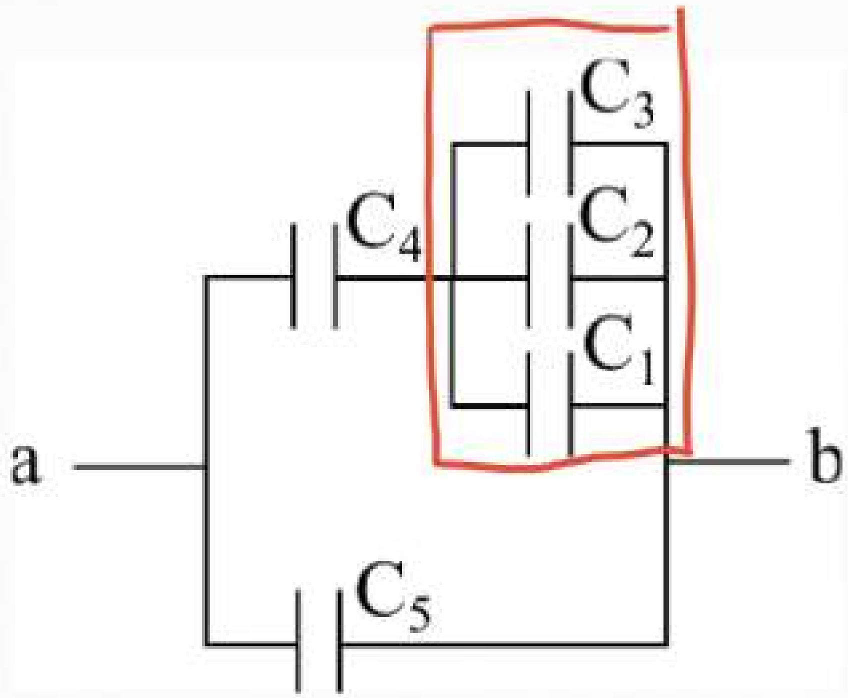
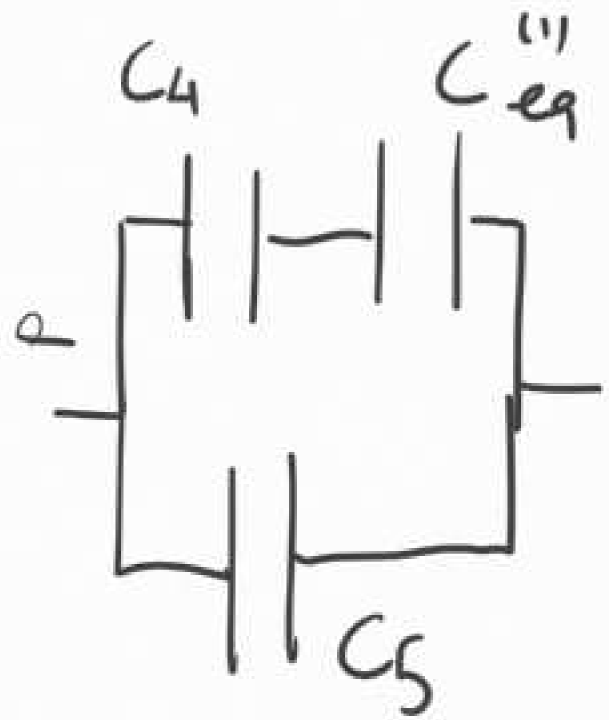
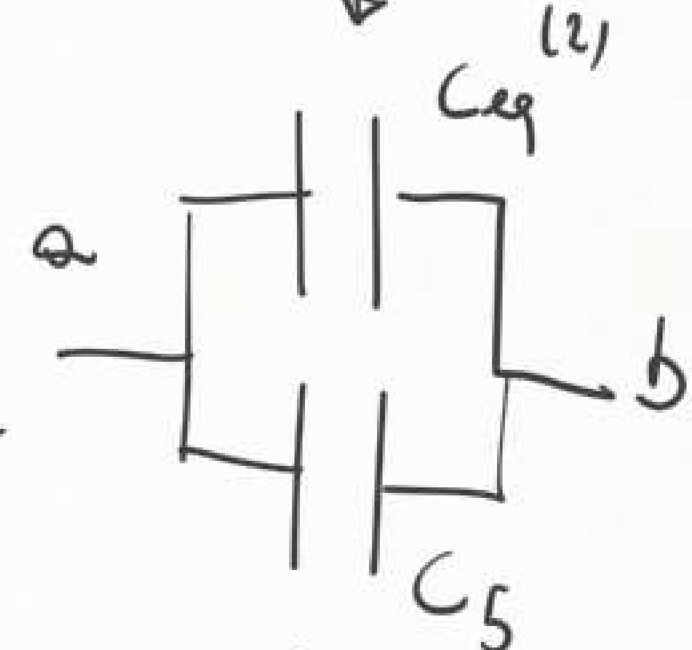


