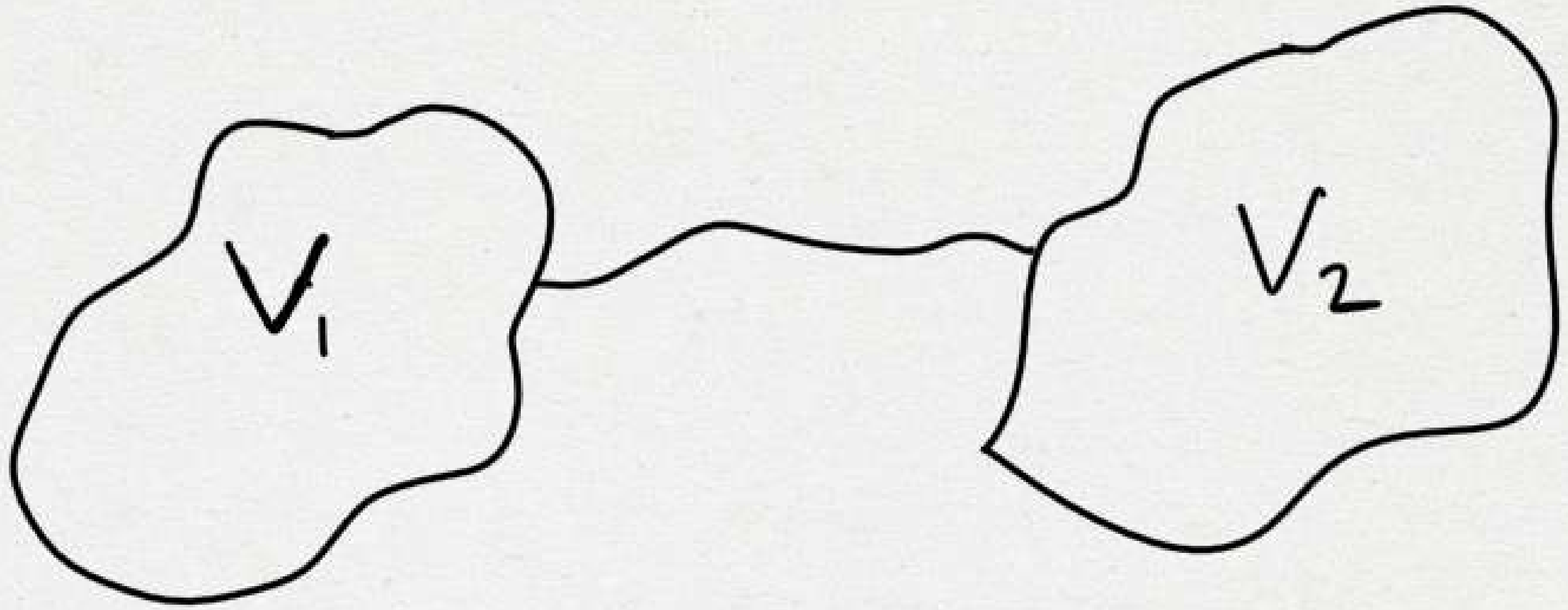
4 NOVEMBRE 14:30 AULA AMALDI

CU013 14-16

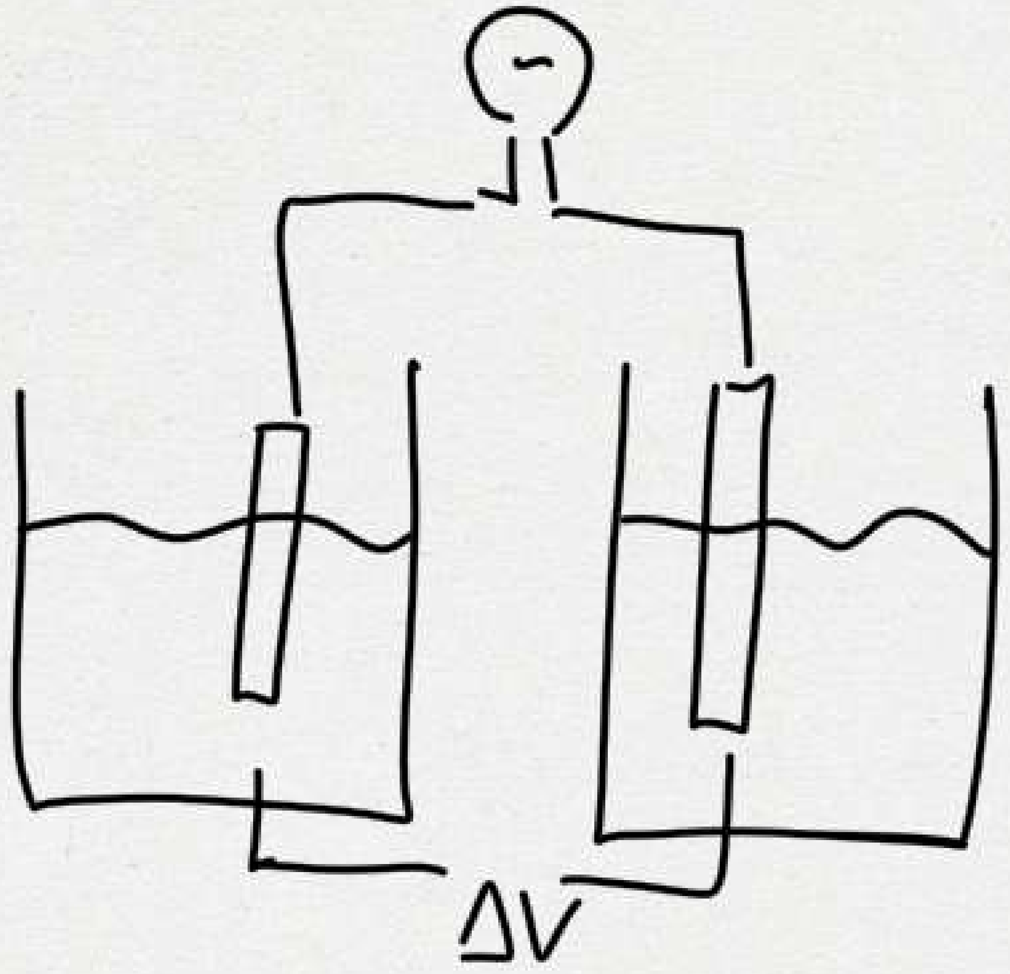


$$n \sim 10^{28}\ \frac{\text{elettroni}}{m^3}$$

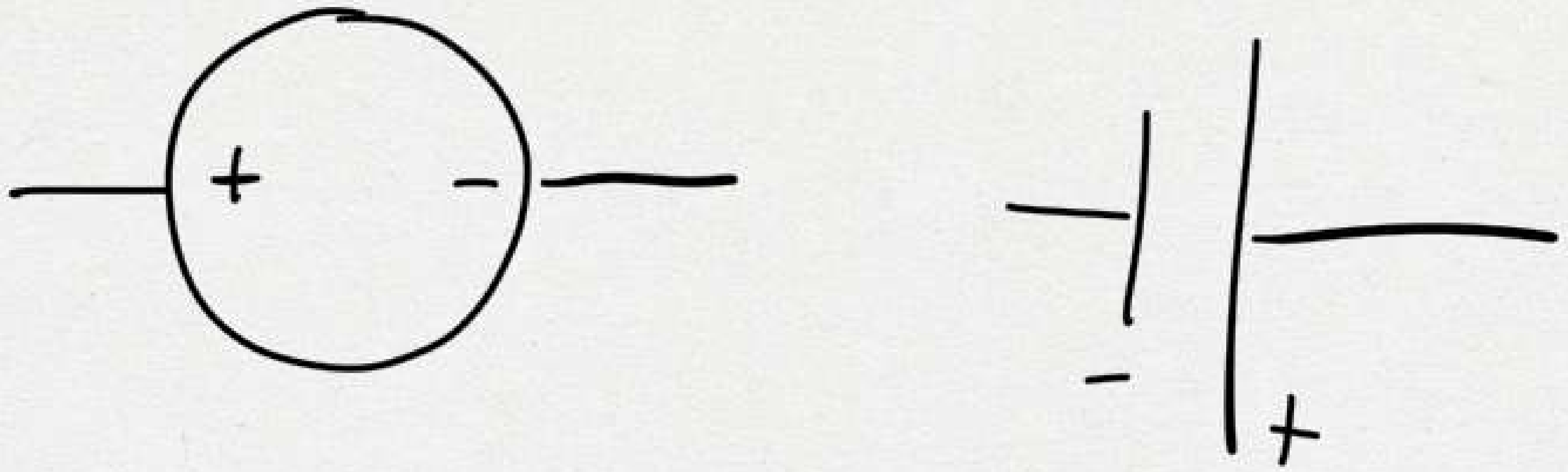
