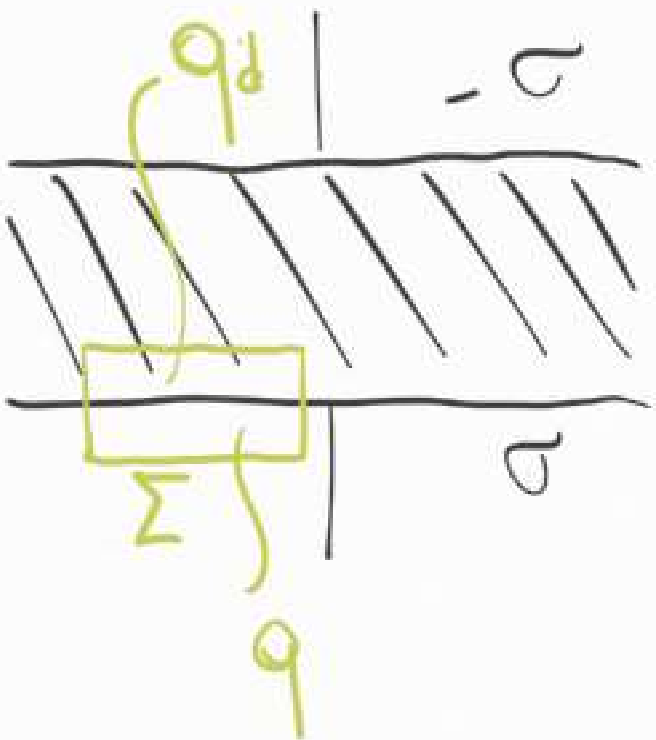


$$\Phi_\Sigma(\vec{E}) = \frac{q+q_d}{\varepsilon_0} \Rightarrow \boxed{\varepsilon_0 \Phi_\Sigma(\vec{E}) = q + q_d}$$

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

$$\varepsilon_0 \Phi_\Sigma(\vec{E}) = \underbrace{\varepsilon_0\kappa\,\Phi_\Sigma(\vec{E})} - \underbrace{\Phi_\Sigma(\vec{P})} = \underbrace{q} + \underbrace{q_d}$$

$$\Rightarrow \Phi_\Sigma(\vec{P}) = -q_d \Rightarrow$$

$$\varepsilon_0 \Phi_\Sigma(\vec{E}) + \Phi_\Sigma(\vec{P}) = q \Rightarrow$$

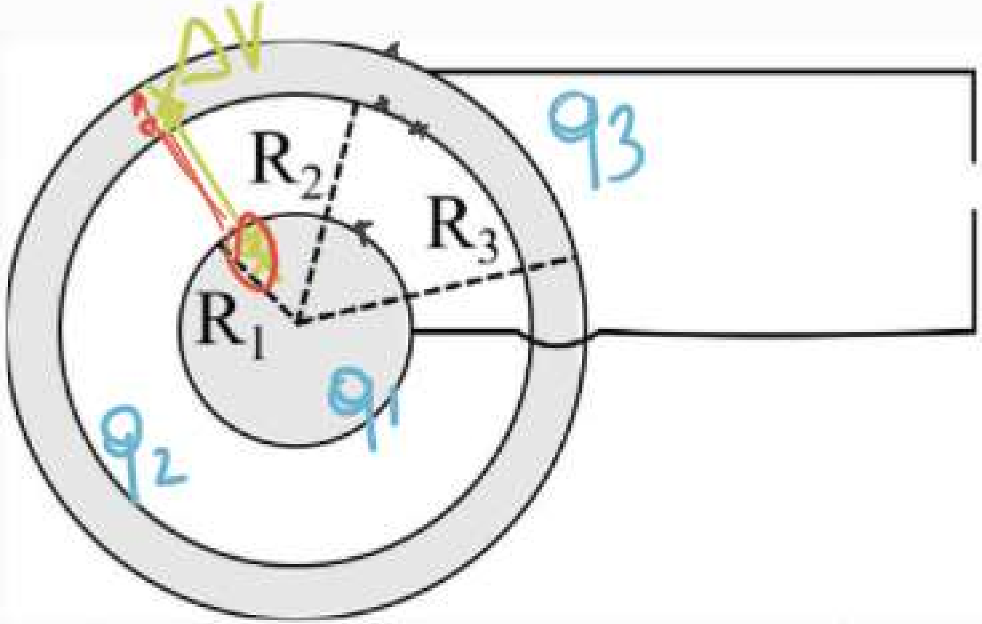
$$\Phi_\Sigma(\varepsilon_0\vec{E} + \vec{P}) = q \Rightarrow \boxed{\vec{D} = \varepsilon_0\vec{E} + \vec{P}}$$

