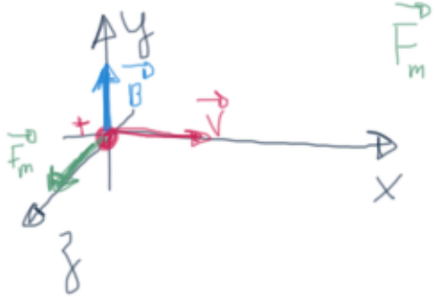
27.18, p. 233/p. 234

$m = 6{,}64 \cdot 10^{-27}\ kg$

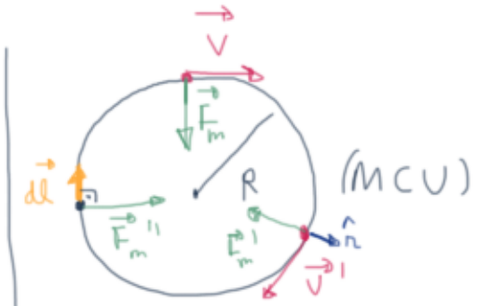
$v = 35{,}6\ \frac{km}{s}$ $\quad q = +2e$

$B = 1{,}10\ T$



$\vec{F}_m = q\vec{v} \wedge \vec{B}$

a) $D = ?$



$$R = \frac{mv}{qB} = \frac{6{,}64 \cdot 10^{-27} \cdot 35{,}6 \cdot 10^{3}}{2 \cdot 1{,}60 \cdot 10^{-19} \cdot 1{,}10}$$

$$\boxed{R = 6{,}72 \cdot 10^{-4}\ m}$$

$$\boxed{R = 0{,}672\ mm}$$

$$D = 2R \rightarrow \boxed{D = 1{,}34\ mm}$$

b) Altera direção e sentido, mas não o módulo de $\vec{v}$.

c)

$$\vec{a} = \frac{\vec{F}_m}{m} = \frac{q\vec{v} \wedge \vec{B}}{m}$$

ou

$$\vec{a} = \underbrace{a}_{a_{cp}} \cdot (-\hat{n}) = \frac{v^2}{R}(-\hat{n})$$

$$\boxed{a = 1{,}9 \cdot 10^{12}\ \frac{m}{s^2}}\ (\text{módulo})$$

direção de $\vec{a}$: radial

sentido de $\vec{a}$: aponta para o centro da trajetória circular (ver figura)

d) $dW = \vec{F}_m \cdot d\vec{l} = 0$

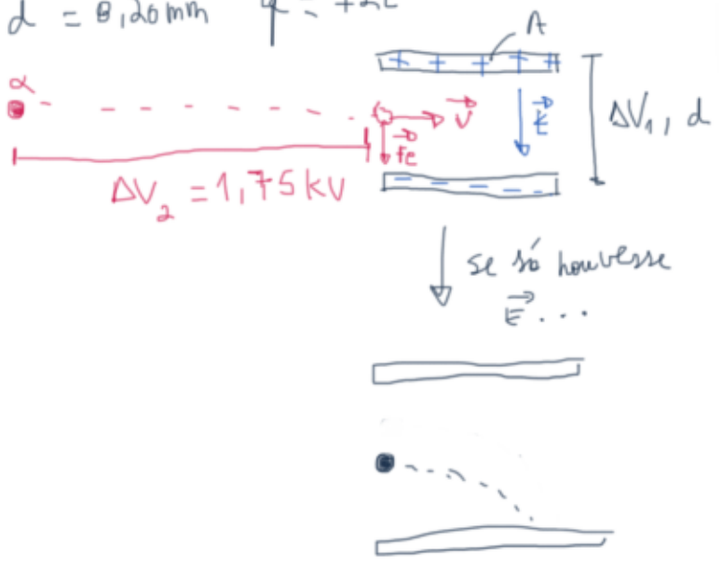
$W = \Delta E_c = 0 \rightarrow$ velocidade constante!

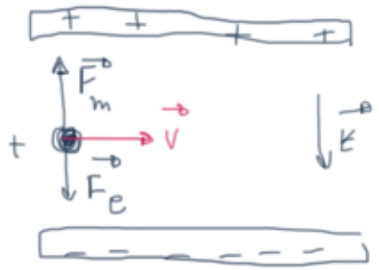
27.29, p. 234

(Filtro de velocidades)

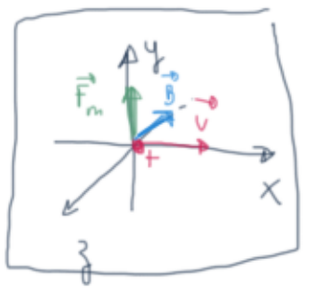
$\Delta V_1 = 150\,V$ $\quad A = 28{,}5\,cm^2$ $\quad m = 6{,}64 \cdot 10^{-27}\,kg$

$d = 8{,}20\,mm$ $\quad q = +2e$





A)



$\vec{F_m} = q\,\vec{v} \wedge \vec{B}$

Direção de $\vec{B}$: direção perpendicular à $\vec{v}$ e $\vec{E}$ (ou $\vec{F_e}$), ou seja, a direção z mostrada na figura A).

