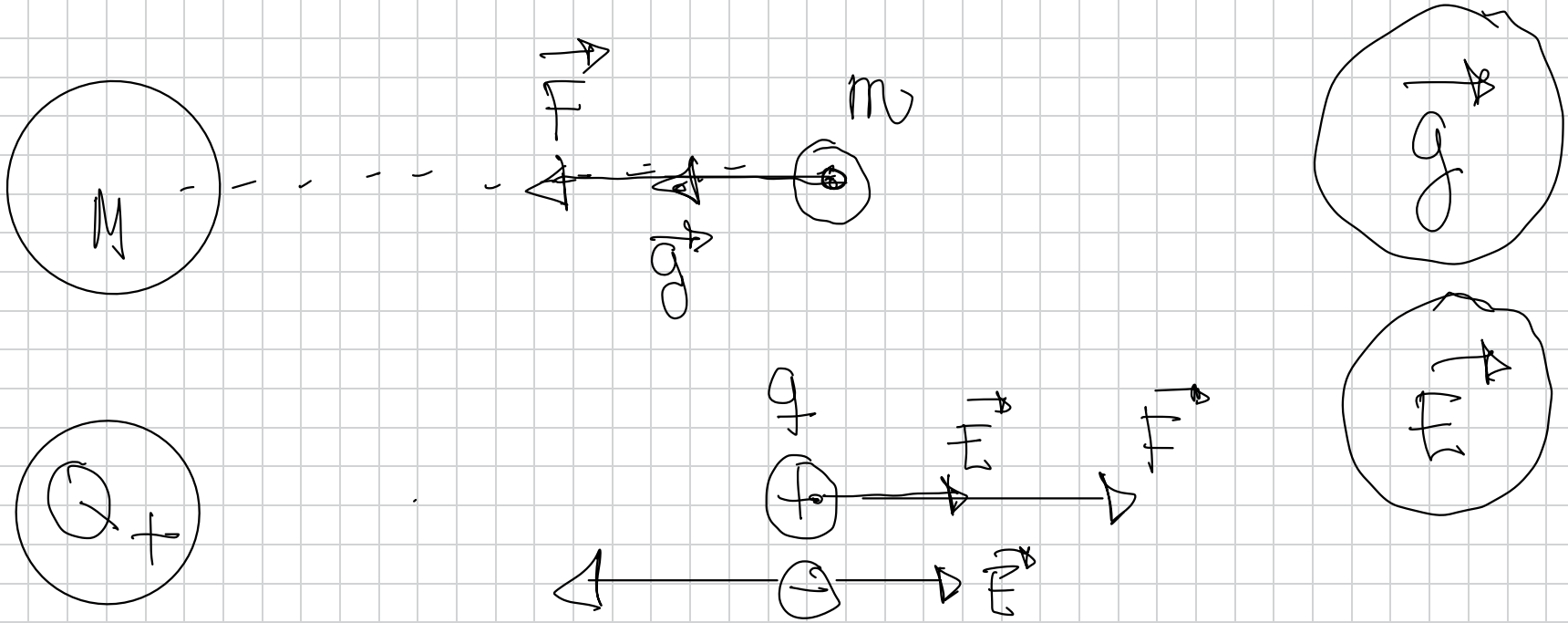
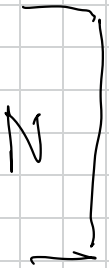
BLOQUE 3

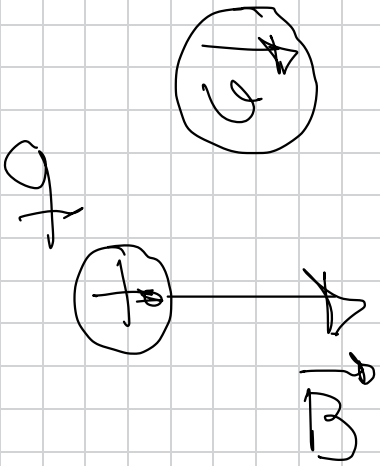
CAMPO MAGNÉTICO Y ELECTROMAGNETISMO

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2º) Fuerza ejercida por un campo magnético sobre una carga en movimiento. Ley de Lorentz



