{s^2}}$$

Por lo tanto

$$T - 1N = -\frac{1}{13}N$$

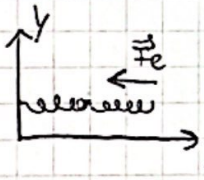
$$\boxed{T = \frac{12}{13}N}$$

6

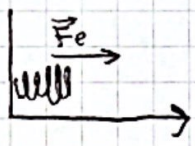


$\vec{Fe}$ es la fuerza que ejerce el resorte para volver a su longitud natural

Por ley de Hooke:



$$\vec{Fe} = -K \cdot \Delta x$$



$$\vec{Fe} = K \cdot \Delta x$$

$$\Delta x = (\bar{X} - \bar{x})$$

$\bar{X}$: posición original

$\bar{x}$: posición nueva

a) Con el cuerpo quieto $\vec{Fe} + \vec{P} = 0$, dado que $|\vec{P}| < 0 \Rightarrow |\vec{Fe}| > 0$

$$K(0{,}9m - 0{,}6m) - m_2 \cdot g = 0$$

$$K = \frac{m_2 \cdot g}{0{,}3m}$$

$$\boxed{K = 800\ \frac{Kg}{s^2}}$$