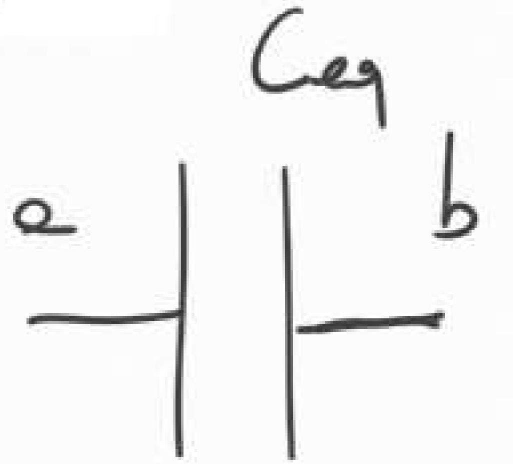
ΔV_{ab}



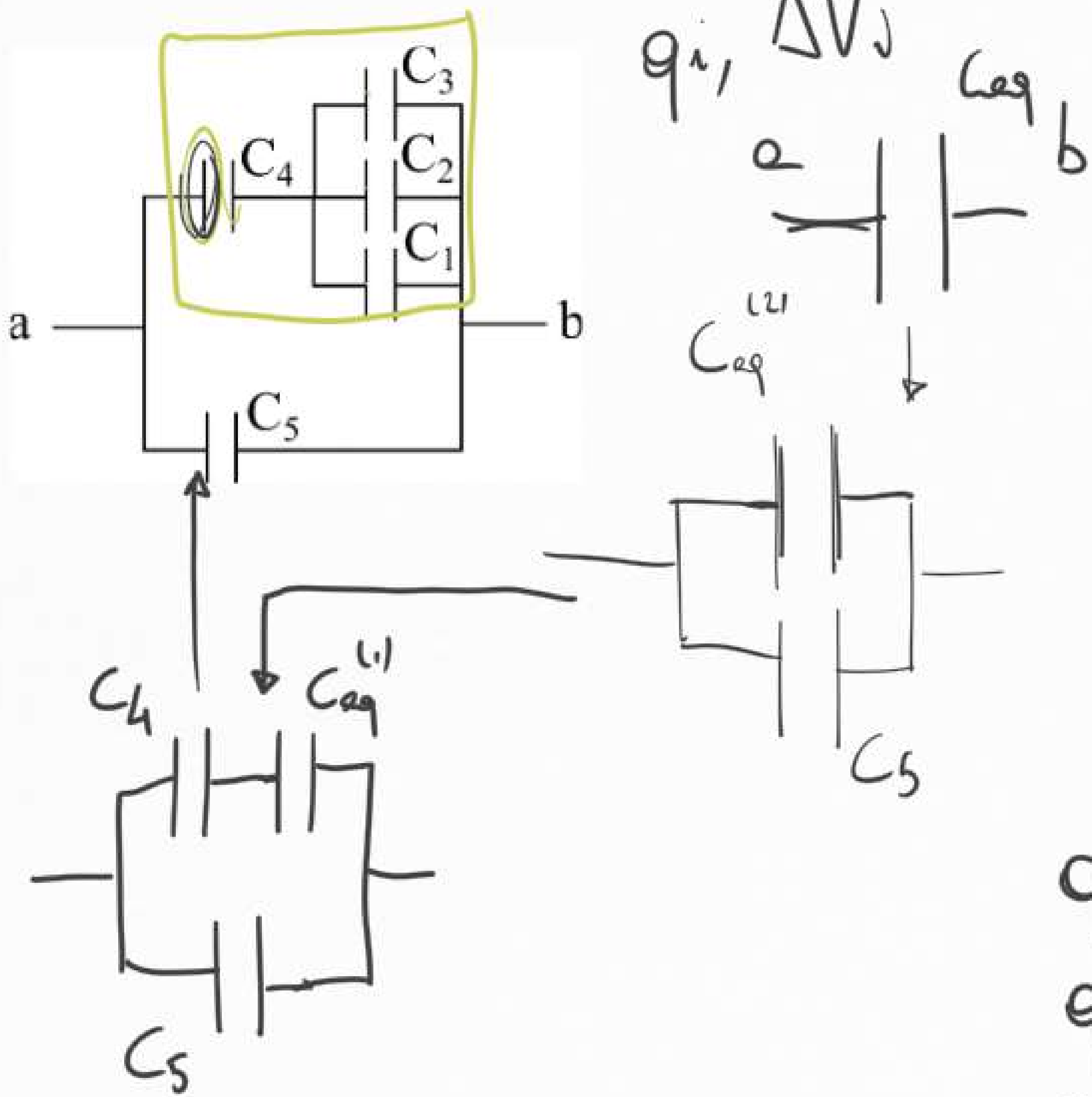
$$C_{eq}^{(1)} = C_1 + C_2 + C_3$$



$$C_{eq}^{(2)} = \frac{C_{eq}^{(1)} C_4}{C_{eq}^{(1)} + C_4}$$



$$C_{eq} = C_5 + C_{eq}^{(2)}$$



$$q_{eq} = C_{eq} \Delta V_{ab}$$

$$q_5 = C_5 \Delta V_{ab}$$

$$q_{eq}^{(2)} = q_{eq} - q_5 = q_4$$

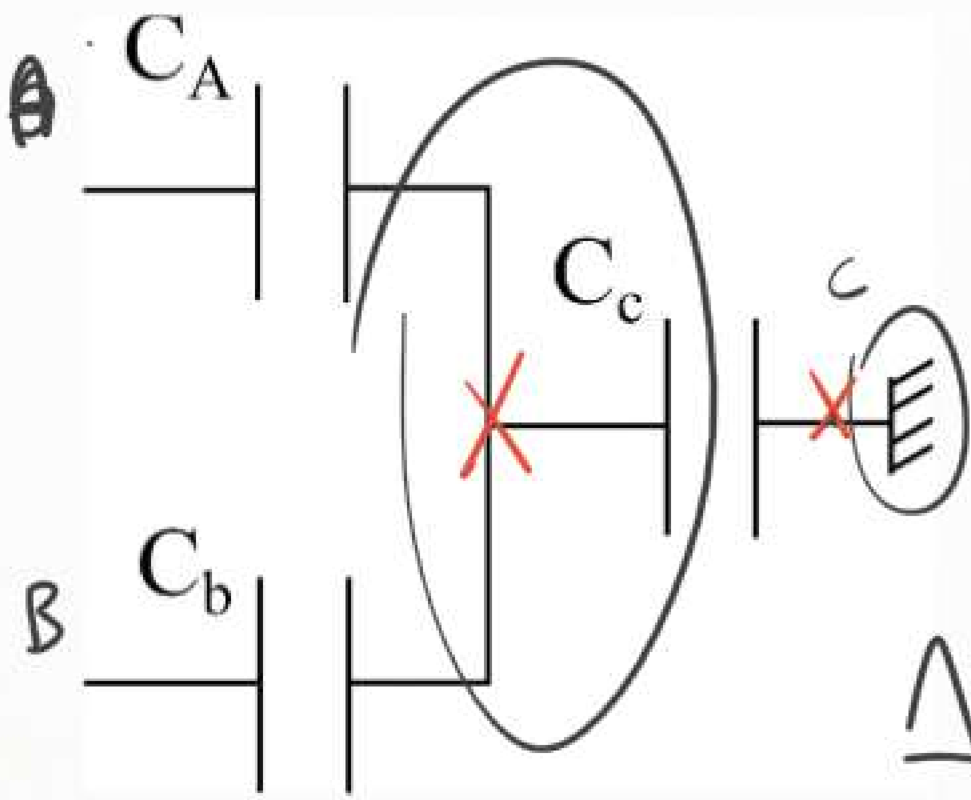
$$\Delta V_4 = \frac{q_4}{C_4}$$

$$\boxed{\Delta V_{eq}^{(1)}} = \frac{q_{eq}^{(1)}}{C_{eq}^{(1)}} = \frac{q_4}{C_{eq}^{(1)}}$$

