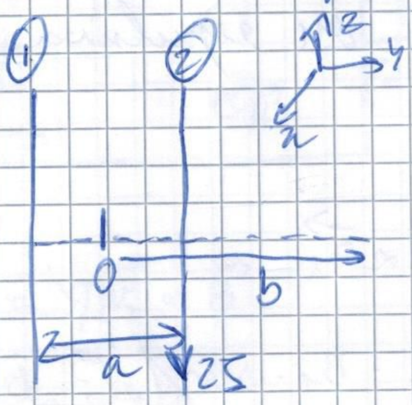
PN 7/12/18

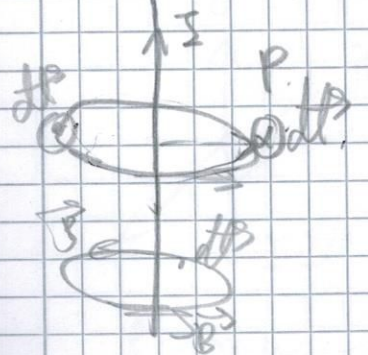
6.1



Princípio sobreposição $\vec{B}_p = \vec{B}_{1p} + \vec{B}_{2p}$

fio "infinito" $\rightarrow$ Lei de Ampere

$$\int \vec{B} \cdot d\vec{l} = \mu_0 I_{int}$$



$$\int \vec{B} \cdot d\vec{l} = \int B \cdot dl \cdot \cos(\vec{B}, d\vec{l}) \quad \vec{B} \parallel d\vec{l}$$

$$\int \vec{B} \cdot d\vec{l} = B \cdot \underbrace{\int dl}_{\text{comprimento da linha}}$$

$$\int dl = 2\pi r$$

$$\int \vec{B} \cdot d\vec{l} = B \cdot 2\pi r$$

$$\int \vec{B} \cdot d\vec{l} = \mu_0 I_{int}$$

$$B \cdot 2\pi r = \mu_0 I$$

$$B = \frac{\mu_0 I}{2\pi r}$$

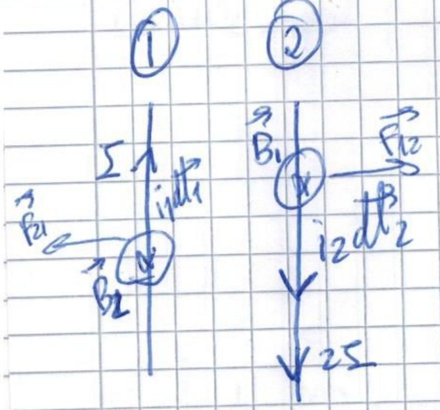
$$\vec{B}_{1p} = \frac{\mu_0 \cdot I}{2\pi (b + a/2)} (-\hat{x})$$

$$\vec{B}_{2p} = \frac{\mu_0 \, 2I}{2\pi (b - a/2)} (\hat{x})$$

$$\vec{B}_p = \frac{\mu_0 I}{2\pi} \left(\frac{2}{b - a/2} - \frac{1}{b + a/2} \right) (\hat{x})$$

b) Força por unidade de comprimento

c) Verificar se o $\vec{F}$ é atrativa ou repulsiva



Lei de Lorentz

$$d\vec{F}_{12} = i_2 d\vec{l}_2 \times \vec{B}_1$$

$$dF_{12} = i_2\, dl_2 \cdot B_1 \cdot \underbrace{\cancel{\text{sen}(\vec{dl_2}, \vec{B_1})}}_{\vec{dl_2} \perp \vec{B_1}}^{1}$$

$$\frac{F_{12}}{l_2} = i_2 \cdot B_1 \, (\hat{y})$$

$$\frac{\vec{F}_{21}}{l} = i_1 \cdot B_2 \, (-\hat{y}) \quad (N/m)$$

$$B_1 = \frac{\mu_0 I}{2\pi a} \, (T) \rightarrow \frac{F_{12}}{l} = \frac{2I \cdot \mu_0 I}{2\pi a}$$

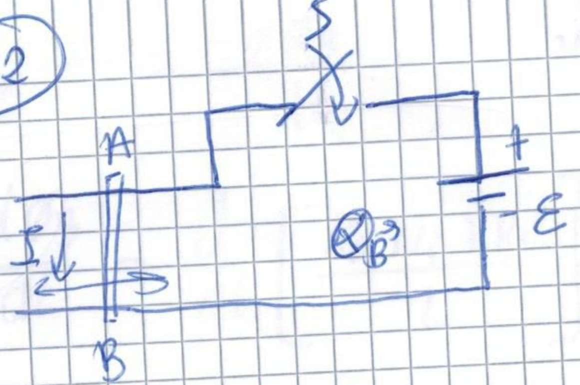
$$B_2 = \frac{2\mu_0 I}{2\pi a} \, (T) \rightarrow \frac{F_{21}}{l} = \frac{I\, 2 \cdot \mu_0 I}{2\pi a}$$

