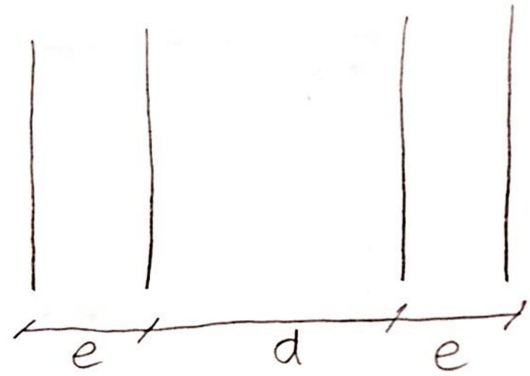
16/7/2015

1) 0,06m de radio

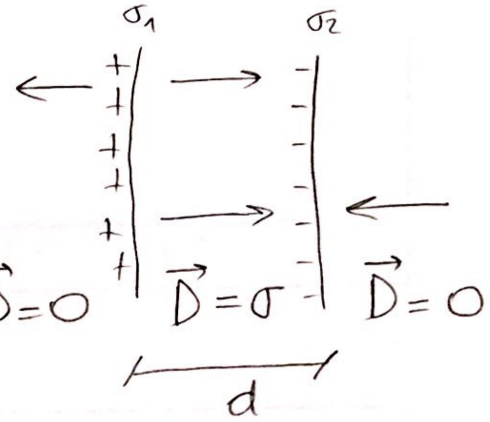
$A = \pi (0{,}06m)^2$

$e = 2.10^{-3} m$

$d = 0{,}01\ m$




Se conecta a una batería de 20V




$$C = \frac{q}{|\Delta V|}$$

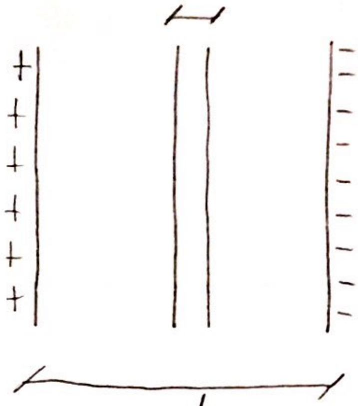
$$\vec{D} = \sigma \hat{\imath}, \quad 0<x<d$$

$$\vec{E} = \frac{\sigma}{\varepsilon_0} \hat{\imath}, \quad 0<x<d$$

$$|\Delta V| = \int_0^d \frac{\sigma}{\varepsilon_0} \hat{\imath}\hat{\imath}\, dx = \frac{\sigma}{\varepsilon_0} d \Rightarrow \left[ C = \frac{\sigma A}{\frac{\sigma d}{\varepsilon_0}} = \frac{A \varepsilon_0}{d} \right]$$

$$\Rightarrow \left[ C = \frac{\pi (0{,}06)^2 \cdot 8{,}85.10^{-12}}{0{,}01} = 1.10^{-11} F \right]$$

b)




$$\vec{D} = \sigma \hat{i} \quad 0 < x < d-e$$

$$\vec{E} = \frac{\sigma}{\varepsilon_0} \hat{i} \quad 0 < x < d-e$$

$$|\Delta V| = \int_0^{d-e} \frac{\sigma}{\varepsilon_0} \hat{i}\hat{i}\, dx = \frac{\sigma}{\varepsilon_0}(d-e)$$

$$\Rightarrow C = \frac{\sigma A}{\frac{\sigma(d-e)}{\varepsilon_0}} = \frac{\varepsilon_0 A}{d-e}$$

$$\Rightarrow 2.10^{-11} F = \frac{\varepsilon_0 . \pi (0{,}06m)^2}{0{,}01m - e}$$

$$\Rightarrow \boxed{e = 5.10^{-3} m}$$

2) $1 \cdot 10^{-4}\, m^2$ de sección

$R_m = 0{,}2\, m$

$N = 1885$

$i = 0{,}2\, A$

$\boxed{\vec{B}_M = 0{,}1\, T}$

$$\oint \vec{H}\, d\vec{l} = i_r$$

$$H_M\, 2\pi R_M = N\, i_r$$

$$H_M = \frac{1885 \cdot 0{,}2\, A}{2\pi \cdot 0{,}2\, m}$$

$$\boxed{H_M = 300\, A/m}$$

Supongo que las líneas de campo quedan confinadas dentro del imán. Esto se puede demostrar en un material lineal:

$$H_{M_t} = H_{o_t}$$

$$\frac{B_{Mt}}{\mu_0 \mu_r} = \frac{B_{ot}}{\mu_0} \quad \text{como } \mu_0 \mu_r \gg \mu_0$$

$$\Rightarrow B_M \gg B_o$$

$$\Rightarrow B_o \cong 0$$

y además $\oiint \vec{B}\, d\vec{S} = 0$

b) $e = 5.10^{-3} m$

$$\oint \vec{H}\,\vec{dl} = i_r$$

$$H_M(2\pi R_M - e) + H_0\, e = N.i_r$$

$$\uparrow$$

$$\frac{B_0}{\mu_0} \rightarrow \iint \vec{B}\,\vec{dS} = 0$$

$$B_0 = B_M$$

$$\Rightarrow H_0 = \frac{B_M}{\mu_0}$$

$$\Rightarrow H_M(2\pi R_M - e) + \frac{B_M}{\mu_0} = N i_r$$

$$B_M = (N i_r - H_M(2\pi R_M - e))\,\mu_0$$

$$B_M = 4{,}73.10^{-4} - H_M 1{,}57.10^{-6}$$