$$|e| = 1.6 \cdot 10^{-19}\ C$$

$$10^{9}\ C$$

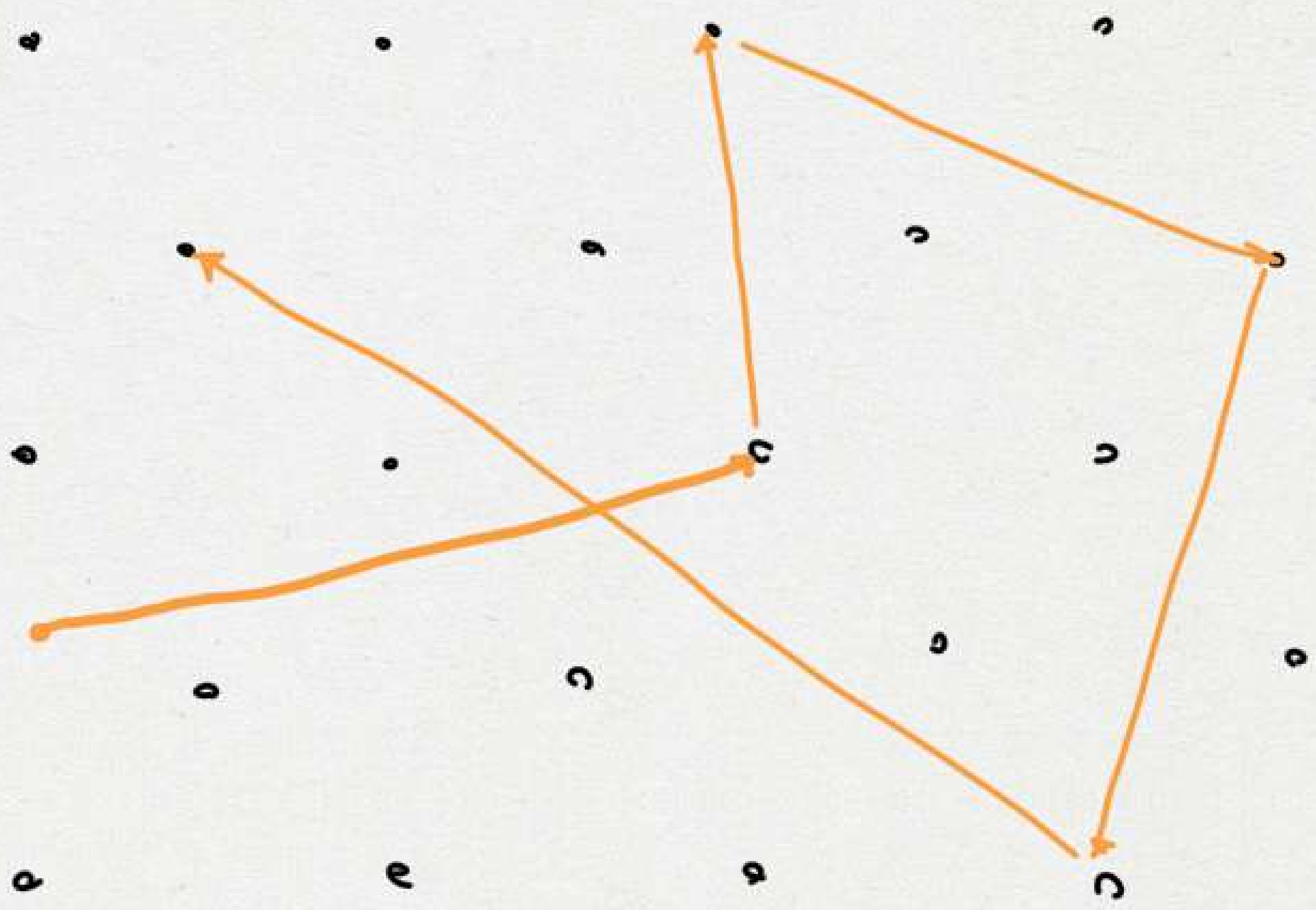
$V_1 > V_2$



$\parallel$



MODELLO DI DRUDE

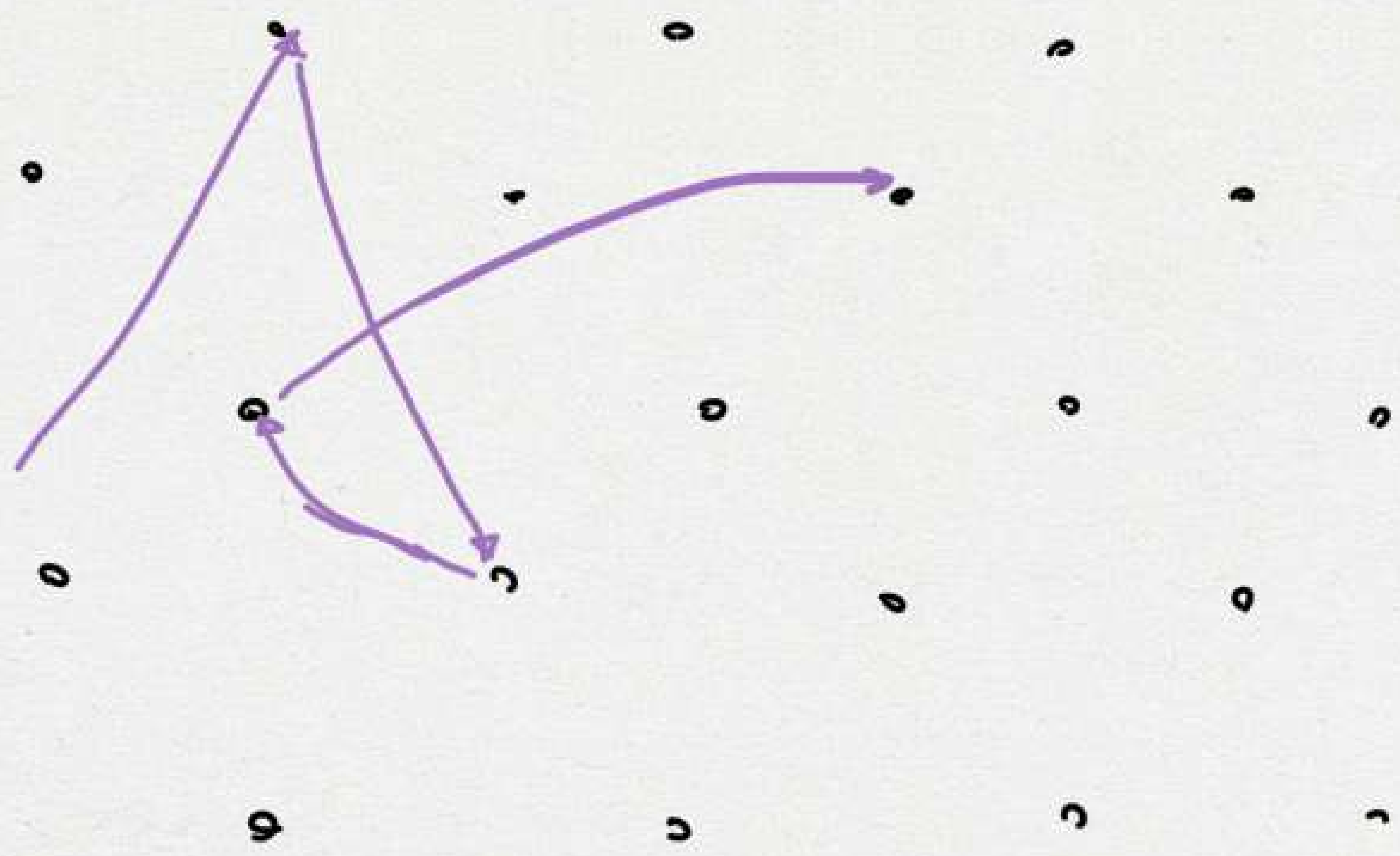


$v \approx 10^6 \ m/s$

$\ell \,, \quad \tau = \frac{\ell}{v}$