VETTORE
INDUZIONE
DIELETTRICA

$$\boxed{\Phi_\Sigma(\vec{D}) = q}$$

$$\vec{D} = \varepsilon_0 \vec{E} + \vec{P} = \cancel{\varepsilon_0 \vec{E}} + \varepsilon_0 (\kappa - \cancel{1}) \vec{E} = \varepsilon_0 \kappa \vec{E} \equiv \varepsilon \vec{E}$$

$$\boxed{\varepsilon \equiv \varepsilon_0 \kappa} \Rightarrow \boxed{\vec{E} = \frac{\vec{D}}{\varepsilon}}$$

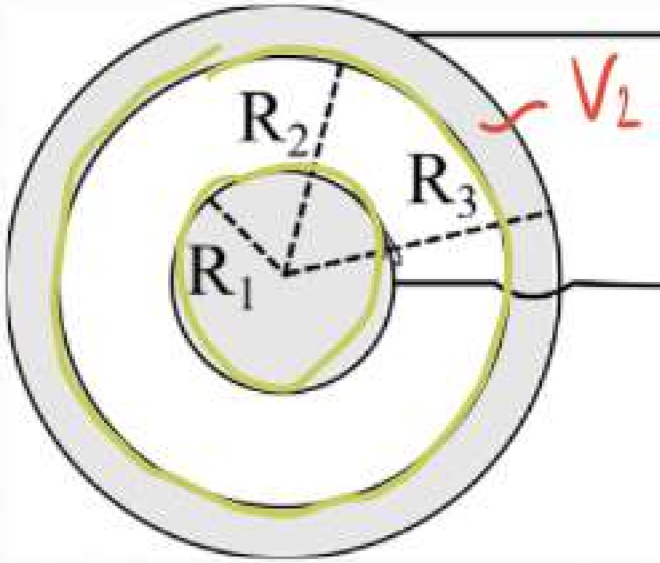


$\Delta V = V_1 - V_2$, $\Delta V = -\int_{R_2}^{R_1} \vec{E} \cdot d\vec{s}$

1) $q_1, q_2, q_3 = ?$

$$\rightarrow \Delta V = \frac{1}{4\pi\varepsilon_0}\left(\frac{q_1}{R_2} - \frac{q_1}{R_1}\right) = \frac{q_1}{4\pi\varepsilon_0}\left(\frac{1}{R_2} - \frac{1}{R_1}\right) \Rightarrow$$

$$\rightarrow \begin{cases} q_1 = C_1 \Delta V = \dfrac{R_2 R_1}{R_2 - R_1} 4\pi\varepsilon_0 \Delta V \\ q_2 = -q_1 \end{cases}$$