$$q_1 = C_1 \Delta V_{eq}^{(1)}$$

$$q_2 = C_2 \Delta V_{eq}^{(1)}$$

$$q_3 = C_3 \Delta V_{eq}^{(1)}$$



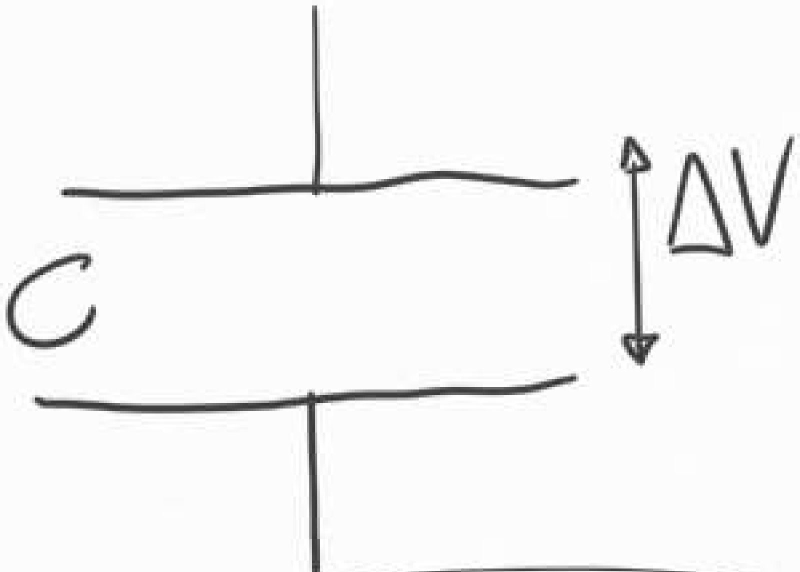
$$C_A = C, \quad C_B = 2C, \quad C_c = 3C$$

$$V_A = 10\,V, \quad V_B = 40\,V$$

$$\Delta V_c = ?$$

$$\Delta V_A = V_A - V_c = \cancel{V_A}$$

$$\Delta V_B = V_B - V_c = \cancel{V_B}$$

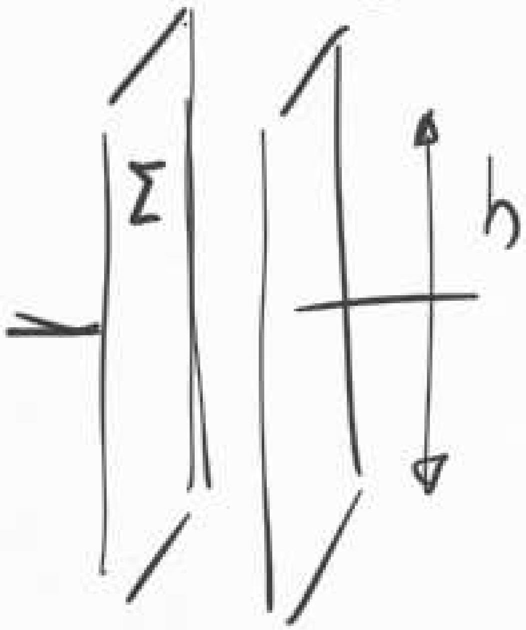


$$dW_{ext} = \Delta V \, dq = \frac{q}{C} \, dq \Rightarrow$$

$$\int_0^q \frac{q'}{C} \, dq' = \boxed{\frac{1}{2} \frac{q^2}{C} = \frac{1}{2} q \Delta V = \frac{1}{2} C \Delta V^2} = U_e$$

$$\boxed{\frac{1}{2} q \Delta V} \neq q \Delta V$$

$$U_e = \frac{1}{2} C \Delta V^2 = \frac{1}{2}\frac{\varepsilon_0 \Sigma}{\cancel{h}} E^2 h^{\cancel{2}} = \frac{1}{2}\varepsilon_0 E^2 \underbrace{\Sigma h}_{=\tau} =$$



$$= \underbrace{\frac{1}{2}\varepsilon_0 E^2}\tau = \boxed{u_e \tau} \Rightarrow$$

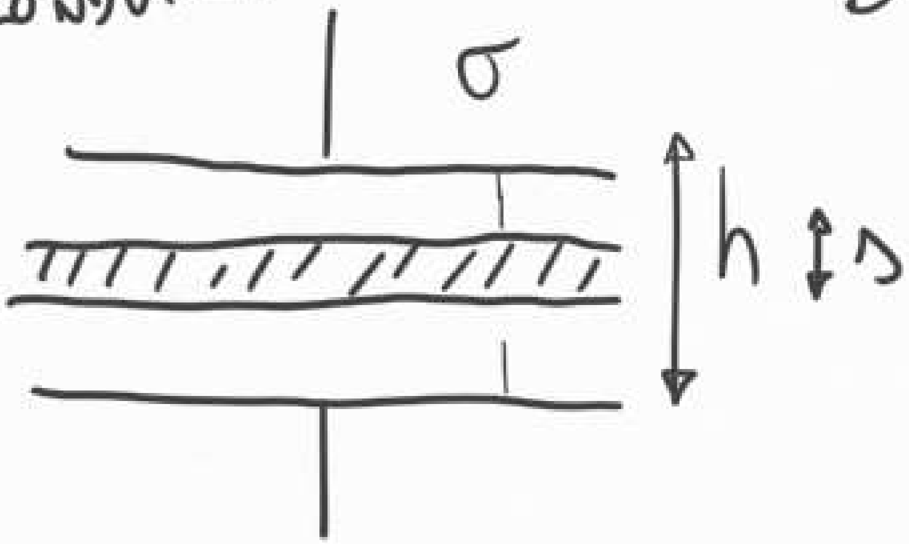
$$\boxed{u_e = \frac{1}{2}\varepsilon_0 E^2} \Rightarrow \boxed{U_e = \int_\tau u_e \, d\tau}$$