senza campi $\langle \vec{v} \rangle = 0$

$\longleftarrow \vec{E}$



$\vec{a} = -\frac{e}{m}\vec{E} \Rightarrow$

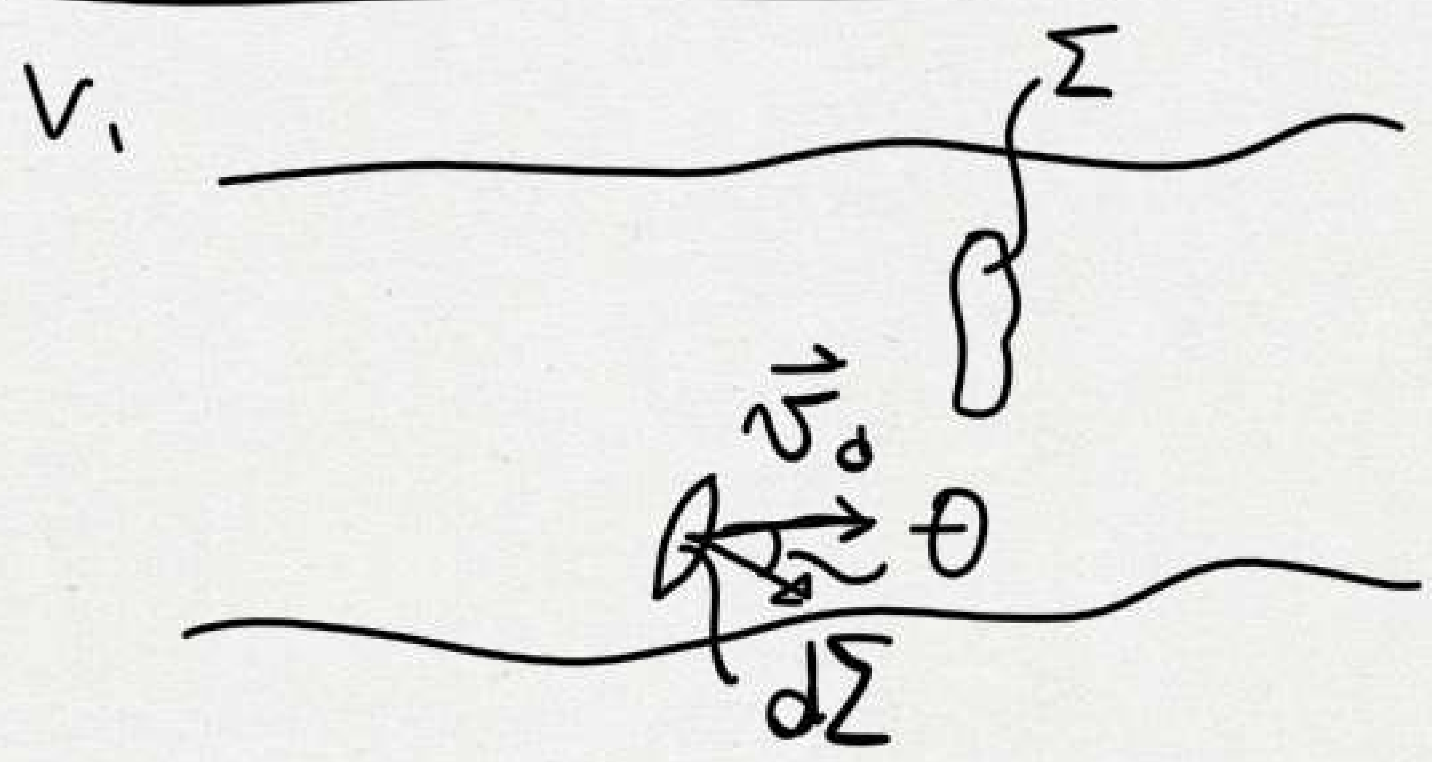
$\hookrightarrow \vec{v}_d = \vec{a}t\Big|_{\text{TRA