Capítulo 6.

(1) $q \cdot E = m a$

$q \cdot \frac{V}{d} = m \cdot a$

$v^2 = v_{0x}^2 + 2 a \Delta x$

$a = \frac{v^2 - v_{0x}^2}{2x}$

$q \cdot \frac{V}{d} = m \cdot \frac{v^2 - v_0^2}{2x}$

$$\left[\frac{2 e V x}{m v_0^2 d} + 1\right]^{1/2} \quad v_0 = v(x)$$

b) $J = n q v \Rightarrow$ ~~$n = \frac{J}{qv}$~~ $n = \frac{J}{qv} \Rightarrow$

$$n = \frac{i}{eA \cdot v_0}\left[1 + \frac{2eVx}{m v_0^2 d}\right]^{-1/2}$$

(3) $V = 9V$

$T = 20^\circ C$

$R_0 = 4{,}5\,\Omega$

$P = 1{,}5\,W$

$\alpha = 4{,}5 \times 10^{-3}$

$P = \frac{V^2}{R}$

$R = \frac{81}{1{,}5} \Rightarrow R = 54\,\Omega$

$\rho = \rho_0 \left[1 + \alpha (T - T_0)\right]$

$54 = 4{,}5 \left[1 + 4{,}5 \times 10^{-3} (T_0 - 20^\circ)\right]$

$54 = 4{,}5 \left[1 + 4{,}5 \times 10^{-3} T_0 - 90 \times 10^{-3}\right]$

$54 = 4{,}5 + 20{,}25 \times 10^{-3} T_0 - 90 \times 10^{-3}$

$54 - 4{,}41 = 20{,}25 \times 10^{-3} T_0$

$T_0 = \frac{49{,}59}{20{,}25 \times 10^{-3}}$

$T_0 = 2{,}45 \times 10^3\, C$

(2) 

$$E = \frac{\lambda}{2\pi\varepsilon_0 r} \quad \therefore \quad \lambda = \frac{q}{l}$$

$$\lambda = E\,2\pi\varepsilon_0 r$$

$$\frac{q}{l} = E\,2\pi\varepsilon_0 r$$

$$q = E\,2\pi\varepsilon_0 r\,l \quad \therefore \quad q = it \;;\; l = v.t$$

$$it = E\,2\pi\varepsilon_0 r\,v.t$$

$$i = 500\;2\pi\,8{,}85\times10^{-12}.5\times10^{-2}.10^{-2}$$

$$\boxed{i = 1{,}39\times10^{-8}\,A}$$

(4) $E = 100\,V/m$
$i = 1800\,A$

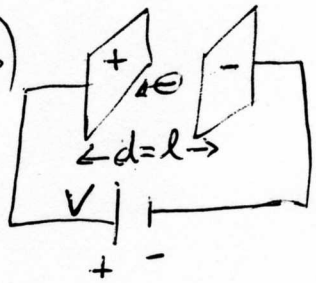
$$J = \sigma.E \quad \therefore \quad J = \frac{i}{S}$$

$$\frac{i}{S} = \sigma.E \Rightarrow \sigma = \frac{i}{4\pi R^2.E} \Rightarrow \sigma = \frac{1800}{4\pi(6{,}37\times10^{6})^2.10}$$

$$\boxed{\sigma = 3{,}53\times10^{-14}\,\Omega\,m^{-1}}$$

(5) a) $C = \frac{\varepsilon_0 A}{d}$ $\therefore$ $R = \rho\frac{l}{A} \Rightarrow R = \frac{1}{\sigma}\frac{d}{A} \Rightarrow A = \frac{d}{R\sigma}$

$$C = \frac{\varepsilon}{d}\frac{d}{R\sigma} \Rightarrow \boxed{R = \frac{\varepsilon}{C\sigma}}$$

b) 

$$R = \rho\frac{l}{A} = \frac{1}{\sigma}\frac{l}{A}$$

$$C = \frac{K\varepsilon_0 A}{l} = \frac{l}{A} = \frac{K\varepsilon_0}{C}$$

$$\boxed{R = \frac{1}{\sigma}\frac{K\varepsilon_0}{C}}$$