Università
degli Studi
di Padova

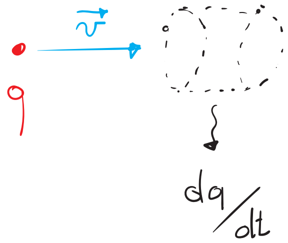
Fisica 1

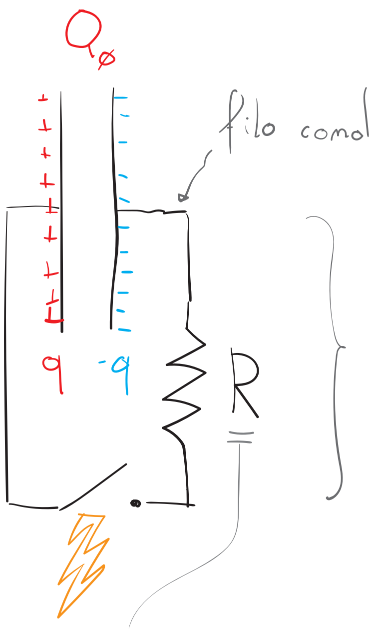
Lezione 51 : Corrente

Prof. Giubilato

Corrente } ≠ ~~Elettrostatica~~

$$\frac{d}{dt} q = I \quad \left[\frac{C}{s}\right] = [A]$$





→ Ohm $\quad V = RI = R\,\frac{dq}{dt}$

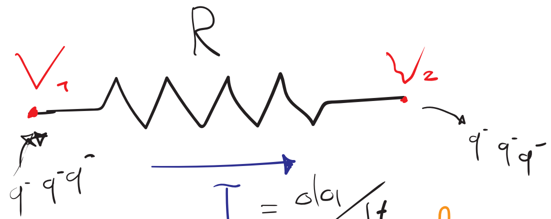
Legge di Ohm

corrente

differenza di potenziale

Resistenza $[Ohm] = \left[\frac{V}{A}\right]$

$[\Omega]$



$I = dq/dt$

$$I = \frac{(V_2 - V_1)}{R}$$

f.e.m.

$$V = -RI$$

$$\frac{q}{C} = -R\,\frac{d}{dt} q$$

chiudo interruttore

$$\frac{q(t)}{C} = -R\,\frac{d}{dt} q(t)$$

$? = f \qquad f = ?$

$$-\frac{q(t)}{RC} = \frac{d}{dt} q(t)$$

$$\frac{d}{dt}\left(Ae^{kt} + B\right) = Ake^{kt} \qquad k = \frac{1}{RC}$$

$$q(t) = \left[Ae^{-\frac{t}{RC}} + B\right] \longrightarrow q(t) = Q_0 e^{-t/RC}$$

$t = \phi$ [int. aperto] $\quad q(t) = Q_0 = A1 + B \Rightarrow = Q_0$

$t = \infty$ [int. chiuso da tempo] $\quad q(\infty) = \phi = A\phi + B \Rightarrow B = \phi$