DUE URTI}} = \vec{a}\tau = -\frac{e\tau}{m}\vec{E}$

$\uparrow$

velocità di deriva

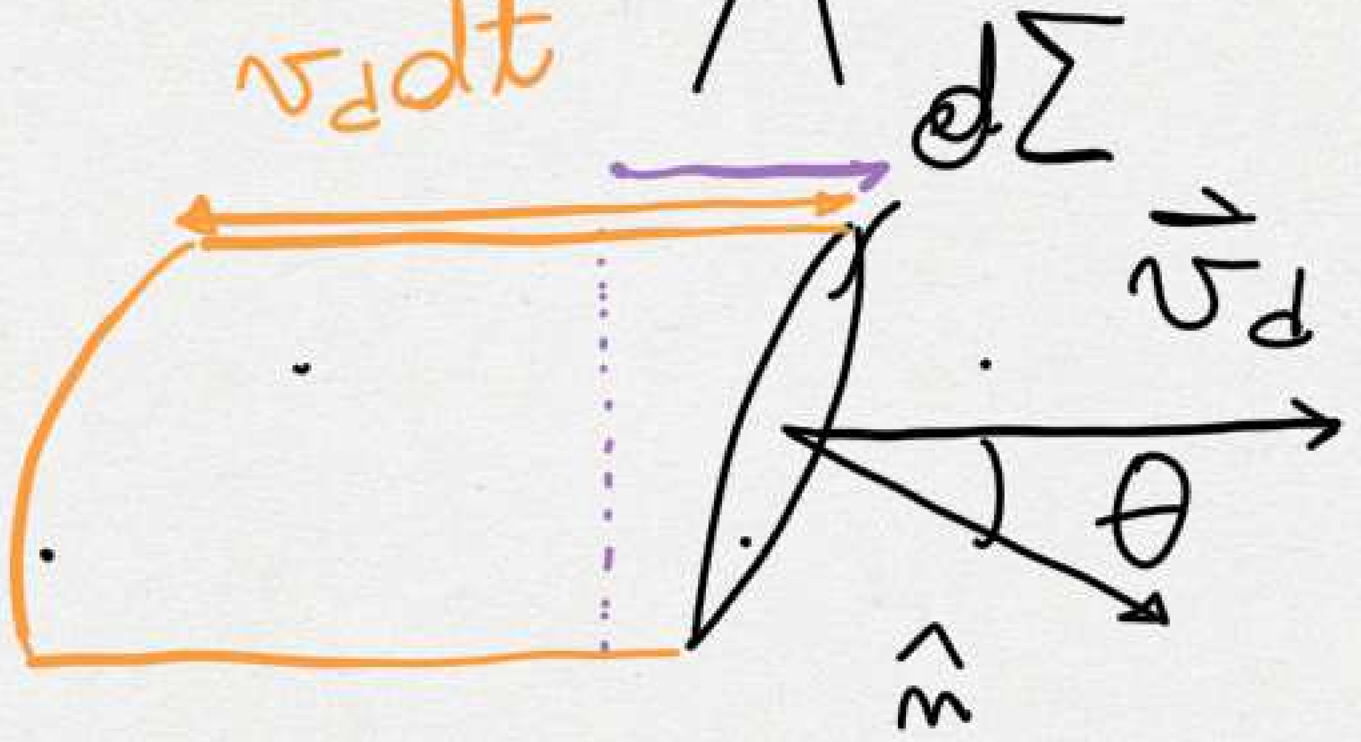
$\ell \sim 4\cdot 10^{-8}\,m \quad , \quad v \sim 10^{6}\,m/s \quad , \quad E \sim 10^{-2}\,V/m$

