Magnetismo:

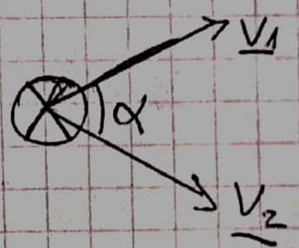
$$\underline{F}_{mag} = q\,\underline{V} \times \underline{B}$$

Interacción entre cargas con $\underline{V}$

$\underline{B}$ = Campo magnetico dado por q_0 con $\underline{V_0}$

$$[\underline{B}] = \frac{[F]}{[q][\underline{V}]} = \frac{N}{C\frac{m}{s}} = \frac{N}{Am} = T$$

Producto vectorial:

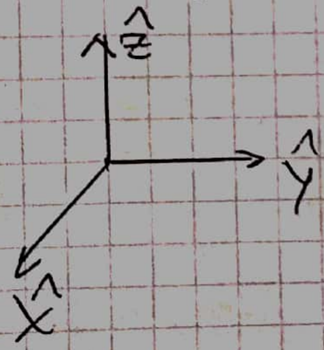


$$\underline{V_1} \times \underline{V_2} = |\underline{V_1}|\,|\underline{V_2}|\,\text{sen}(\alpha)\,\hat{n} = \underline{W}$$

$\underline{W} \perp \underline{V_1}$

$\perp \underline{V_2}$

En cartesianas:



$(\hat{x}, \hat{y}, \hat{z})$

$\hat{x} \times \hat{y} = \hat{z} \quad \rightarrow \quad \hat{y} \times \hat{x} = -\hat{z}$

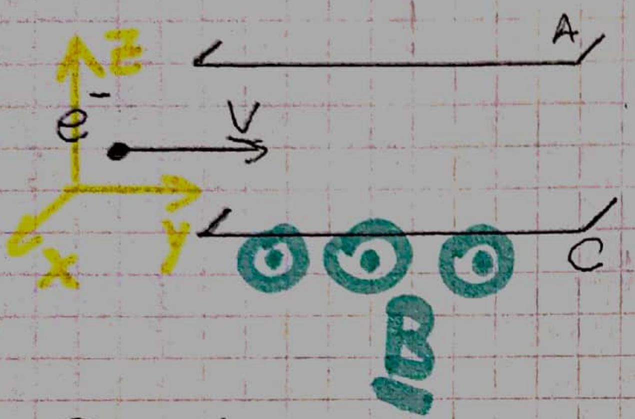
$\hat{y} \times \hat{z} = \hat{x} \quad \rightarrow \quad \hat{z} \times \hat{y} = -\hat{x}$

$\hat{z} \times \hat{x} = \hat{y} \quad \rightarrow \quad \hat{x} \times \hat{z} = -\hat{y}$

Fuerza de Lorentz:

$$\underline{F}_L = q\underline{E} + q\,\underline{v}\times\underline{B}$$

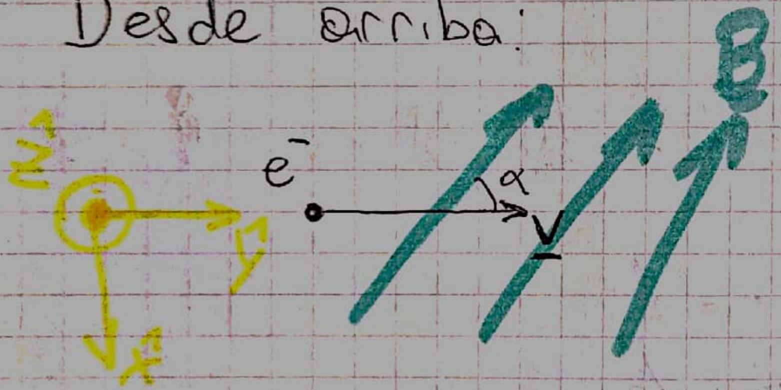
Problema 3: (Guía 3):



a) Si $\underline{E} = \underline{0}$.

$\underline{B}$ paralelo a las placas.

Desde arriba:



$$\underline{F}_L = e^- \underline{v}\times\underline{B}$$
$$= e v B \,\text{sen}(\alpha)\,\hat{\underline{z}}$$

Caso $\alpha = 0$:

$$\text{sen}(\alpha) = 0 \Rightarrow \underline{F}_L = \underline{0}$$

$$\underline{v} \parallel \underline{B}$$

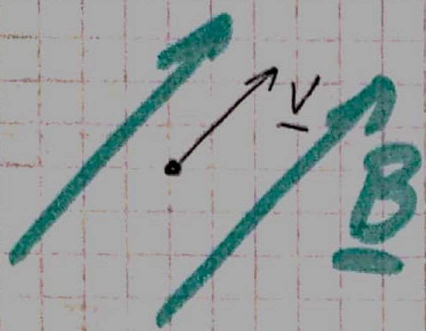
Caso $\alpha < \pi$:

$$\text{sen}(\alpha) \neq 0.$$

Si por ejemplo $\alpha = \frac{\pi}{2}$ $\quad \underline{v} \perp \underline{B}$

$$\text{sen}\left(\frac{\pi}{2}\right) = 1$$

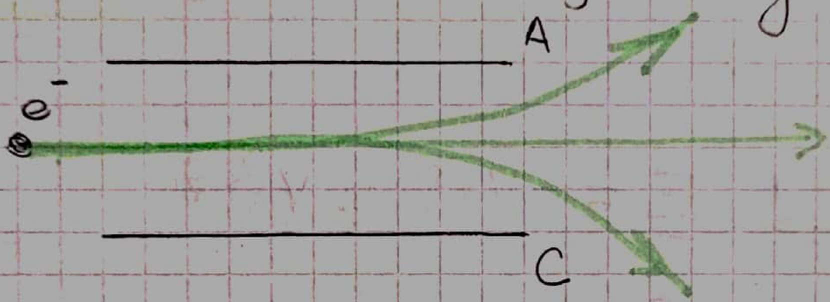
Tengo velocidad variable.