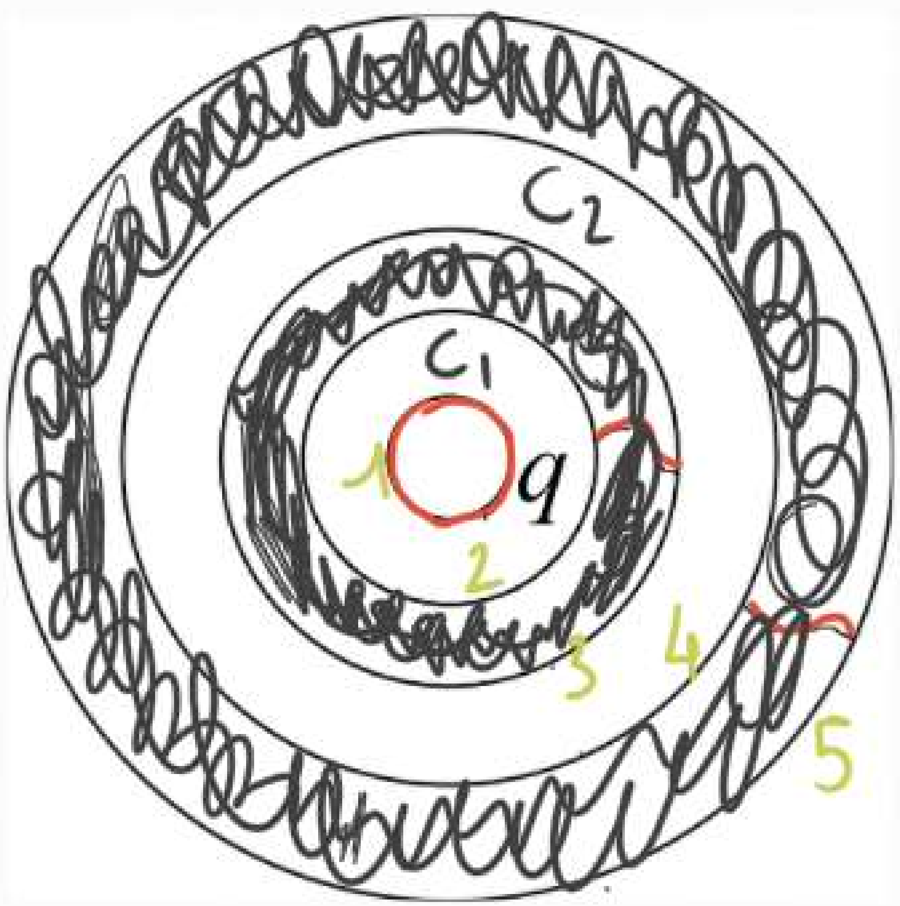


$$\Delta V = V_1 - V_2$$

$$V_2 = \frac{q_3}{4\pi\varepsilon_0}\,\frac{1}{R_3} \Rightarrow \boxed{q_3 = 4\pi\varepsilon_0 R_3 V_2}$$

$$C = 4\pi\varepsilon_0 \frac{R_3 R_\infty}{R_\infty - R_3} \xrightarrow[R_\infty \to \infty]{} 4\pi\varepsilon_0 R_3 \Rightarrow$$