$v_d \sim \underline{10^{-4}\,m/s} = 10^{-10}\,v \quad , \quad v_d \ll v \quad , \quad \vec{v}_d = -\frac{e\tau}{m}\vec{E}$



$$i_m^{\Sigma} = \frac{\Delta q}{\Delta t} \xrightarrow[\Delta t \to 0]{} \frac{dq}{dt} = i$$

n densità di elettroni



$$dV = v_d\, dt\, d\Sigma \cos\theta \implies$$

$$dN_e = n\, dV = n\, v_d\, dt\, d\Sigma \cos\theta$$

$$dq = -en\, v_d\, dt\, d\Sigma \cos\theta = -e\, dN_e$$

$$\frac{dq}{dt} = -n e v_d \cos\theta \, d\Sigma = di$$

$$\vec{J} \equiv -n e \vec{v}_d$$ densità di corrente

$$di = \vec{J} \cdot \hat{n} \, d\Sigma \implies i = \int_\Sigma di = \int_\Sigma \vec{J} \cdot \hat{n} \, d\Sigma = \Phi_\Sigma(\vec{J}) = i$$

$$\boxed{\vec{J}} = -n e \vec{v}_d = \frac{n e^2 \tau}{m} \boxed{\vec{E}}$$ LEGGE DI OHM

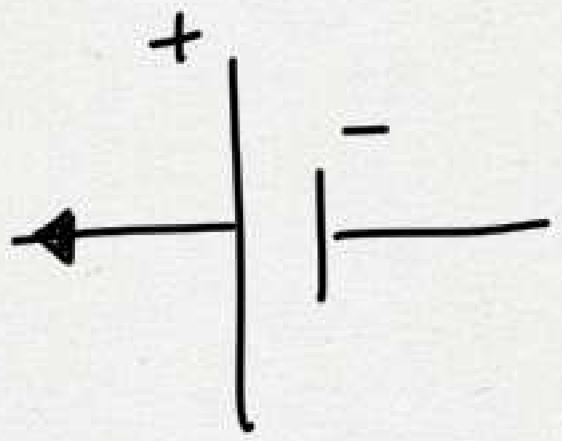
$$\vec{J} = \frac{n e^2 \tau}{m} \vec{E}$$ OPPURE $$\vec{E} = \frac{m}{n e^2 \tau} \vec{J}$$

$$\vec{J} = \frac{n e^2 \tau}{m} \vec{E} = \underbrace{\sigma}_{\text{CONDUTTIVITÀ}} \vec{E} \qquad \sigma = \frac{1}{\rho}$$

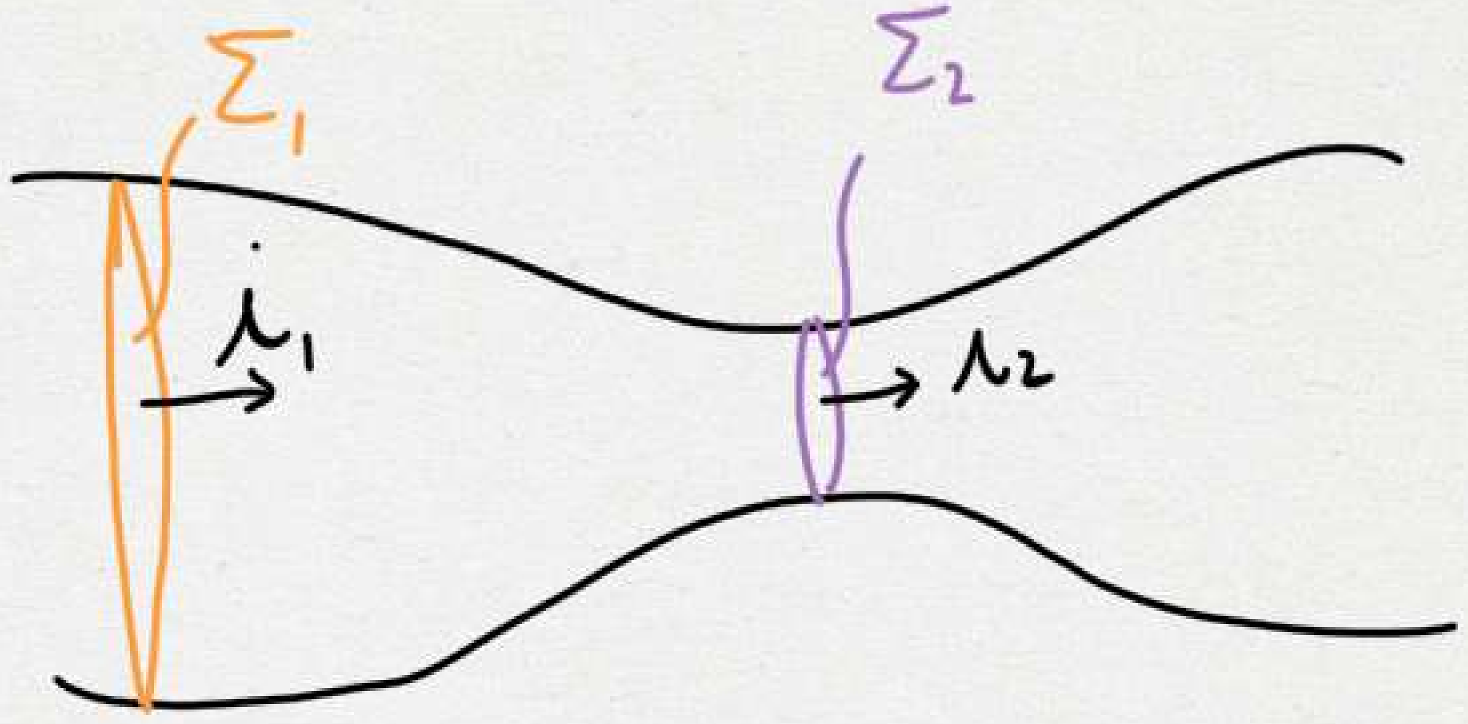
$$\vec{E} = \boxed{\frac{m}{n e^2 \tau}} \vec{J} = \underbrace{\rho}_{\text{RESISTIVITÀ}} \vec{J}$$

