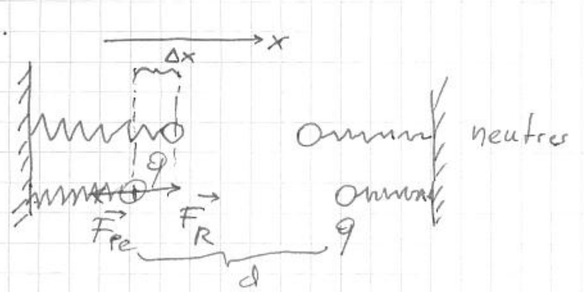
(8.13).



$\Delta x = 0{,}025\,m$ $\quad$ $d = 0{,}1\,m$

$q = 1{,}6 \cdot 10^{-6}\,C$

$k^* =$ inconnue

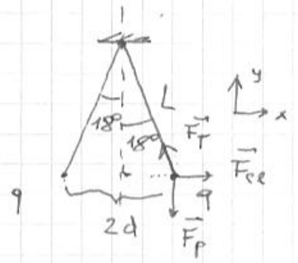
Equilibre des forces : (2ème loi) $\quad \Sigma \vec{F} = \vec{0} \quad \Rightarrow$ sur x : $\quad -F_{el} + F_R = 0$

avec : $\quad F_{el} = k\,\dfrac{q^2}{d^2}$

$F_R = k^* \Delta x$

$$\Rightarrow -k\frac{q^2}{d^2} + k^*\Delta x = 0 \quad \Rightarrow \quad k^* = \frac{kq^2}{\Delta x\, d^2} = \frac{9 \cdot 10^9 \cdot (1{,}6 \cdot 10^{-6})^2}{0{,}025 \cdot 0{,}1^2} \cong \underline{\underline{92{,}2\,\frac{N}{m}}}$$

(8.14).



• 2ème loi de Newton : $\quad \Sigma \vec{F} = m\vec{a} = \vec{0}$

$\vec{F}_T + \vec{F}_{el} + \vec{F}_p = \vec{0}$

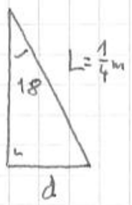
sur x : $\quad -F_T \cos 72° + F_{el} = 0 \quad (1)$

sur y : $\quad F_T \cos 18° - F_p = 0 \quad (2)$

$F_p = mg \quad (3)$

$F_{el} = k \cdot \dfrac{q^2}{(2d)^2} = k\,\dfrac{q^2}{\frac{\sin 18}{4}^2} = 4k\,\dfrac{q^2}{(\sin 18)^2} > 0 \quad (4)$

• Calcul de d :



$\sin 18 = \dfrac{d}{L}$

$\Rightarrow d = L \sin 18 = \dfrac{\sin 18}{4}$

$\Rightarrow 2d = \dfrac{\sin 18°}{2}$

De (1) : $\quad F_{el} = F_T \cos 72° \quad (1')$

(2) : $\quad F_p = F_T \cos 18° = F_T \sin 72° \quad (2')$

$\Rightarrow \dfrac{(2')}{(1')} : \quad \dfrac{F_p}{F_{el}} = tg\,72°$

$\Rightarrow \dfrac{mg}{4kq^2}(\sin 18)^2 = tg\,72°$

$\Rightarrow q^2 = \dfrac{mg\,(\sin 18)^2}{4k \cdot tg\,72°} = \dfrac{8 \cdot 10^{-4} \cdot 9{,}8 \cdot (\sin 18)^2}{4 \cdot 9 \cdot 10^9 \cdot tg\,72°}$

$\Rightarrow \underline{q \cong 8{,}2 \cdot 10^{-8}\,C}$ $\quad$ réponse b.

a). $\quad F_T = \dfrac{F_p}{\cos 18°} = \dfrac{mg}{\cos 18°} \cong \underline{\underline{8{,}2 \cdot 10^{-3}\,N}}$