Sentido de $\vec{B}$: Depende do sentido de $\vec{E}$. Na figura A), o sentido de $\vec{B}$ é o $-z$. Se o sentido de $\vec{E}$ for o contrário, então o sentido de $\vec{B}$ seria o de $+z$.

módulo de $\vec{B}$:

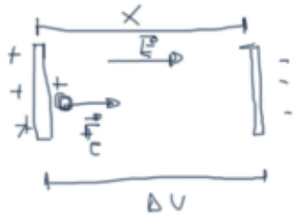
$$V = \frac{E}{B}$$

$F_e = F_m$ $\quad \theta = 90°$

$q E = q v B \operatorname{sen}\theta \rightarrow B = \frac{E}{v}$ (1) (2)

(1) $E = \Delta V_1 / d$ ✓

(2) $v = ?$



$a = \frac{F_e}{m} = \frac{q \cdot E}{m} = \text{constante} \rightarrow MUV$

$v^2 = v_0^2 + 2ax$ ($v_0 = 0$)

$v^2 = 2 \cdot \frac{qE}{m} \cdot x$ ($E \cdot x = \Delta V$)

$\frac{mv^2}{2} = q \cdot \Delta V$

$$E_c = q \cdot \Delta V$$

$$E_c = q\Delta V$$

$$\frac{mv^2}{2} = q\Delta V$$

(2) $$v = \sqrt{\frac{2q\Delta V_2}{m}}$$

$$B = \frac{E}{v}$$

$$= E \cdot \frac{1}{v}$$

$$= \frac{\Delta V_1}{d} \cdot \sqrt{\frac{m}{2q\Delta V_2}}$$

$+2e$

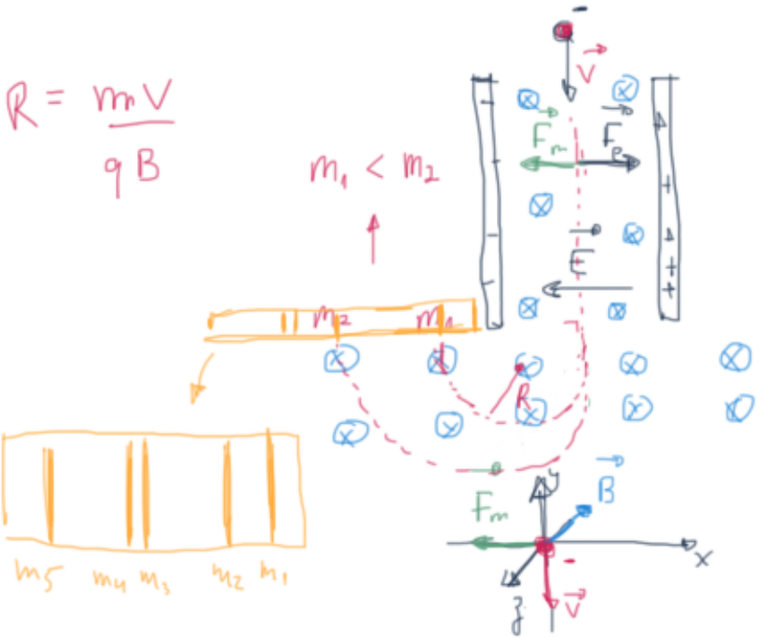
$$\boxed{B = 0{,}0445\ T}$$

27.31 | p. 235 (espectrômetro de massa)

$$E = 1{,}12 \cdot 10^5\ \frac{V}{m}$$

$$B = 0{,}540\ T$$

$$R = \frac{mv}{qB}$$



$q = -e$

$R = 31{,}0\ cm$

$m = ?$

$1\ u = 1{,}66 \cdot 10^{-27}\ kg$

$N_{massa} = ?$

$$R = \frac{mv}{qB} \Rightarrow m = \frac{RqB}{v}$$

$v = \frac{E}{B}$

$$m = R \cdot q \cdot B \cdot \frac{1}{v} = RqB\,\frac{B}{E}$$

$$m = \frac{RqB^2}{E} = \frac{31{,}0 \cdot 10^{-2} \cdot 1{,}60 \cdot 10^{-19} \cdot 0{,}540^2}{1{,}12 \cdot 10^5}$$

$$\boxed{m = 1{,}29 \cdot 10^{-25}\ kg}$$

$$\boxed{N_{massa} = \frac{m}{u} = 78\ u}$$