U_e per un condensatore sferico:

$$\left[U_e = \frac{1}{2} C \Delta V^2 = \int_\tau u_e \, d\tau = \frac{1}{2}\varepsilon_0 \int_\tau \bar{E} \, d\tau \right]$$

DIELETTRICI

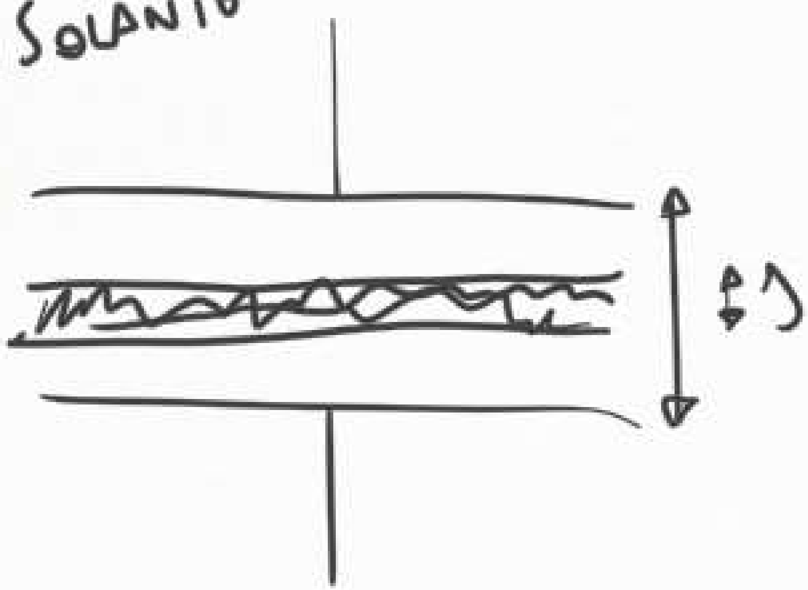
CONDUTTORE



$$\Delta V_0 = \frac{\sigma}{\varepsilon_0} h = E_0 h$$

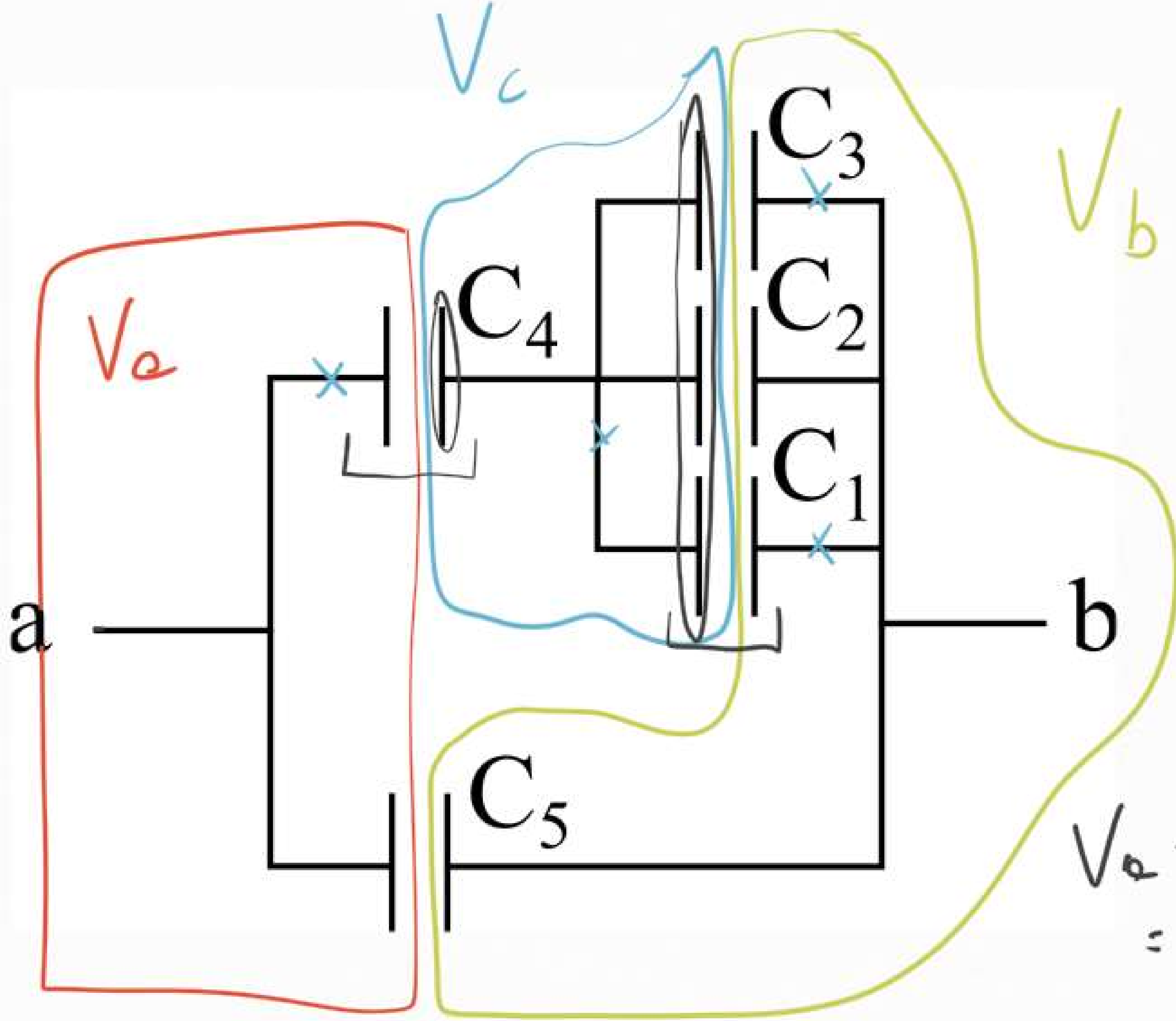
$$\Delta V = \frac{\sigma}{\varepsilon_0}(h - s) = -\int_0^h E \, dx$$