PORTATORI

MATERIALE



CORRENTE ELETTRICA STAZIONARIA

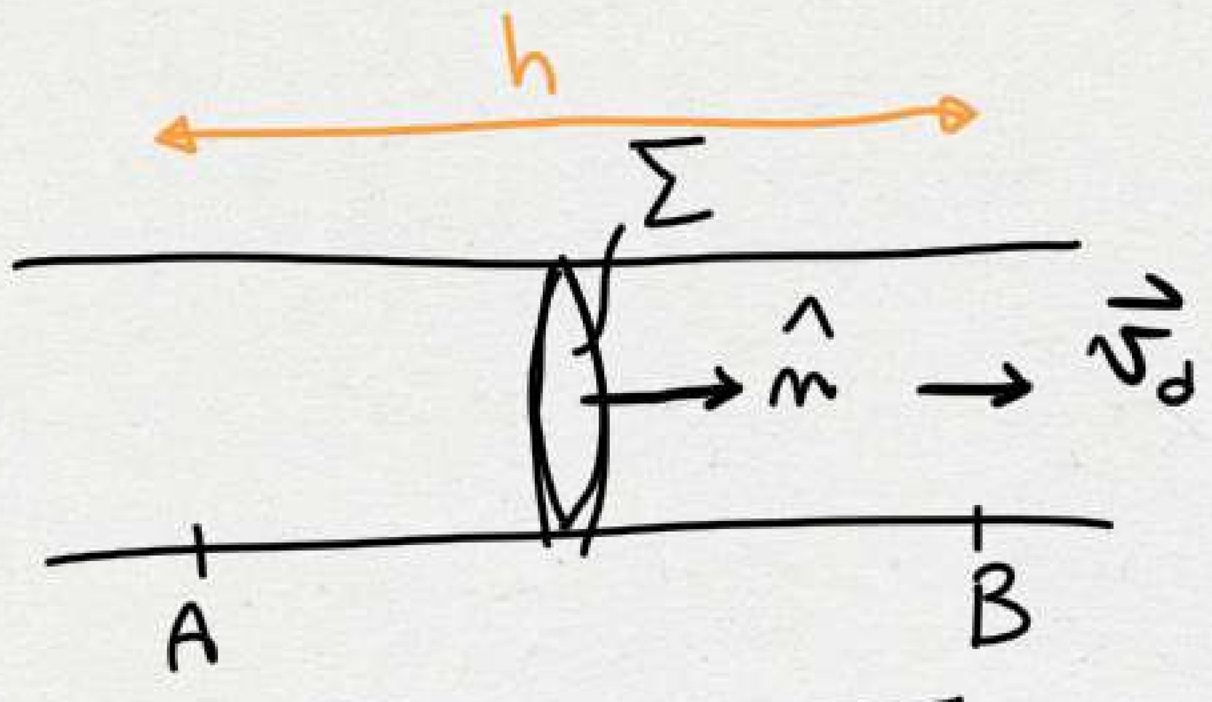


STAZIONARIETÀ

$$i_1 = i_2$$

$$i = \int_\Sigma \vec{J} \cdot n \, d\Sigma \xrightarrow[J \text{ UNIFORME}]{} J\Sigma = i \Rightarrow J = \frac{i}{\Sigma}$$

$$J_1 \Sigma_1 = J_2 \Sigma_2 \Rightarrow \frac{J_1}{J_2} = \frac{\Sigma_2}{\Sigma_1}$$



$$\Delta V = V_B - V_A$$

$$\vec{E} = \rho \vec{J}$$

$$\Delta V = \int_A^B \vec{E}\cdot d\vec{s} = \int_A^B \rho \vec{J}\, d\vec{s} = \rho \int_A^B J\, ds = \rho \int_A^B \frac{i}{\Sigma}\, ds = \frac{\rho i}{\Sigma}\int_A^B ds = \frac{\rho h}{\Sigma}\, i$$

$$\Rightarrow \Delta V = R i \,, \quad R = \frac{\rho h}{\Sigma} \,, \quad \text{GENERICAMENTE} \quad R = \int_A^B \frac{\rho\, ds}{\Sigma}$$

RESISTENZA

OHM

$$[\Delta V] = [R][i] \Rightarrow V = [R]\frac{C}{s} = [R]\, A \Rightarrow [R] = \frac{V}{A} = \Omega$$

$$dW = \Delta V\, dq = \Delta V\, i\, dt \implies$$

$$\frac{dW}{dt} = \Delta V\, i = R i^2 = \frac{\Delta V^2}{R} = P \quad \text{POTENZA}$$