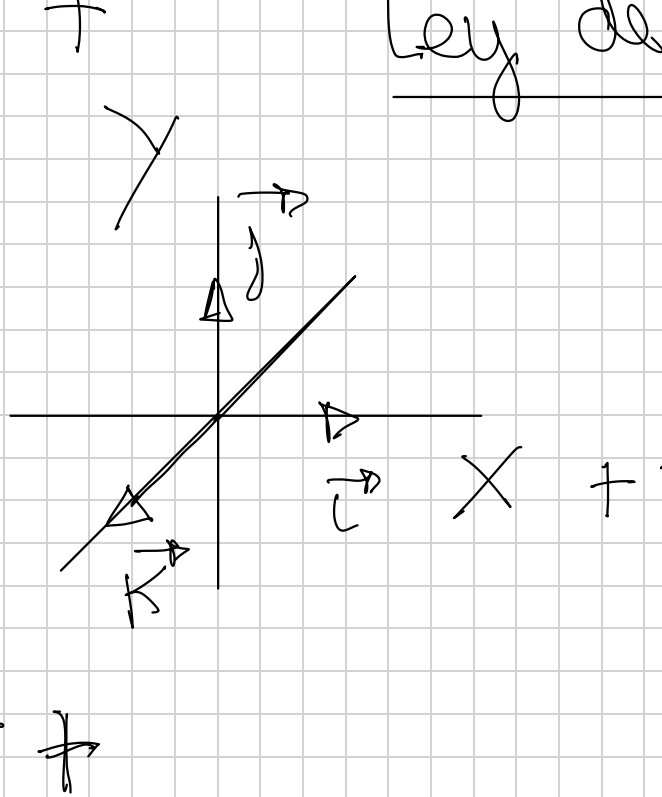


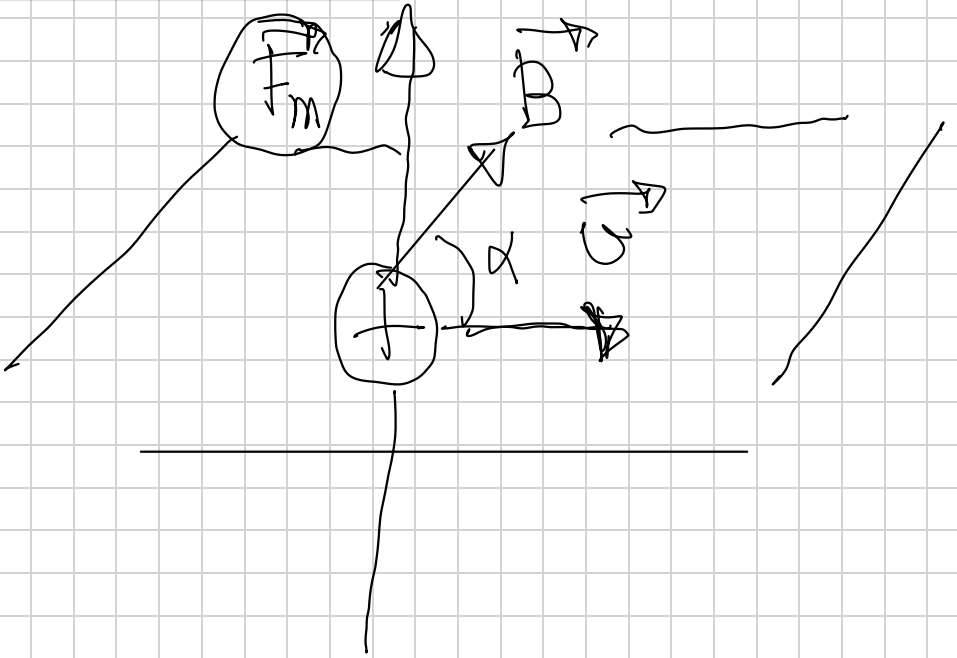




dirección → $\vec{F}$ ⊥ al plano formado por $\vec{v}$ y $\vec{B}$

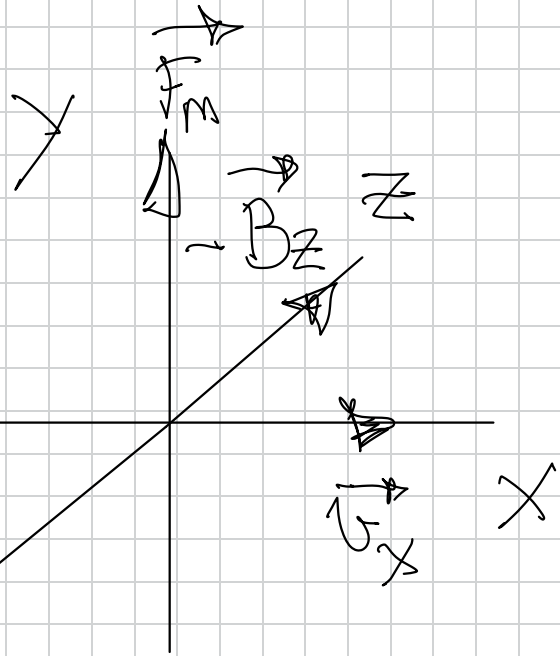
Ley de Lorentz



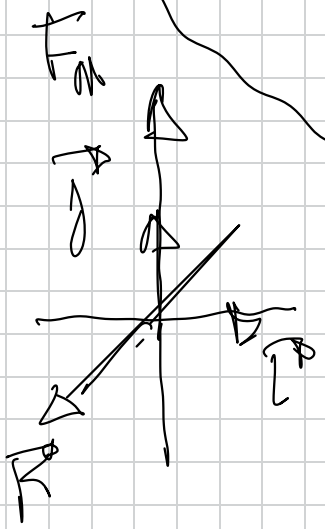


$$\vec{F}_m = q \cdot (\vec{v} \times \vec{B})$$

$$\vec{v} \times \vec{B} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ v_x & 0 & 0 \\ 0 & 0 & -B_z \end{vmatrix} =$$



$$0 + 0 + 0 - \left(0 + 0 + \left(-B_z \vec{j}\, v_x\right)\right)$$



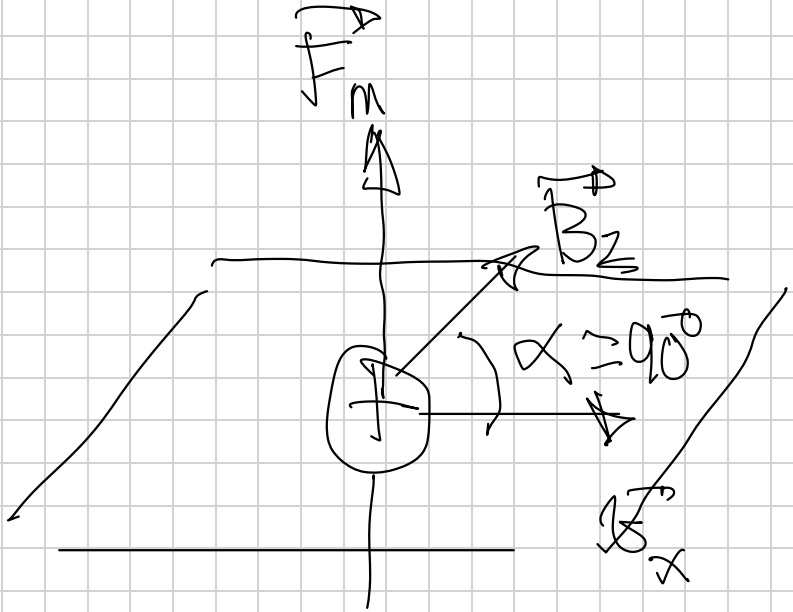
$$= 0 + B_z \vec{j}\, v_x = v_x B_z \vec{j}$$

$$\vec{F}_m = q \cdot v_x \cdot B_z \vec{j}$$

$(\vec{v} \times \vec{B})$

α ángulo formado por $\vec{v}$ y $\vec{B}$

Carga (+)