$$q_3 = C_3 V_2$$



$q_i = ?$, $\bar{E}(r) = ?$, $U_e = ?$

$q_1 = q$, $q_2 = -q$, $q_3 = q$,

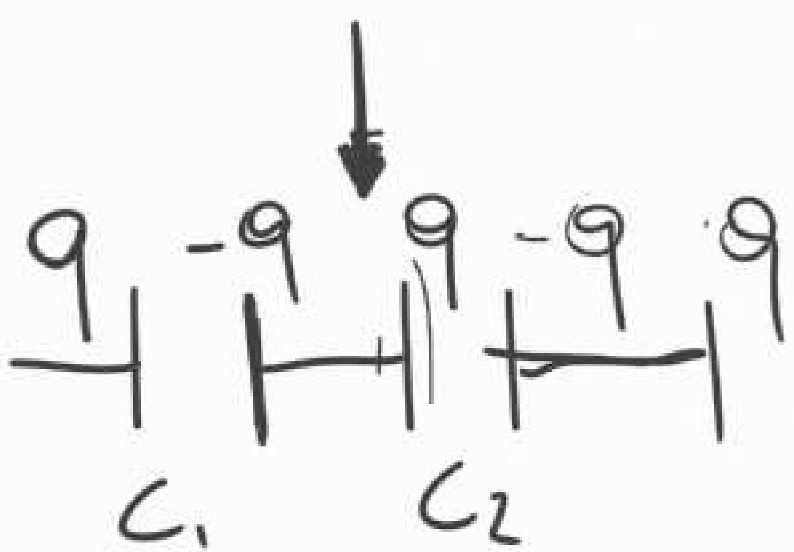
$q_4 = -q$, $q_5 = q$

$$E(r) = \frac{q}{4\pi\varepsilon_0}\frac{1}{r^2}$$

$R_2 > r > R_1$

$R_4 > r > R_3$

$r > R_5$

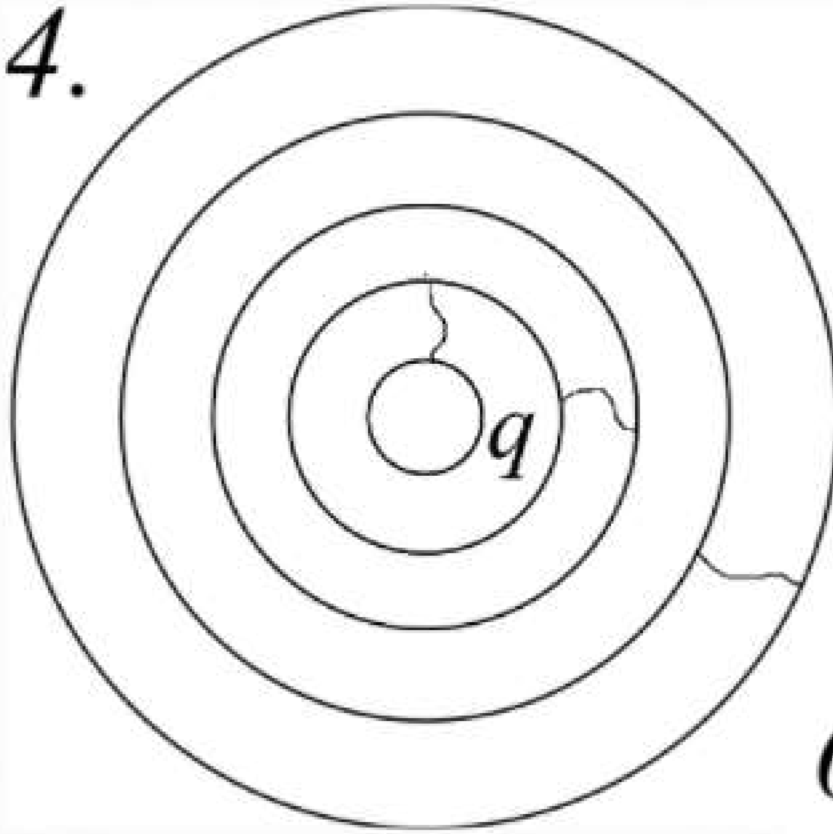


$$U_e = \frac{1}{2} C \Delta V^2 = \boxed{\frac{1}{2}\frac{q^2}{C}}$$

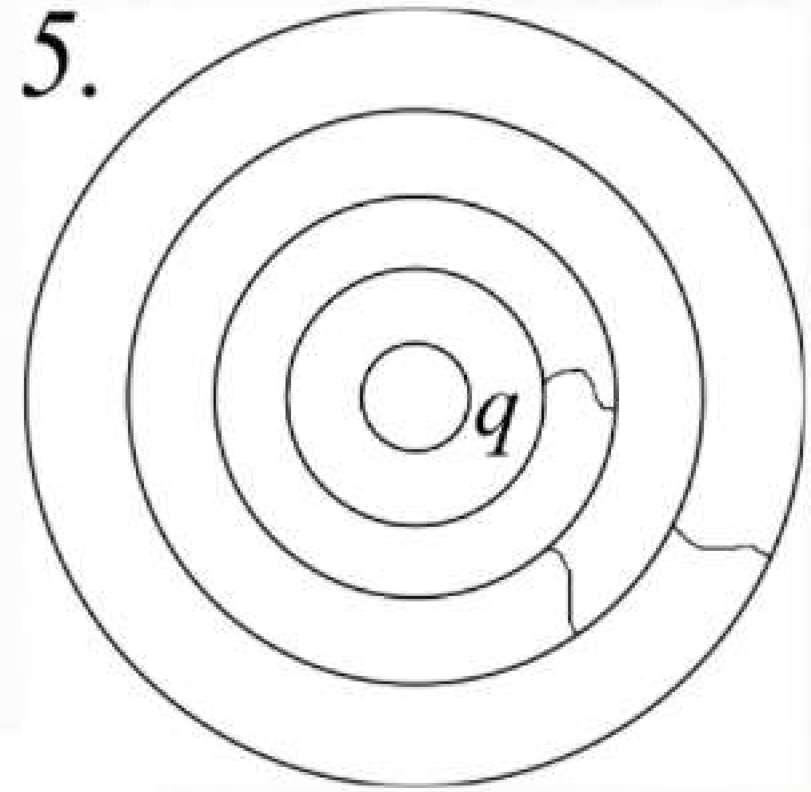
$$\Rightarrow U_e = U_e^{(1)} + U_e^{(2)} + U_e^{(3)} = \frac{1}{2}\frac{q^2}{C_1} + \frac{1}{2}\frac{q^2}{C_2} + \frac{1}{2}\frac{q^2}{C_3}$$