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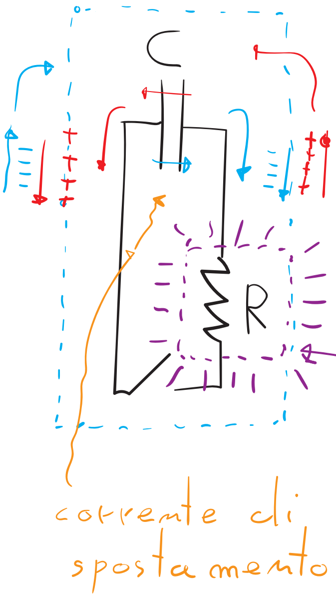
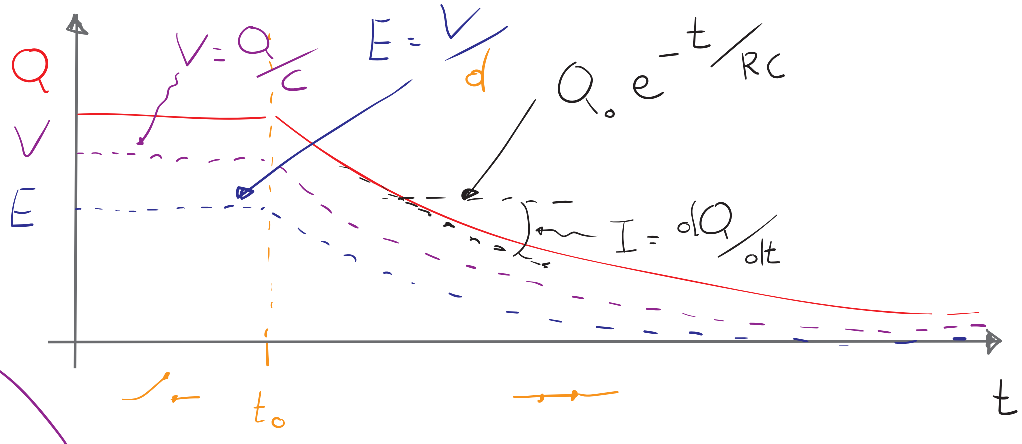
$q(t) = Q_0 e^{-t/RC}$ Scarica di Condensatore

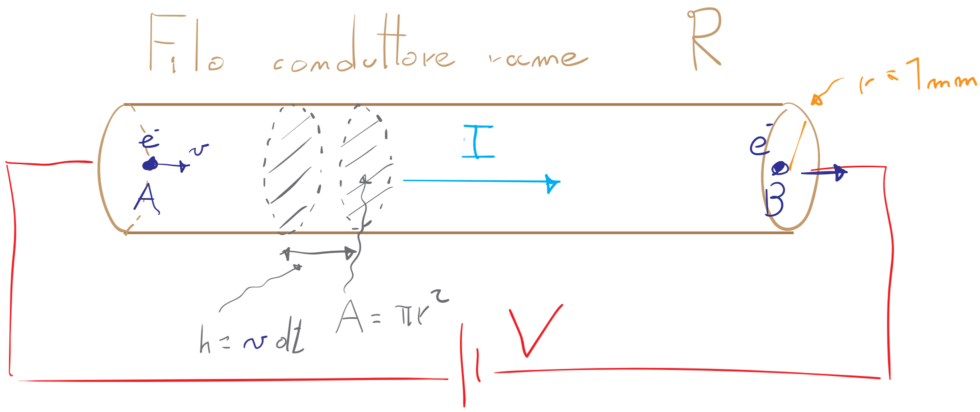




$$U_e = \frac{1}{2} C V^2 = \xrightarrow[t \to \infty]{} \phi$$

↳ dissipata su R

"Velocità" della carica e^-lettrone



densità di elettroni

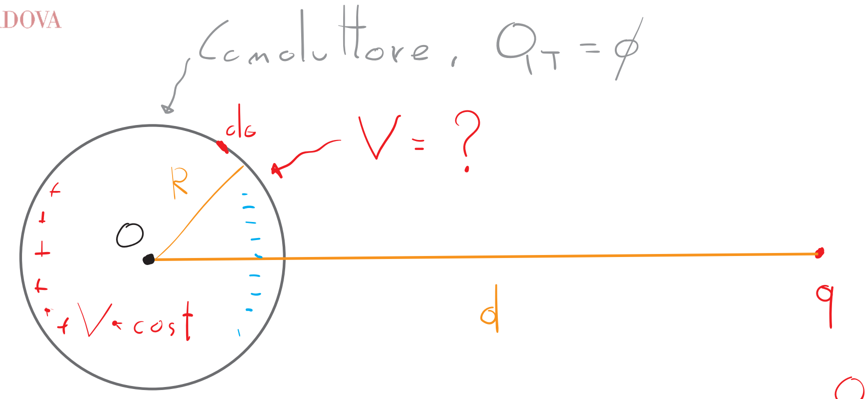
$$I = \frac{dq}{dt} = \frac{n_e \cdot A \cdot h \cdot e}{dt} = \frac{n_e \pi r^2 v \, dt \cdot e}{dt} = n_e \pi r^2 v_e \cdot e$$