$$\vec{F}_m = q \cdot (\vec{v} \times \vec{B})$$

$$\vec{F}_m = q \cdot v \cdot B \cdot \vec{j}$$

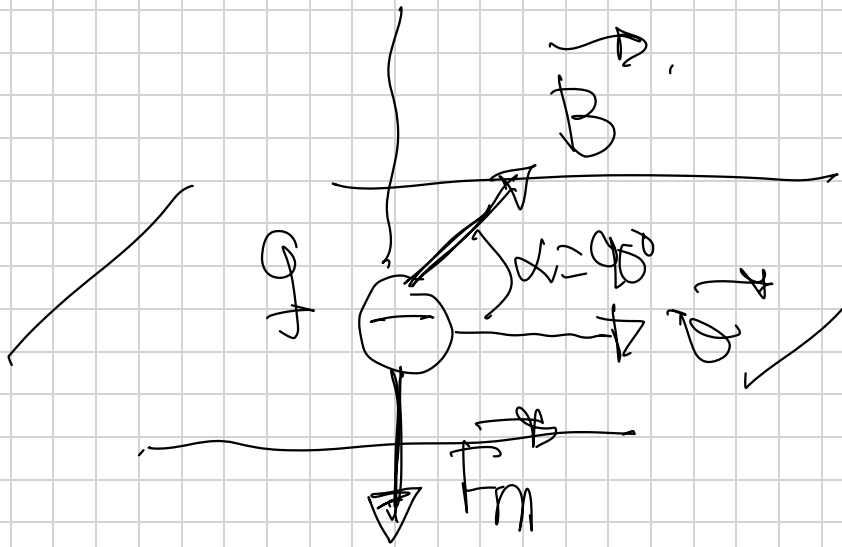
$$|\vec{F}_m| = q \cdot v \cdot B$$

Módulo $|\vec{F}_m| = q \cdot v \cdot B \cdot \sin 90° = q \cdot v \cdot B$. ($\sin 90° = 1$)

dirección: $\perp$ al plano formado por $\vec{v}$ y $\vec{B}$.

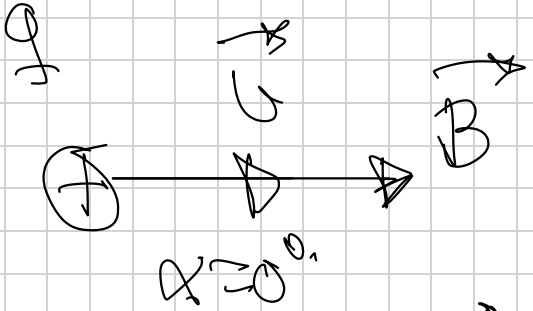
sentido: regla de la mano izquierda, nos da el producto vectorial de $\vec{v} \times \vec{B}$.

$$\vec{F}_M = q \cdot (\vec{v} \times \vec{B})$$

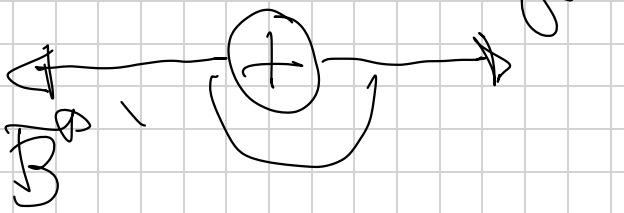


- Módulo $|\vec{F}| = q \cdot v \cdot B \cdot \cancel{\text{sen}}\, 90^\circ = q \cdot v \cdot B$
- Dirección ⊥ al plano formado por $\vec{v}$ y $\vec{B}$
- Sentido el contrario a la regla de la mano izquierda

$\vec{F_m} = 0$.

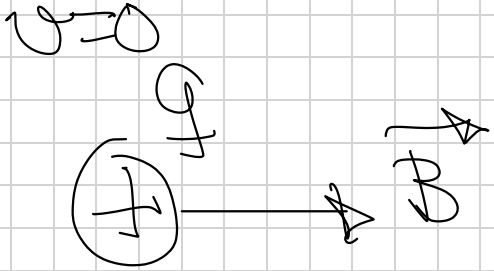


$\vec{F_m} = 0$.