SE VALE LA LEGGE DI OHM

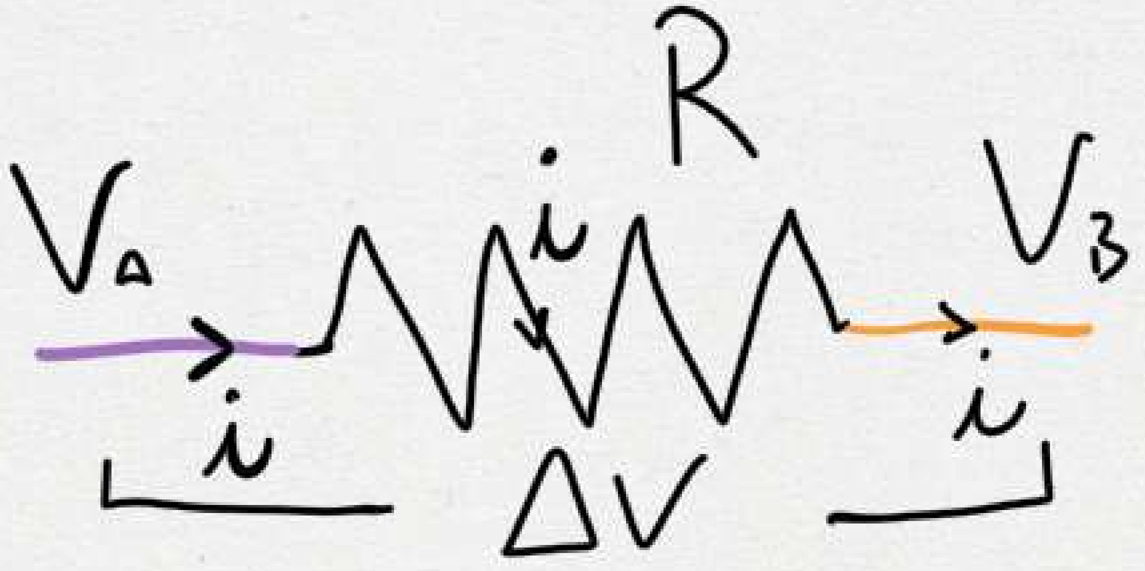
$$[P] = \frac{J}{s} = W \quad \text{WATT}$$

$$\Downarrow$$

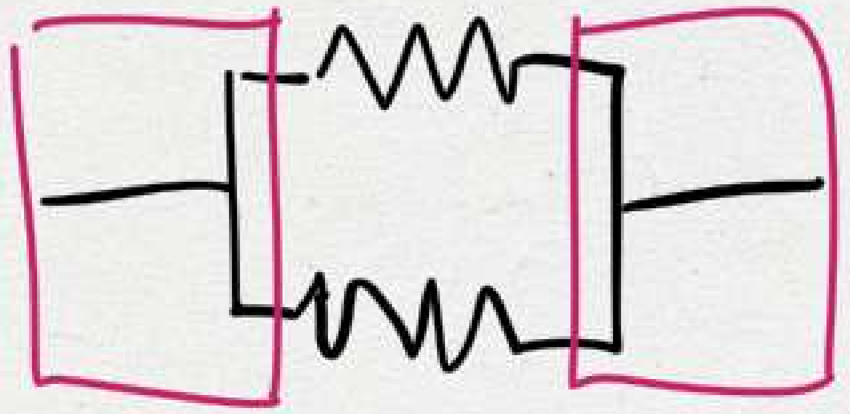
$$W = \int_0^t P\, dt' = \int_0^t R i^2\, dt'$$