ISOLANTE



$$\Delta V_i < \Delta V_0$$

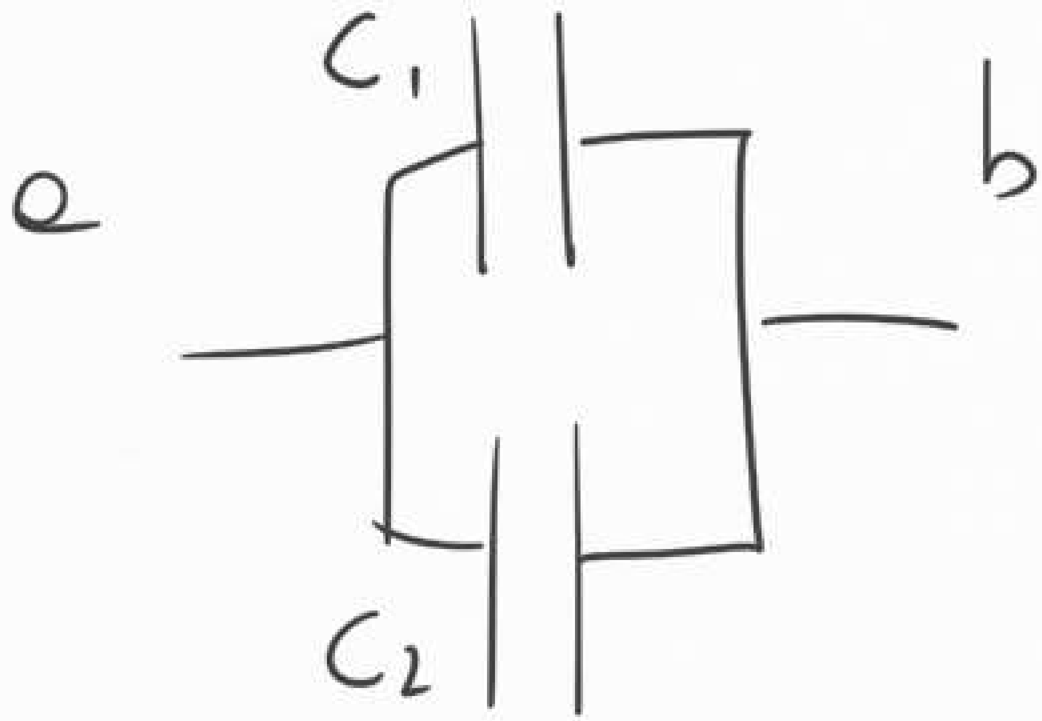
$$\Delta V_i > \Delta V$$



$V_a - V_b$

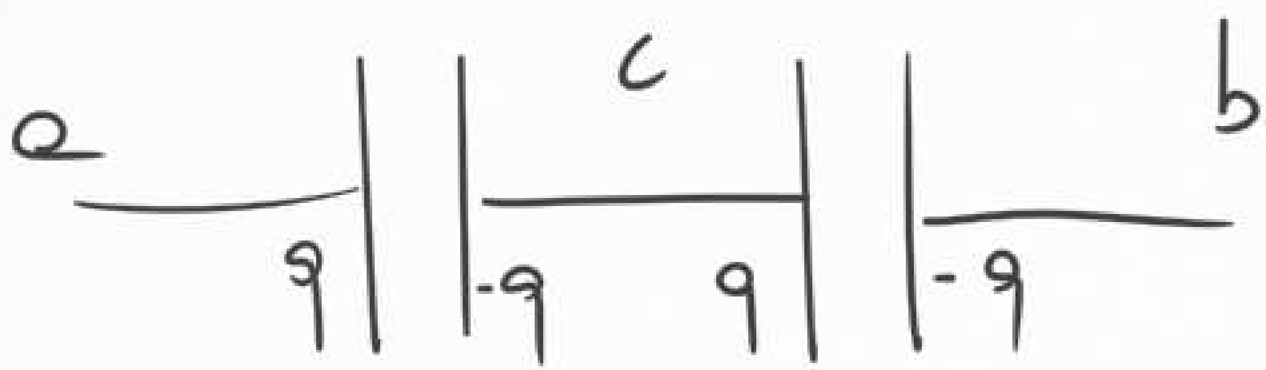
$V_a - V_c + V_c - V_b =$

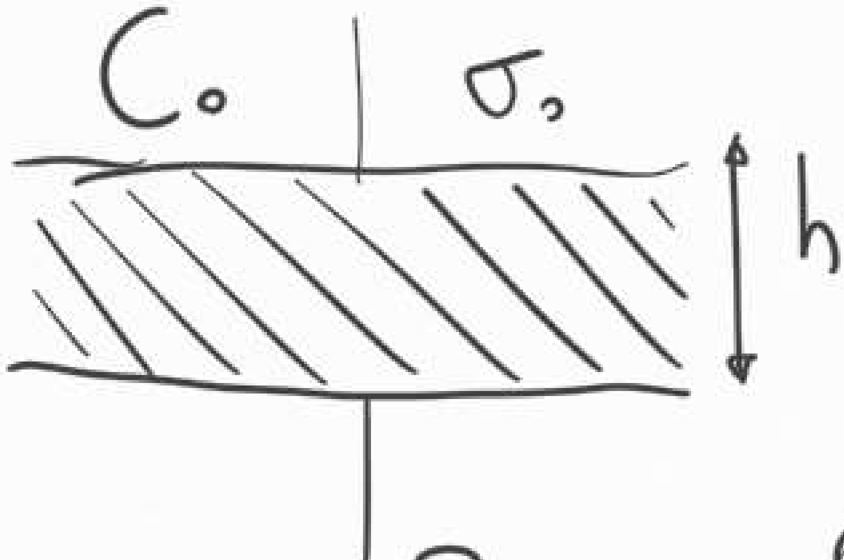
$= V_a - V_b$



$q_1 = C_1 \Delta V$

$q_2 = C_2 \Delta V$





$$\Delta V = \frac{\Delta V_0}{K} = \frac{E_0 h}{k} = E h$$

K → COSTANTE DIELETTRICA $\boxed{\text{RELATIVA}}$

$k > 1$, $K_{aria} = 1{,}004$

$K_{acqua} \simeq 80$

$$C = \frac{q_0}{\Delta V} = K \frac{q_0}{\Delta V_0} = k C_0$$

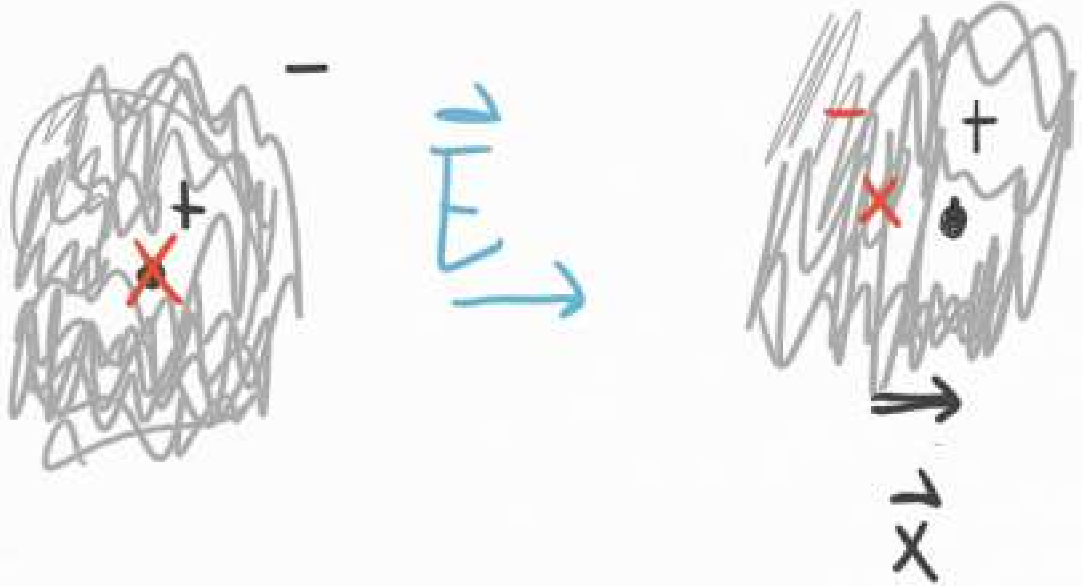