$$v_e = \frac{I}{n_e \pi r^2 e} = \frac{1A}{\pi \cdot 10^{-6} \cdot 1.6 \cdot 10^{-19} \cdot 3 \cdot 10^{30}} \simeq \frac{1}{10^6} = 10^{-6}$$

n_e ↓ Atomo di Bohr

$10^{-10}\,m \simeq 10^{30}$ atomi/Volume → 3e × Atomo Cu

(1)

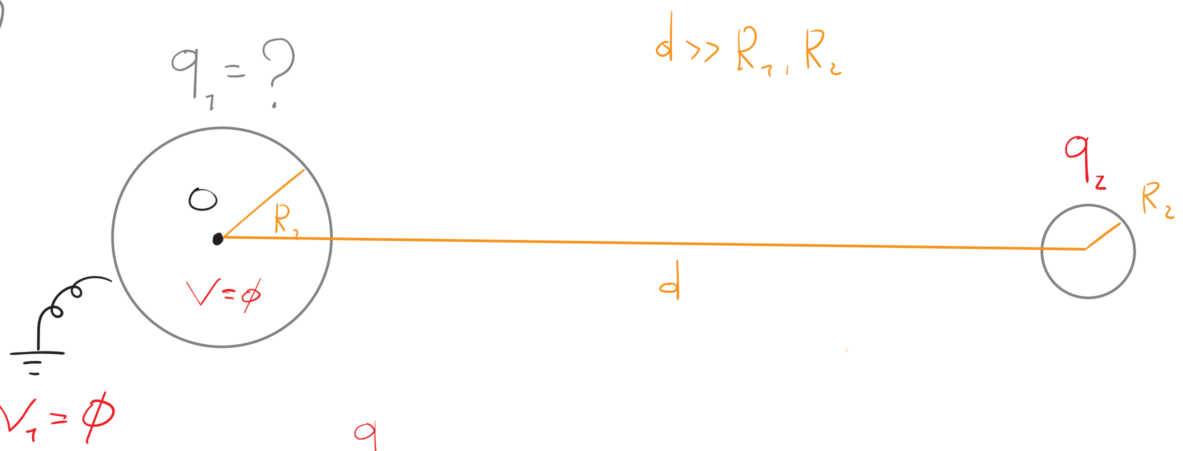


$$V_0 = \oint\!\!\!\oint_{\Sigma\ sfera} \frac{1}{4\pi\varepsilon_0}\frac{d\sigma}{R}\,d\Sigma + \frac{1}{4\pi\varepsilon_0}\frac{q}{d} = \frac{1}{4\pi\varepsilon_0 R}\oint\!\!\!\oint_{\Sigma\ sfera} d\sigma\, d\Sigma + \frac{1}{4\pi\varepsilon_0}\frac{q}{d}$$

(potenziale q sfera; potenziale q; $Q_T = \phi$)

$$= \frac{1}{4\pi\varepsilon_0}\frac{q}{d}$$

(2)



$$\phi = V_0 = \frac{1}{4\pi\varepsilon_0 R_1}\oint\!\!\!\oint_{\Sigma S_1} d\sigma_1\, d\Sigma_1 + \frac{q_2}{4\pi\varepsilon_0 d} = \frac{q_1}{4\pi\varepsilon_0 R_1} + \frac{q_2}{4\pi\varepsilon_0 d} = \phi$$

(q_1)

$$q_1 = -\frac{q_2 R_1}{d}$$

$$= -\frac{q_2 C_1}{4\pi\varepsilon_0 d} = -V_2 C_1$$