$$\begin{cases} C_1 = 4\pi\varepsilon_0 \dfrac{R_1 R_2}{R_2 - R_1} \\ C_2 = 4\pi\varepsilon_0 \dfrac{R_3 R_4}{R_4 - R_3} \\ \boxed{C_3 = 4\pi\varepsilon_0 R_5} \end{cases}$$

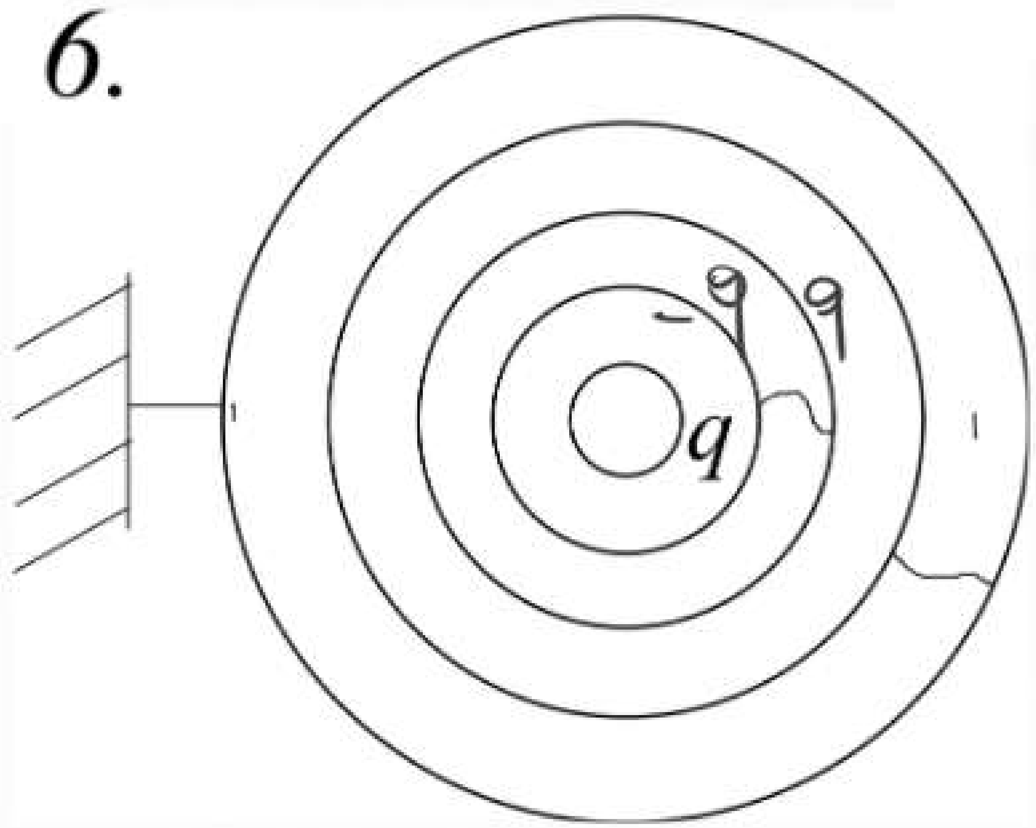
4.

