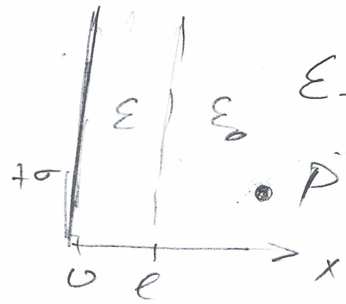
EXAMEN Física II – Tecnólogo – 14/12/2018

Ejercicio 1

a)

$$\boxed{\begin{array}{ll} 0<x<\ell & E=\dfrac{\sigma}{2\varepsilon}=\dfrac{\sigma}{20\varepsilon_0} \\ x>\ell & E=\dfrac{\sigma}{2\varepsilon_0} \end{array}}$$



$\varepsilon = 10\varepsilon_0$

b) $x_P = 2\ell$

$$V(x_P) - \underset{\downarrow\, 0}{V(0)} = -\int_0^{x_P} E\,dx = -\int_0^{\ell} \frac{\sigma}{20\varepsilon_0}\,dx - \int_{\ell}^{x_P} \frac{\sigma}{2\varepsilon_0}\,dx$$

$$V(x_P) = -\frac{\sigma}{20\varepsilon_0}\ell - \frac{\sigma}{2\varepsilon_0}(\underset{\to 2\ell}{x_P} - \ell) = -\frac{\sigma}{20\varepsilon_0}\ell - \frac{\sigma}{2\varepsilon_0}(2\ell - \ell)$$

$$\boxed{V(2\ell) = -\frac{11}{20}\frac{\sigma\ell}{\varepsilon_0}}$$

c)

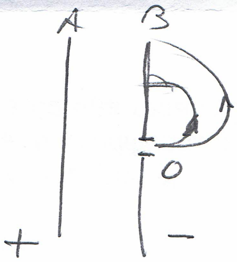
$EP + EC = \text{constante} \Rightarrow \Delta EC = -\Delta EP \qquad EP(x) = qV(x)$

$$\frac{m v_f^2}{2} - \frac{m v_0^2}{2} = -\left[0 - qV(2\ell)\right] = qV(2\ell) = -\frac{11}{20}\frac{\sigma\ell q}{\varepsilon_0}$$

$$\frac{m v_f^2}{2} = \frac{m v_0^2}{2} - \frac{11}{20}\frac{\sigma\ell q}{\varepsilon_0} \Rightarrow \boxed{v_f = \sqrt{v_0^2 - \frac{11}{10}\frac{\sigma\ell q}{m\varepsilon_0}}}$$

Ejercicio 2

$$\frac{m v^2}{2} = q V_{AB}$$



$V_{AB} = V_A - V_B$

a) $$\boxed{v_1 = \sqrt{\frac{2 q V_{AB}}{m_1}} \;,\; v_2 = \sqrt{\frac{2 q V_{AB}}{m_2}}}$$

b) Se desvían hacia "arriba".

c) $$qBv = \frac{m v^2}{r} \Rightarrow qB = \frac{m v}{r} \Rightarrow qB = \frac{m}{r}\sqrt{\frac{2 q V_{AB}}{m}}$$

$$q^2 B^2 = \frac{m^2}{r^2} \frac{2 q V_{AB}}{m} \Rightarrow q B^2 = \frac{2 m V_{AB}}{r^2} \Rightarrow \frac{q B^2 r^2}{2 V_{AB}} = m$$

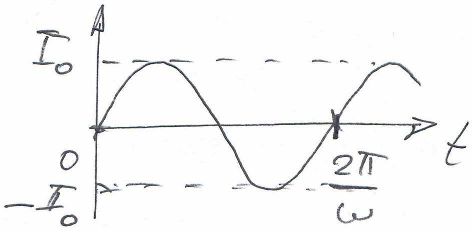
$$\Rightarrow \boxed{\frac{m_1}{m_2} = \frac{r_1^2}{r_2^2} = 3^2 = 9}$$

Ejercicio 3

a) $B = \mu_0 n i = \mu_0 n\, i_{max} \cos \omega t \qquad \phi(t) = \pi r^2 B(t)$

$\phi(t) = \pi \mu_0 n r^2 i_{max} \cos \omega t \qquad \boxed{\mathcal{E} = -\frac{d\phi}{dt} = \pi \mu_0 n r^2 \omega\, i_{max} \operatorname{sen} \omega t}$

b) $$i(t) = \frac{\mathcal{E}(t)}{R} = \frac{\pi \mu_0 n r^2 \omega i_0}{R} \operatorname{sen} \omega t = I_0 \operatorname{sen} \omega t$$



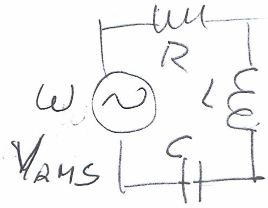
c)

$$\mathcal{E} = -\frac{d\phi}{dt} = \int_C \vec{E} \cdot d\vec{l} \qquad \phi = \pi \mu_0 n r^2 i_{max} \cos \omega t \Rightarrow$$

$$\Rightarrow \pi \mu_0 n \omega\, i_{max} r^2 \operatorname{sen} \omega t = E\, 2\pi r \Rightarrow$$

$$\boxed{E(r,t) = \frac{\mu_0 n \omega\, i_{max}}{2} r \operatorname{sen} \omega t}$$

Ejercicio 4



$$V_G(t) = V_0 \cos \omega t \qquad V_0 = \sqrt{2}\, V_{RMS}$$

$$X_L = \omega L = 2\pi f L = 7.85\ \Omega$$

$$X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C} = 63.7\ \Omega$$

$\Rightarrow$ Necesita una L' en serie (a)

$$X_L + X_{L'} = X_C \Rightarrow X_{L'} = X_C - X_L = 55.8\ \Omega = \omega L' \Rightarrow \boxed{L' = 178\ mH}\ \text{(b)}$$

$$i(t) = i_0 \cos(\omega t + \varphi) = \frac{V_0}{|Z|}\cos(\omega t + \varphi).$$

En resonancia $\begin{cases} \varphi = 0 \\ Z = R \end{cases}$

$$\Rightarrow i(t) = \frac{\sqrt{2}\, V_{RMS}}{R}\cos \omega t = \boxed{16.3 \cos \omega t \text{ (Amperes)}\ \text{(c)}}$$

- $P_{media}(L) = P_{media}(C) = 0$ siempre, porque son elementos conservativos
- $P_{media}(R) = R\, i_{rms}^2 = \dfrac{V_{RMS}^2}{R} = \boxed{2645\ W}$ (d)