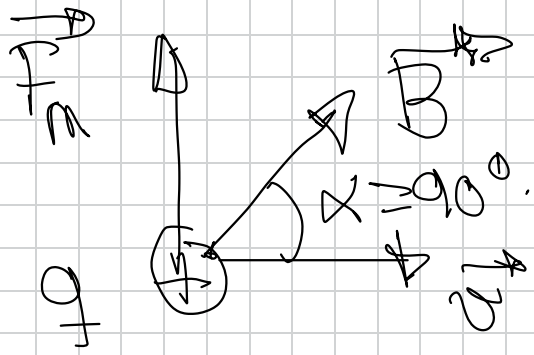
Modulo: $F_m = q \cdot v \cdot B \cdot \sin 0° = 0$.

$F_m = q \cdot v \cdot B \cdot \sin 180° = 0$



$F_m = q \cdot v \cdot B = 0$.

0



$$\left|\vec{F_m}\right| = q \cdot v \cdot B \cdot \operatorname{sen} 90°$$

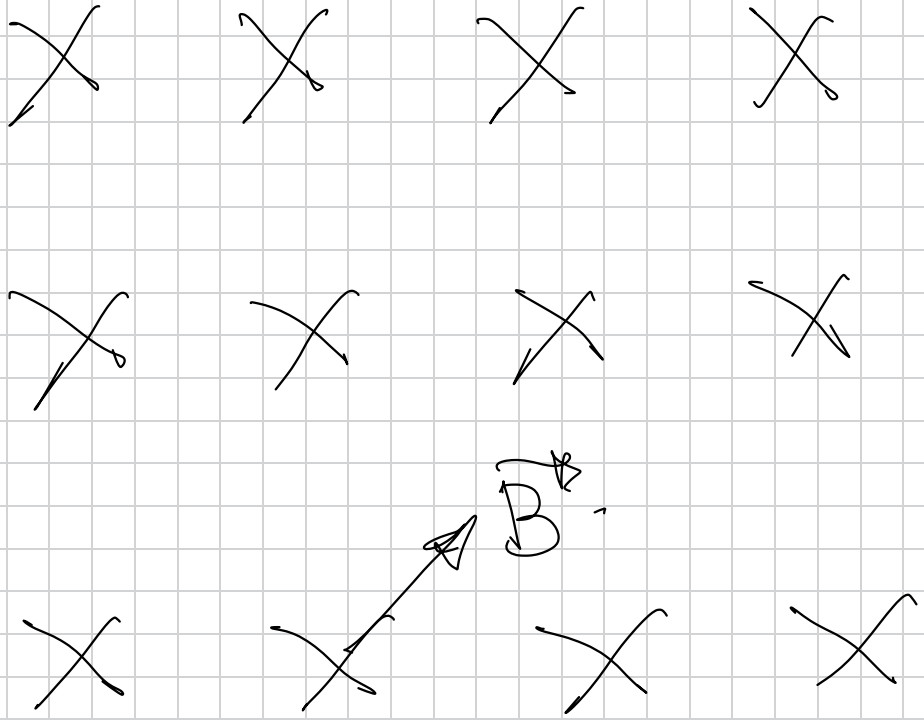
Unidades.

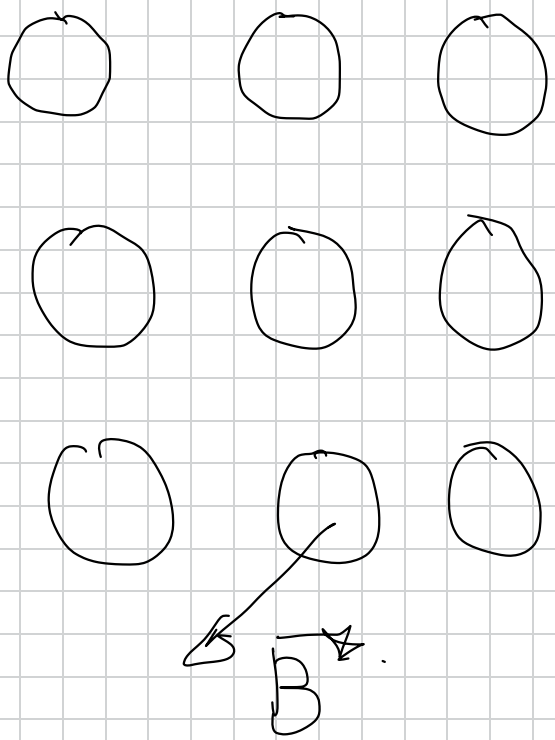
$$B = \frac{F_m}{q \cdot v \cdot \operatorname{sen} 90°}$$