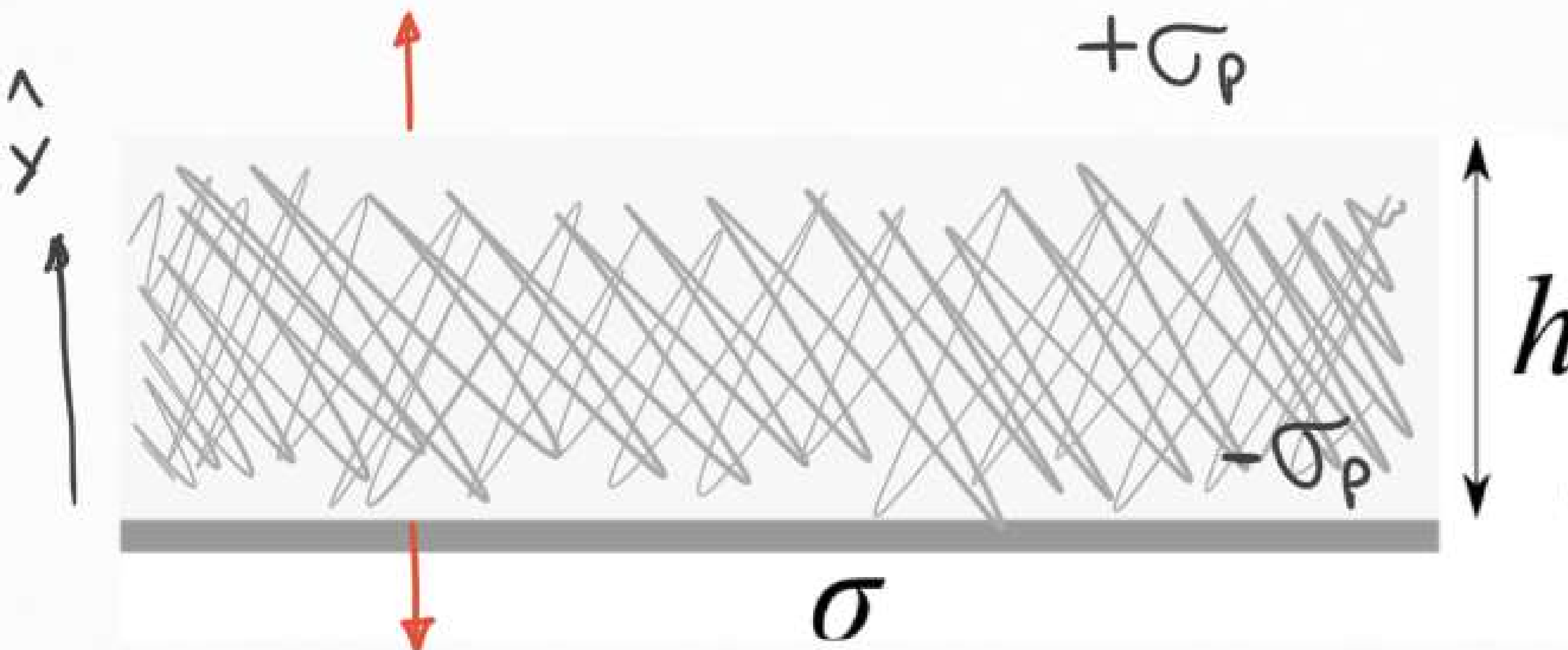


5.



6.