$$E = \frac{E_0}{k} = \frac{\sigma_0}{\varepsilon_0 k},$$

$$E_0 - E = \frac{\sigma_0}{\varepsilon_0}\left(1 - \frac{1}{k}\right) = \frac{\sigma_0}{\varepsilon_0}\,\frac{k-1}{k} = \frac{\sigma_0}{\varepsilon_0}\,\frac{\chi}{\chi+1}$$

$\chi \equiv k - 1$ SUSCETTIVITÀ DIELETTRICI

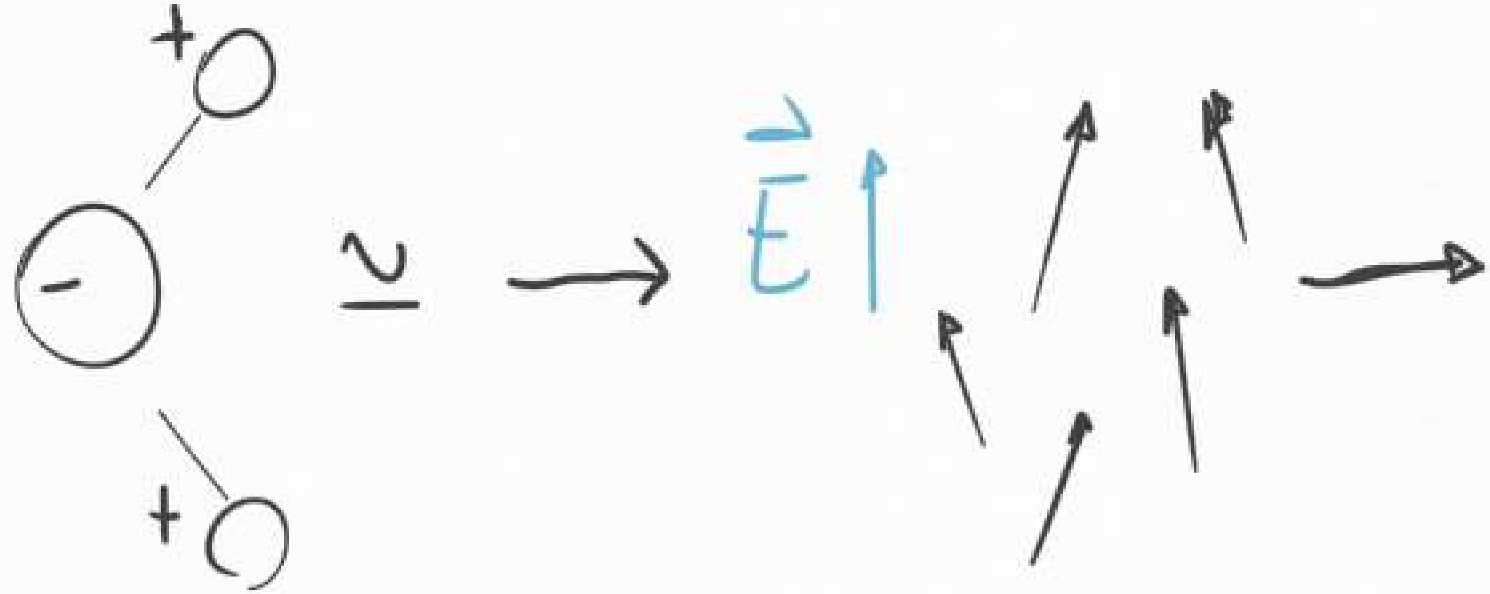
$$E = \underbrace{\frac{\sigma_0}{\varepsilon_0}}_{} - \underbrace{\frac{k-1}{k}\,\frac{\sigma_0}{\varepsilon_0}}_{} = \frac{\sigma_0}{\varepsilon_0} - \frac{\sigma_p}{\varepsilon_0}, \quad \boxed{\sigma_p \equiv \frac{k-1}{k}\sigma_0} < \sigma_0$$