$$B = \frac{1\,N}{1\,C \cdot 1\,\frac{m}{s} \cdot \operatorname{sen} 90°}$$

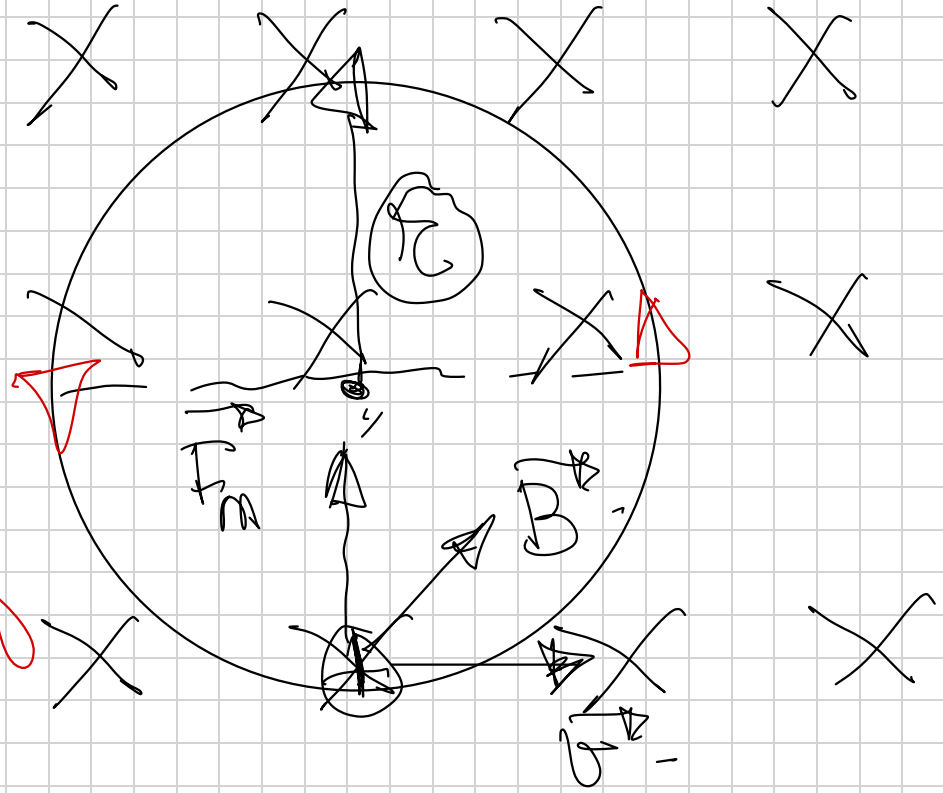
Tesla (T)

$$1\,T \rightarrow B = \frac{N}{C \cdot \frac{m}{s}} = T$$


B'


B'

$\vec{v}$ solo cambia en dirección, no en módulo.