1) σ_p

2) $\Delta V(x)$

$\sigma > 0$, $\sigma_p > 0$

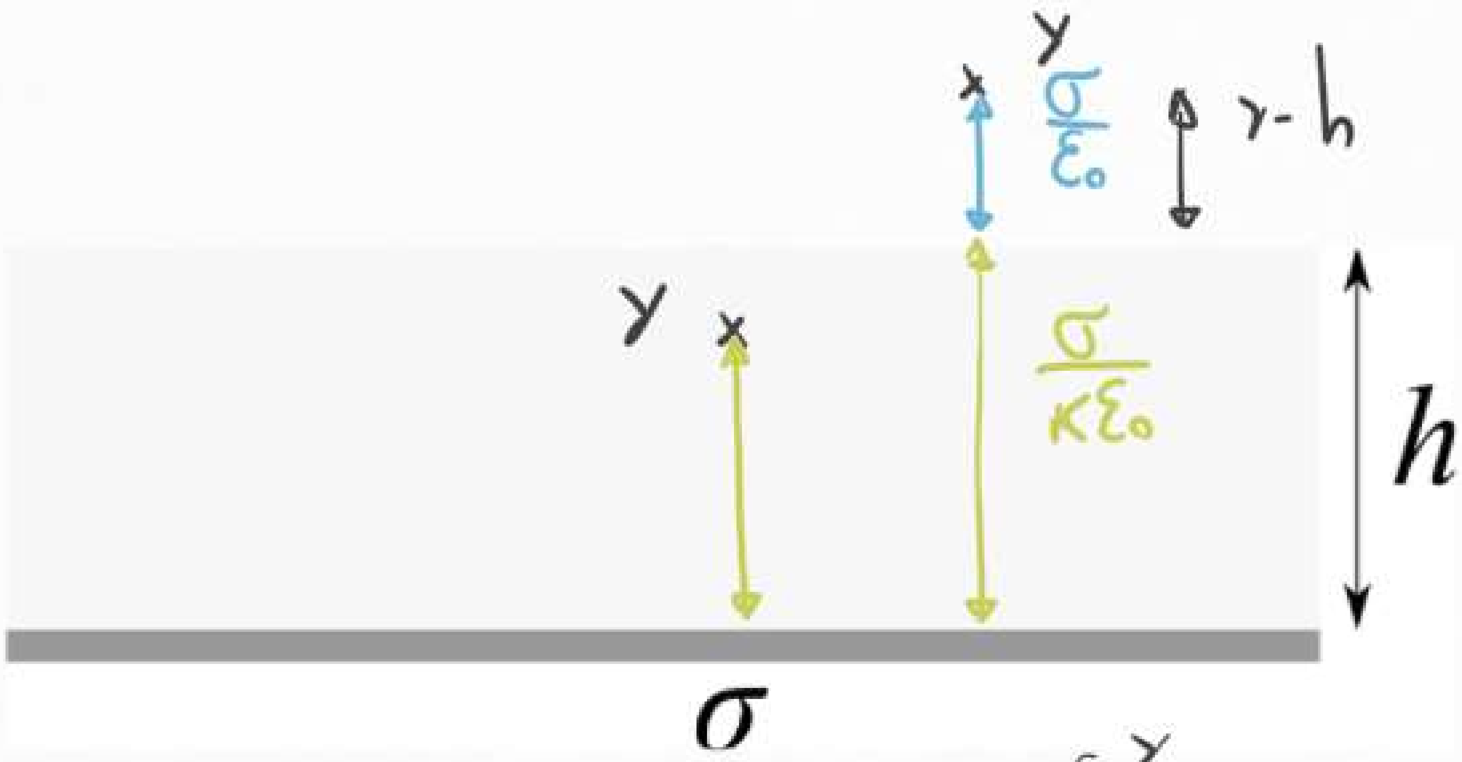
$$\vec{P} \cdot \hat{n} = \sigma_p \quad , \quad \vec{P} = \underbrace{\varepsilon_0 (K-1)}\, \vec{E} = \cancel{\varepsilon_0} (K-1) \boxed{\frac{\sigma}{K \cancel{\varepsilon_0}}}^{\text{"}E\text{"}} \hat{y}$$

IN BASSO

$$\vec{P} \cdot \hat{n} = -\cancel{\varepsilon_0} \frac{K-1}{K} \frac{\sigma}{\cancel{\varepsilon_0}}$$

IN ALTO

$$\vec{P} \cdot \hat{n} = \cancel{\varepsilon_0} \frac{K-1}{K} \frac{\sigma}{\cancel{\varepsilon_0}}$$