1



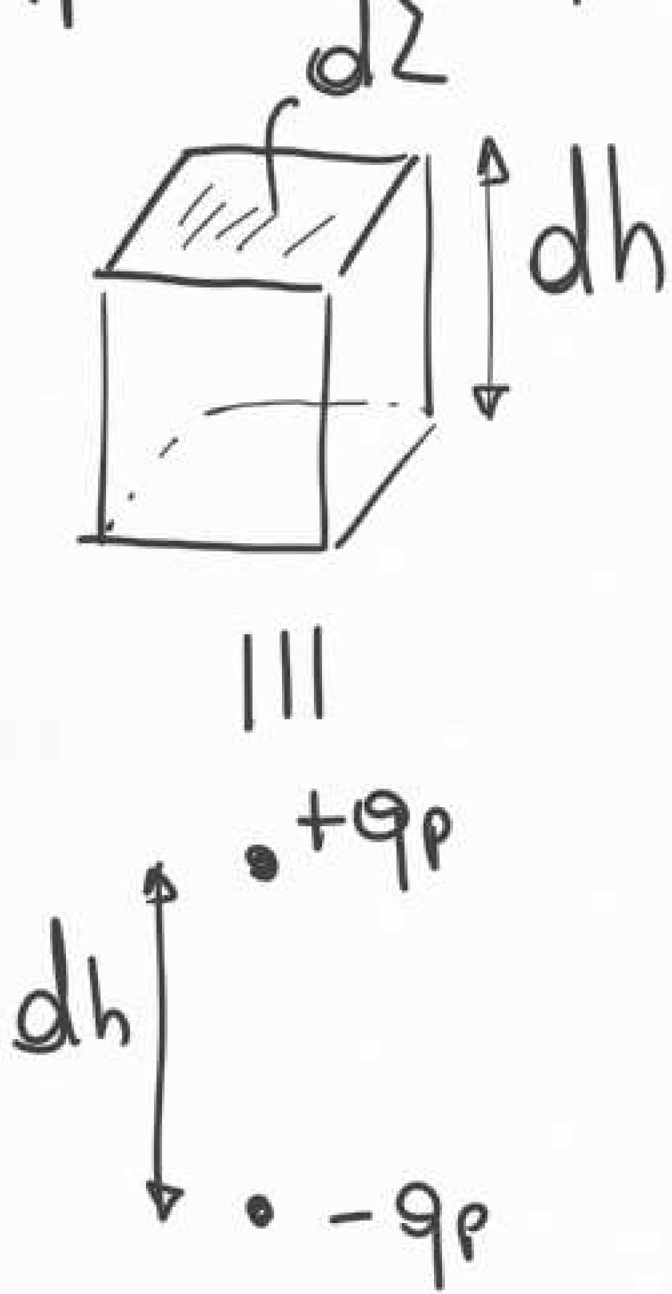
$$Ze\vec{x} = \vec{p} \parallel \vec{E}$$

2



$$\langle \vec{p} \rangle \parallel \vec{E}$$

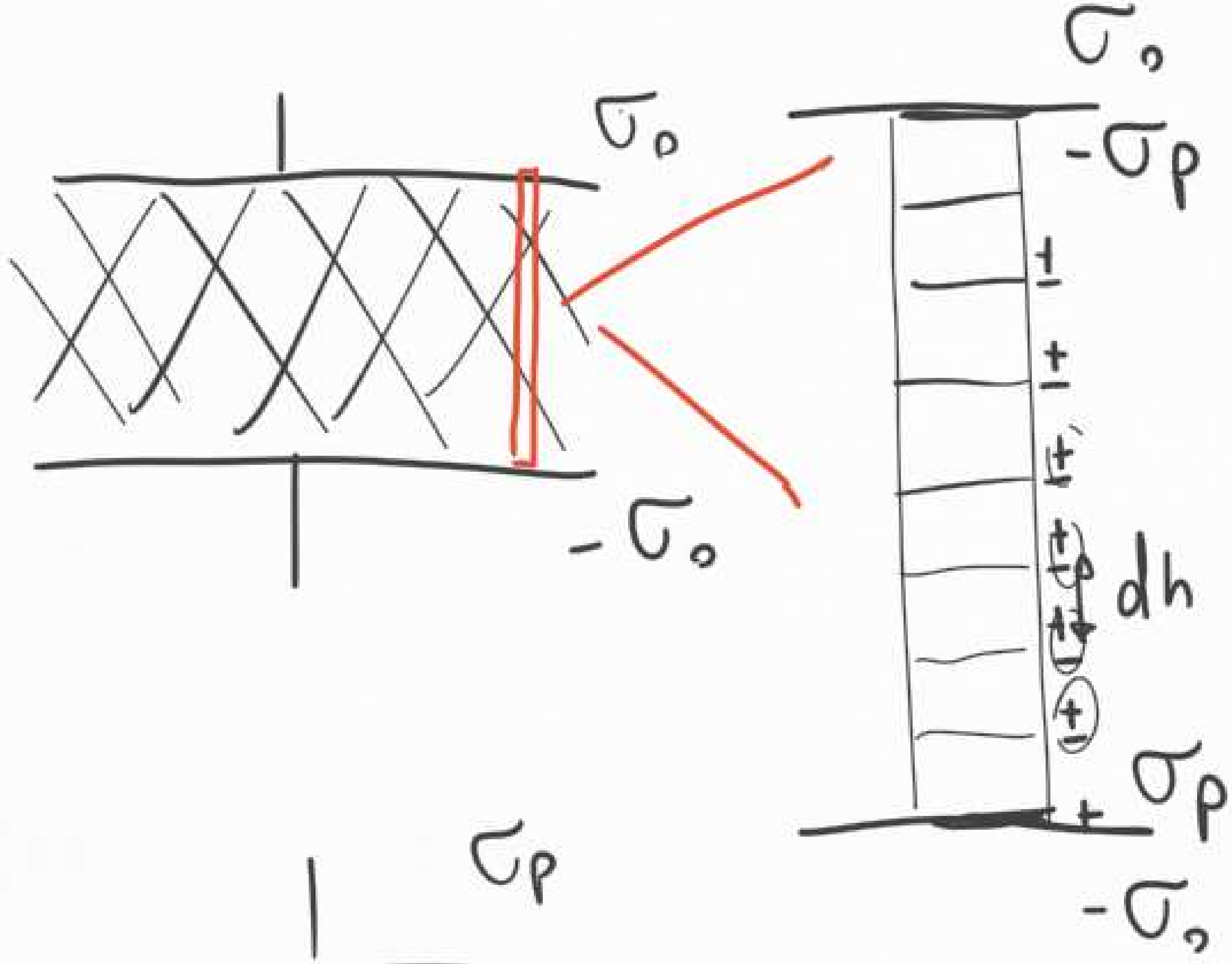
$$\langle \vec{p} \rangle \to N \langle \vec{p} \rangle \Rightarrow \quad \vec{P} \equiv \frac{N \langle \vec{p} \rangle}{\tau} \,/\!/\, \vec{E}$$