SENTIDO ANTIHORARIO

$\vec{F}_m$ ⊥ al plano por $\vec{v}$ y $\vec{B}$

$\vec{F}_m = q \cdot (\vec{v} \times \vec{B})$

$\vec{F}_m \perp \vec{v}$

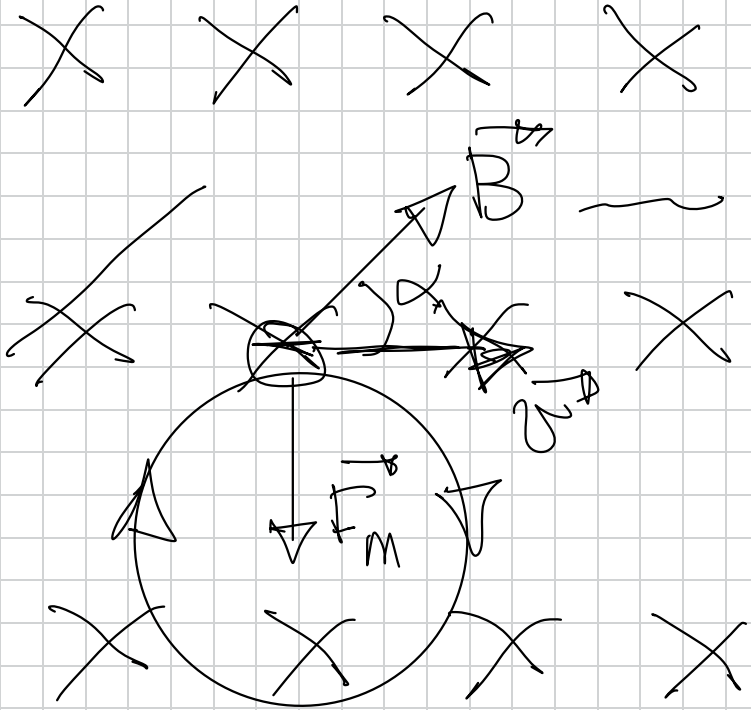
F_{normal}

$$F_m = F_n$$

$$q \cdot v \cdot B \cdot \operatorname{sen} 90^\circ = m_p \cdot a_n$$

$$q \cdot v \cdot B = m_p \cdot \frac{v^2}{r}$$

$$R_p = \frac{m_p \cdot v}{q \cdot B}$$



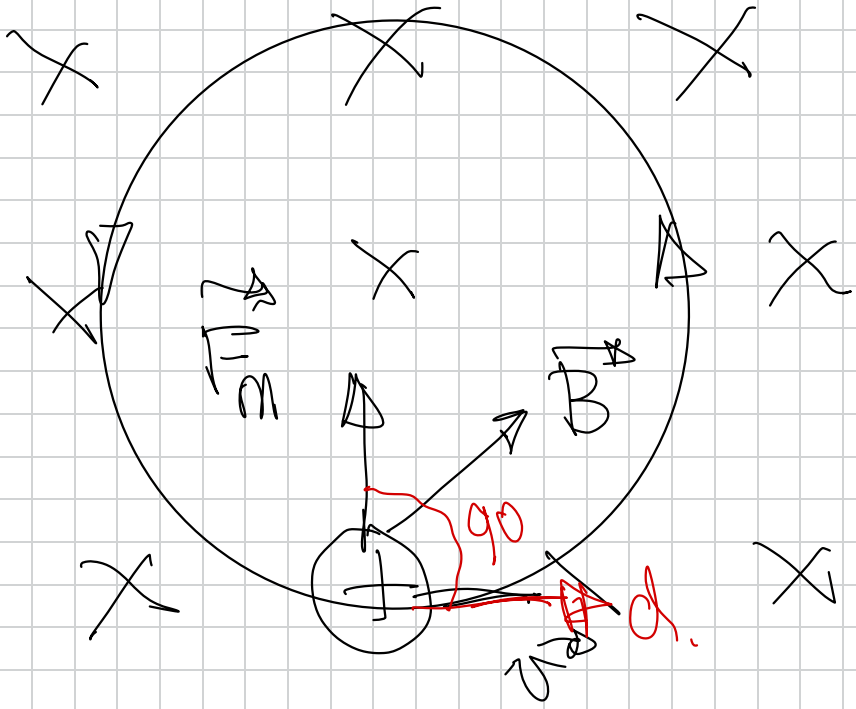
SENTIDO HORARIO.

$$F_m = F_n$$

$$q \cdot v \cdot B \cdot \operatorname{sen} 90^\circ = m_e \cdot a_n$$

$$q \cdot v \cdot B = m_e \cdot \frac{v^2}{r_e}$$

$$r_e = \frac{m_e \cdot v}{q \cdot B} \qquad m_e < m_p$$



$\vec{F}_m \perp$ al plano formado $\vec{v}$ y $\vec{B}$ (Ley de Lorentz).

$\vec{F}_m \perp$ a $\vec{v}$ y al desplazamiento.

$W = F_m \cdot d \cdot \cos 90° = 0$

F_m

$\Delta E_p = W = \Delta E_c$

$v = cte$.

