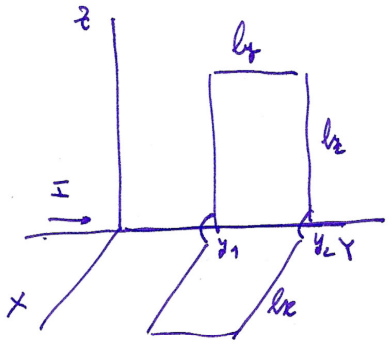
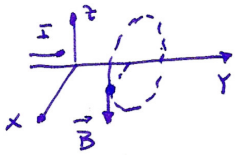
2º Intercalar | Versão A | MBio + MQuim | 2007/2008 2º S | 16/5/2008



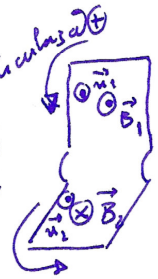
a) $\oint (\vec{B}\cdot d\vec{s}) = \mu_0 I$



$|B|\, 2\pi x = \mu_0 I$

$\vec{B} = \frac{\mu_0}{4\pi}\frac{2I}{x}(-\vec{e}_x)$ [Tesla]

b)



Ao longo da área definida pelos arcos de circunferência, $\vec{B}$ é $\perp$ $\vec{n}$ logo $(\vec{B}\cdot\vec{n})=0$

$\vec{n}_1 = +\vec{e}_x$

$\vec{n}_2 = +\vec{e}_z$

$\int (\vec{B}\cdot\vec{n})\, ds = \int_{S_1} (\vec{B}_1\cdot\vec{n}_1) ds + \int_{S_2} (\vec{B}_2\cdot\vec{n}_2) ds$

$$\Phi_{espira} = \int (\vec{B}\cdot\vec{n})\, ds = \frac{\mu_0}{4\pi}\int_x^{x+l_z}\frac{2I}{z}dz\int_{y_1}^{y_2}dy - \frac{\mu_0}{4\pi}\int_x^{x+l_x}\frac{2I}{x}dx\int_{y_1}^{y_2}dy$$

$$\Phi_{espira} = \frac{\mu_0}{4\pi}2I\left(\ln\frac{x+l_z}{x}\right)(y_2-y_1) - \frac{\mu_0}{4\pi}2I\left(\ln\frac{x+l_x}{x}\right)(y_2-y_1)$$

$$\Phi_{espira} = \frac{\mu_0}{4\pi}2I\,l_y\left[\ln(x+l_z) - \ln z - \ln(x+l_x) + \ln x\right]$$

$$\Phi_{espira} = \frac{\mu_0}{4\pi}2I\,l_y\left(\ln\frac{x+l_z}{x+l_x}\right)$$

$$\Phi_{TOTAL} = \frac{\mu_0}{4\pi}2I\,l_y N\left(\ln\frac{x+l_z}{x+l_x}\right)$$

c) $\Phi_{TOTAL} = L\,I$ $\quad L = \frac{\mu_0}{4\pi}2l_y N\left(\ln\frac{x+l_z}{x+l_x}\right)$

$$L = 10^{-7}\times 2\times \underbrace{0{,}02}_{\text{metros!...}}\times 50\times\left(\ln\frac{0{,}2+5}{0{,}2+3}\right)$$

$L = 97$ nHenry (nano Henry)

xxXXXX

| vem do A. com i

d) $\Phi_{TOTAL} = L \times I$

$\Phi_{TOTAL} = 9{,}1 \times 10^{-9} \times 2 \times 10^{-3}$

$\Phi_{TOTAL} \approx 0{,}2$ nWeb (nano Weber)

e) $\frac{d\Phi_T}{dt} = L \frac{dI}{dt} = L \frac{d}{dt}(I_0 + \alpha t) = L\alpha$

$\varepsilon^{ind} = -\frac{d\Phi_T}{dt} = -L\alpha$

$I^{ind} = -\frac{L\alpha}{R}$

f) $I^{ind} = -\frac{9{,}1 \times 10^{-9} \times (-0{,}1 \times 10^{-3})}{22}$

$I^{ind} = +0{,}44\ \mu A$ (pico Ampère)