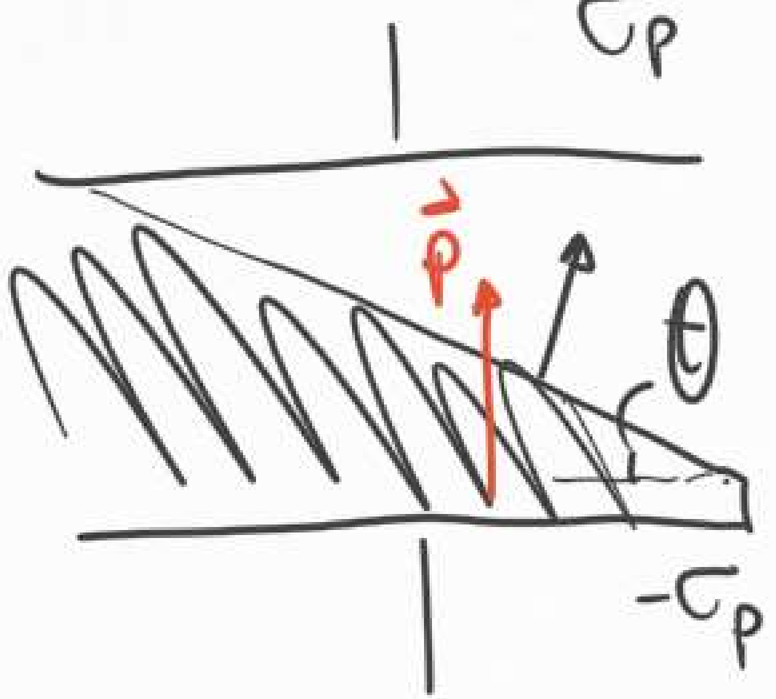
$$\vec{p} = \vec{P}\, d\tau = \underbrace{\vec{P}\, d\Sigma}\, dh \to$$

$$\boxed{p = \underbrace{P\, d\Sigma}\, \underbrace{dh}},$$

$$q_p = P\, d\Sigma \Rightarrow \sigma_p = \frac{q_p}{d\Sigma} = P$$



$$\pm\sigma_p = \pm P$$



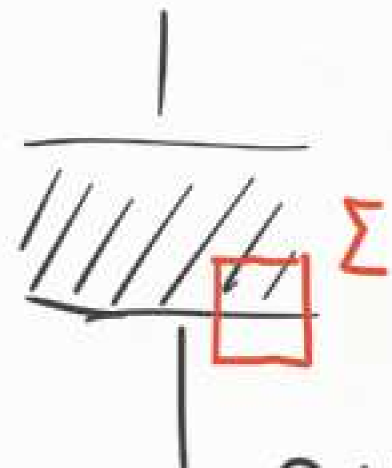
$E_0 \qquad \approx \vec{P}$

$$\boxed{\sigma_p = \vec{P}\cdot\hat{n}} \quad , \quad \boxed{\frac{\sigma_0}{\varepsilon_0} - \frac{\sigma_p}{\varepsilon_0} = E}$$

$$E = E_0 - \frac{\sigma_p}{\varepsilon_0} = \frac{\sigma_0}{\varepsilon_0} - \frac{\sigma_p}{\varepsilon_0} \Longrightarrow$$

$$\boxed{\vec{P} = \varepsilon_0(\kappa - 1)\vec{E} = \varepsilon_0 \chi \vec{E}}$$

DIELETTRICI LINEARI



$$\oint_\Sigma \vec{E}\cdot\hat{n}\, d\Sigma = \frac{q_0 + q_p}{\varepsilon_0} =$$

$$= \int_\Sigma \left(\kappa\vec{E} - \frac{\vec{P}}{\varepsilon_0}\right)\cdot\hat{n} = \underbrace{\int_\Sigma \kappa\vec{E}\cdot\hat{n}\, d\Sigma}_{\frac{q}{\varepsilon_0}} - \underbrace{\int_\Sigma \frac{\vec{P}}{\varepsilon_0}\cdot\hat{n}\, d\Sigma}_{\frac{q_p}{\varepsilon_0}} = \frac{q + q_p}{\varepsilon_0}$$

$$E = \frac{E_0}{k} \Rightarrow E_0 = kE$$

$$\int_{\Sigma} \vec{E}_0 \cdot \hat{n}\, d\Sigma - \int_{\Sigma} \frac{\vec{P}}{\varepsilon_0} \cdot \hat{n}\, d\Sigma = \frac{q + q_P}{\varepsilon_0} \Rightarrow$$

$$-\int_{\Sigma} \vec{P} \cdot \hat{n}\, d\Sigma = q_P \Rightarrow$$

$$\boxed{\oint (\varepsilon_0 \vec{E} + \vec{P}) \cdot \hat{n}\, d\Sigma = q}$$