$\nexists E_{p\,magnética}$

$\nexists$ Potencial magnético

(1)

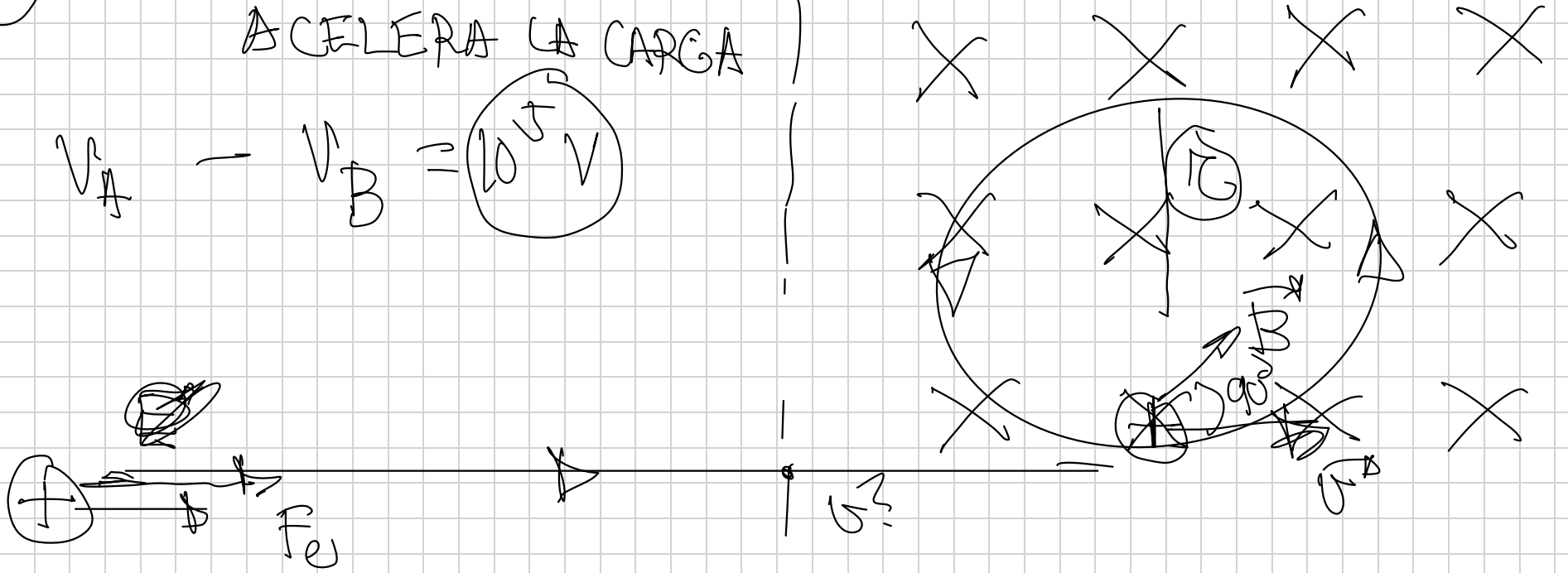
CAMPO ELECTRICO

ACELERA LA CARGA

$V_A - V_B = 10^5\ V$

CAMPO MAGNÉTICO

DESVIA A LA CARGA



$W_{A \to B} = \Delta E_{c\, A \to B}$

$q \cdot (V_A - V_B) = \frac{1}{2} m v^2 - \frac{1}{2} m v_0^2$ ($v_0 = 0$)

$F_M = q \cdot v \cdot B \cdot \operatorname{sen} 0$ ($0 = 0$)

F_A

$$v = \sqrt{\frac{2q(V_A - V_B)}{m}} =$$

$$= \sqrt{\frac{2 \cdot 1{,}6 \cdot 10^{-19} \cdot 10^5}{1{,}67 \cdot 10^{-27}}} = \left[4{,}37 \cdot 10^6 \frac{m}{s}\right]$$

$$F_M = F_n$$

$$q \cdot v \cdot B \cdot \operatorname{sen} 90^\circ = m \cdot a_n$$

$$q \cdot v \cdot B = m \cdot \frac{v^2}{r}$$

$$r = \frac{m \cdot v}{q \cdot B}$$

$$r = \frac{m \cdot v}{q \cdot B} = \frac{1{,}67 \cdot 10^{-27} \cdot 4{,}37 \cdot 10^6}{1{,}6 \cdot 10^{-19} \cdot 2} = 22{,}8 \cdot 10^{-3}\ m$$

$(22{,}8\ mm)$