RESISTORI / RESISTENZE

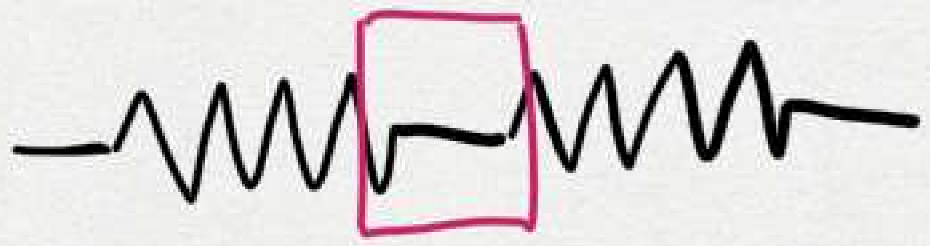
$R \sim 2 \cdot 10^{-4}\ \Omega$



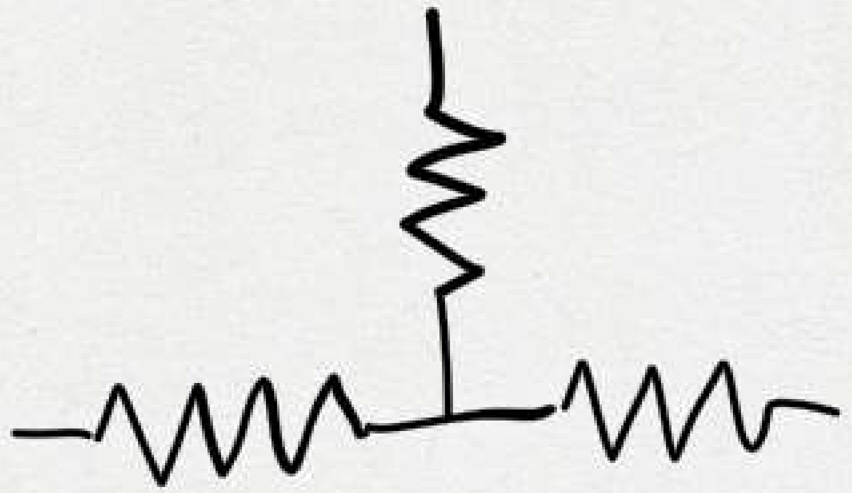
$\Delta V = R i$



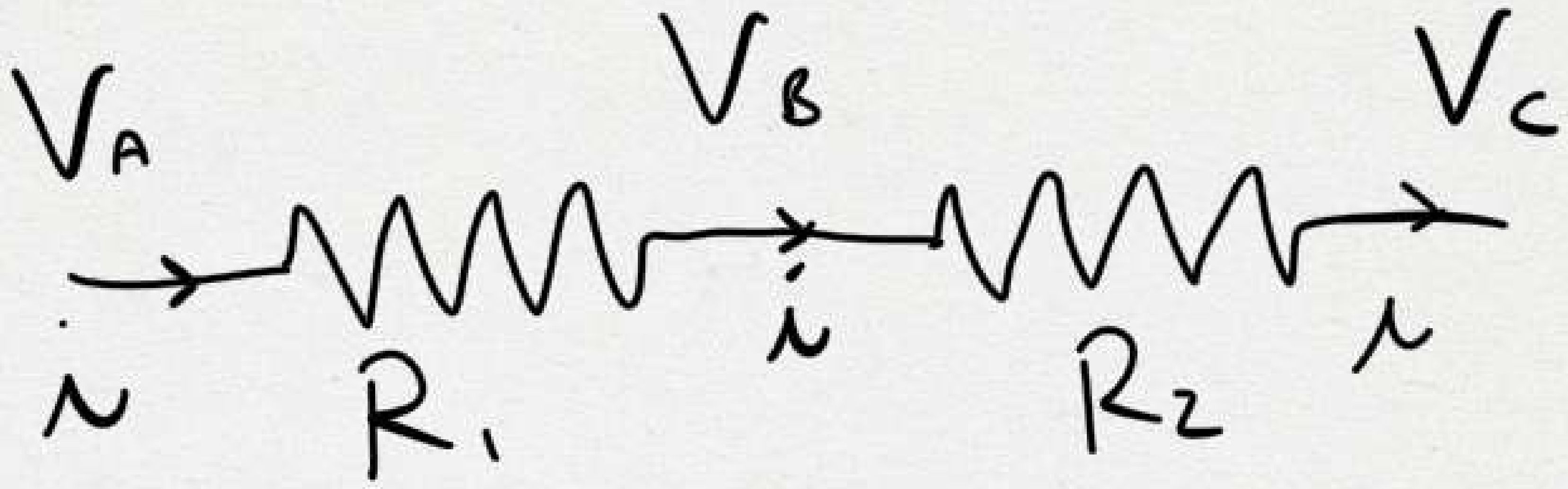
PARALLELO



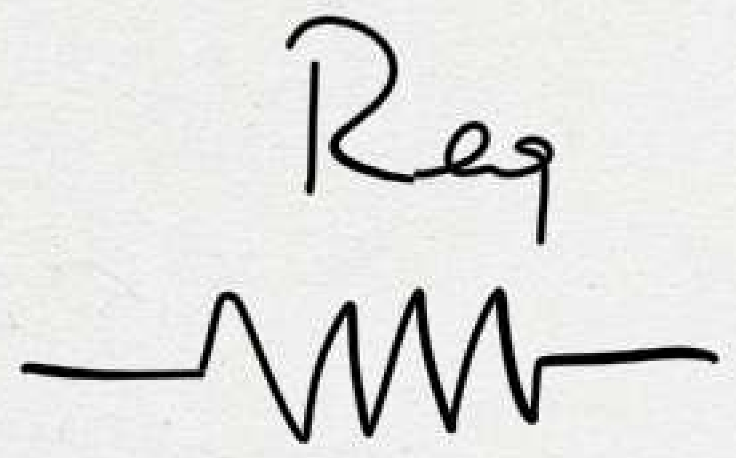
SERIE



SERIE



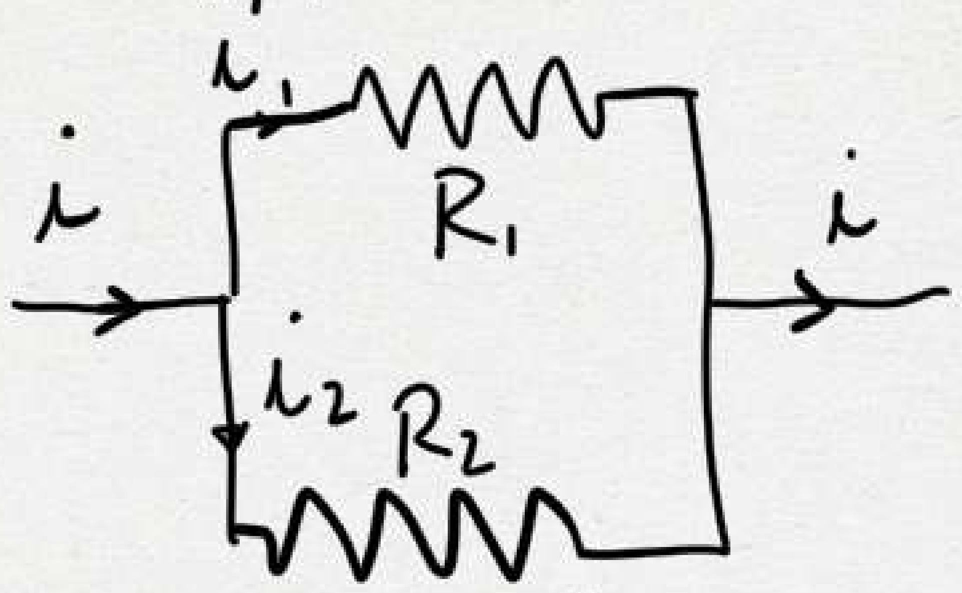
"$=$"



$$V_A - V_C = V_A - V_B + V_B - V_C = \Delta V_1 + \Delta V_2 = R_1 i + R_2 i \Rightarrow$$

$$\Delta V = (R_1 + R_2)\, i = R_{eq}\, i$$

PARALLELO



"$=$" R_{eq}

$$\Delta V = R_1 i_1$$

$$\Delta V = R_2 i_2$$

$$i = i_1 + i_2 = \frac{\Delta V}{R_1} + \frac{\Delta V}{R_2} = \Delta V \left(\frac{1}{R_1} + \frac{1}{R_2} \right) = \frac{\Delta V}{R_{eq}}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} \neq R_{eq}$$