$$\frac{\vec{F}_{12}}{l} = \frac{\mu_0 I^2}{\pi a} (\hat{y})$$

$$\frac{\vec{F}_{21}}{l} = \frac{\mu_0 I^2}{\pi a} (-\hat{y})$$

→ Repulsivo //

6.2

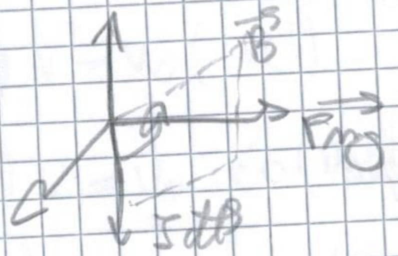


$\vec{F}_{mg} = q\vec{v} \times \vec{B}$

$i = \frac{dq}{dt}$

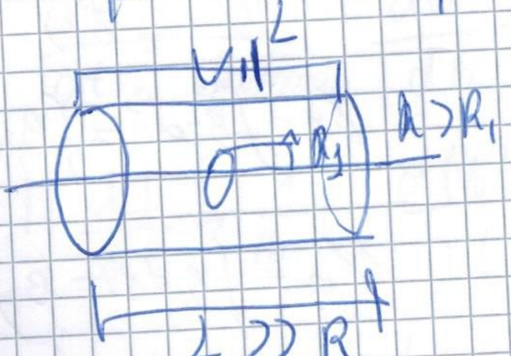
$d\vec{F}_{mg} = \frac{dq}{dt}\vec{v} \times \vec{B} = d\vec{F}_{mg} = i\,d\vec{l} \times \vec{B}$

$d\vec{F}_{mg} = i\,d\vec{l} \times \vec{B}$



$F = ma$

6.3



$f.e.m = \frac{-d\phi_B}{dt}$

$\phi_B = \int \vec{B} \cdot d\vec{s}$

$\phi_B = \int B \cdot ds \cdot \cos(\vec{B}, d\vec{s})$

$B \to \phi_B \to \frac{d\phi_B}{dt}$

Se $L \gg R \Rightarrow$ lei de Ampere

$$\int_a^b B \cdot dl \cdot \underbrace{\cos(\vec{B}, \vec{dl})}_{\vec{B} // \vec{dl}}^{1} = B\,l$$

$$\int_b^c B \cdot \vec{dl} = 0, \quad \vec{B} \perp \vec{dl}$$

$$\int_d^a B \cdot dl = 0, \quad \vec{B} \perp \vec{dl}$$

Na aproximidade do solenoide infinito

$$B_{\text{fora do solenoide}} = 0 \Rightarrow \int_c^d \vec{B} \cdot dl = 0$$

$$\int \vec{B} \cdot \vec{dl} = B \cdot l = \mu_0 \cdot I_{int} \longrightarrow B \cdot l = \mu_0\, i\, \frac{N}{L} \cdot l$$

$$\boxed{B = \frac{\mu_0 N i}{L} \ (T)}$$

$$\mu_0 I_{int} = \mu_0\, i\, \underbrace{\frac{N}{L} \cdot l}_{\text{número de espiras dentro da linha fechada}}$$

$$\phi_B = \int \vec{B} \cdot \vec{ds} = \int B \cdot ds \underbrace{\cos(B, ds)}_{\vec{B} // \vec{ds}}^{1}$$

$$N \rightarrow L$$
$$n \rightarrow l$$
$$n = \frac{N}{L} \cdot l$$

$$\phi_B = \int B\, ds = B \underbrace{\int ds}_{\text{Área} = \pi R^2}$$

$$\boxed{\phi_B = \frac{\mu_0 N i}{l} \pi R^2}$$

$$f.e.m = \frac{-d\phi_B}{dt}$$

$$\frac{d\phi_B}{dt} = \frac{d}{dt}\left[\frac{\mu_0 N_1 \pi R_1^2}{L}\right]$$

$$\frac{d\phi_B}{dt} = \frac{\mu_0 N \pi R_1^2}{L} \frac{dI}{dt}$$

$$f.e.m = -\underbrace{\frac{\mu_0 N \pi R_1^2}{L}}_{M} \frac{dI}{dt}$$

$$f.e.m = -M \frac{dI}{dt}$$

i) $V = V_0$ (Volt)

ii) $V = V_0 \cdot t$ (Volt)

iii) $V = V_0 \operatorname{sen}(wt)$ (Volt)

$V = \text{Resistencia} \cdot I$

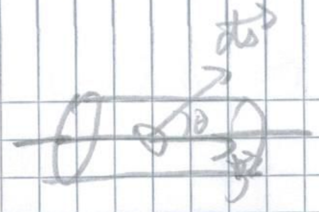
$$I = \frac{V}{\text{Resistencia}}$$

i) $\frac{dI}{dt} = \frac{1}{\text{Resistencia}} \frac{dV_0}{dt} = 0 \Rightarrow f.e.m = 0$

ii) $\frac{dI}{dt} = \frac{1}{\text{Resistencia}} \frac{d(V_0 t)}{dt} \Rightarrow \frac{dI}{dt} = \frac{1}{\text{Resist.}} V_0 \Rightarrow f.e.m = -M \frac{1}{R} V$

iii) $\frac{dI}{dt} = \frac{1}{R} \frac{d}{dt}\left[V_0 \operatorname{sen}(wt)\right] \Rightarrow f.e.m = -M \frac{1}{R}\left[wV\right.$

b)



$$\phi_B = \int \vec{B} \cdot \vec{ds} = \int B \, ds \cdot \cos(\vec{B}, \vec{ds})$$

$$\phi_B = B \cdot \underline{Area} \cdot \cos\theta$$

i) 0

ii) $f.e.m = -M \frac{1}{Resist.} V_0 \cos\theta$

iii) $f.e.m = -M \frac{1}{Resist.} \left[W V_0 \cos(Wt) \right] \cos\theta$