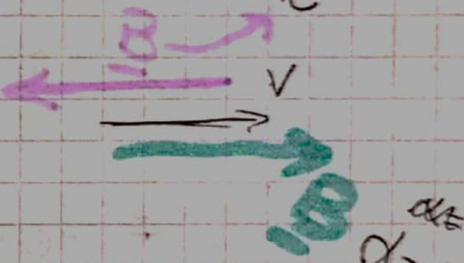
en este caso
$\underline{V}$ se hizo // $\underline{B}$

$$\underline{F}_L^{final} = \underline{0}$$

Visto como el dibujo original:



$\to \alpha = 0$ ó π



b

$\underline{E} \neq \underline{0}$ que es $\perp$ $\underline{V}_i$

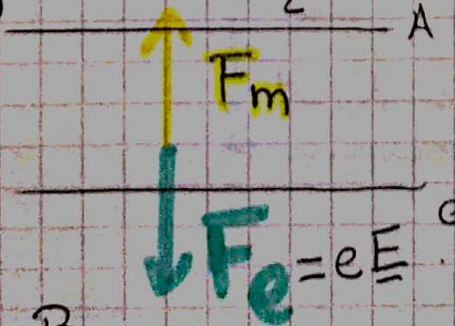
$\underline{B}$ como antes

$$\underline{F}_L = q(\underline{E} + \underline{V} \times \underline{B}) = \underline{0}$$

→ pido para que no se desvíe.

$$\Leftrightarrow \underline{E} = -\underline{V} \times \underline{B}$$

Supongamos $\alpha = \frac{\pi}{2} \Rightarrow \underline{V} \perp \underline{B}$

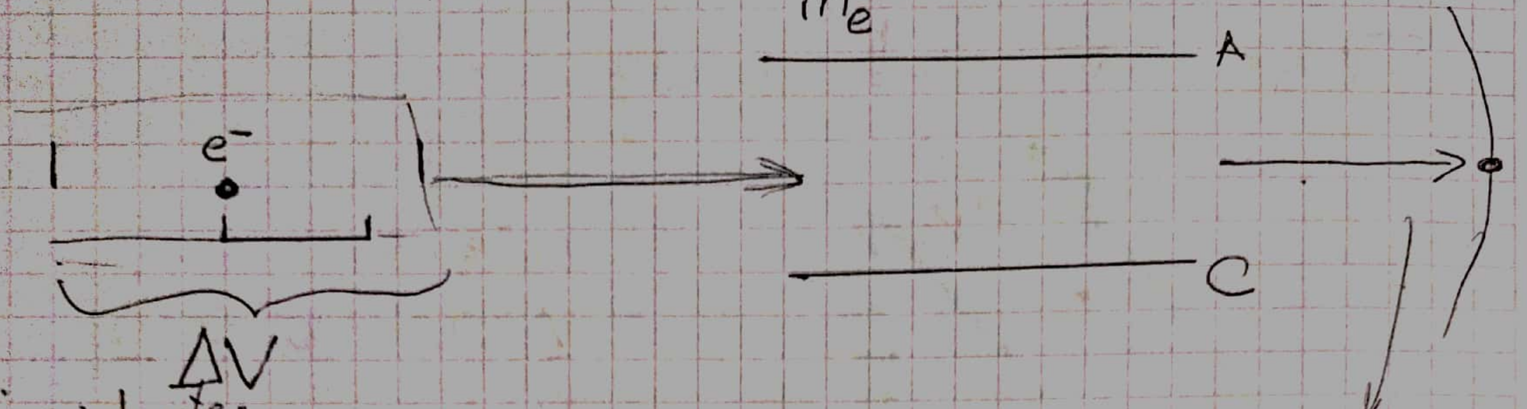


$|\underline{F_m}| = evB$

$F_e = e\underline{E}$ $\Rightarrow \{\underline{F_e}\} = E_0 \hat{z}$

$\underline{E} \perp \underline{V}$ y $\underline{B}$

c) $\underline{E}$ y $\underline{B}$ para medir $\frac{e}{m_e}$



inicialmente: $U_p = e\Delta V$

Finalmente: $\frac{1}{2} m_e v^2 = U_{cin}$

$$\underline{F}_L = \overset{e}{q}\underline{E} + \overset{e}{q}\,\underline{v} \times \underline{B} = 0$$

$$E\hat{z} = \underline{E} = -\underline{v} \times \underline{B} = -vB\hat{z}$$

$$\Rightarrow E = -vB$$

$$U_p = U_{cin} \Rightarrow e\Delta V = \frac{1}{2} m_e v^2$$

$$\Leftrightarrow \boxed{\frac{e}{m_e} = \frac{1}{2}\frac{v^2}{\Delta V}}$$

y $v = -\frac{E}{B} \Leftrightarrow v^2 = \left(\frac{E}{B}\right)^2$

$$\Rightarrow \boxed{\frac{e}{m_e} = \frac{1}{2}\frac{E^2}{\Delta V B^2}}$$