2) $\Delta V(y) = ?$

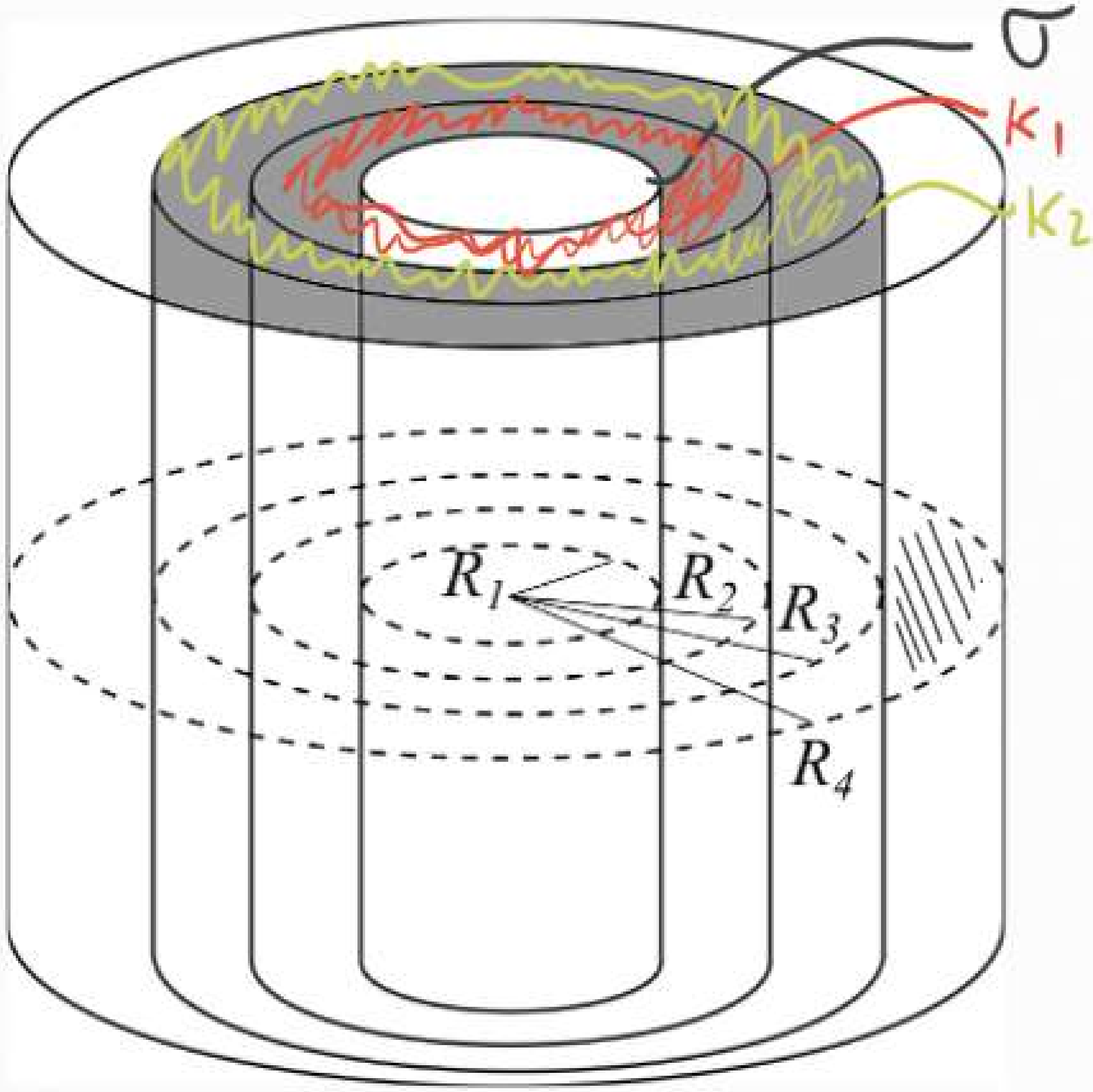
$$\Delta V = V(0) - V(y) = \int_0^y E\, dy' =$$

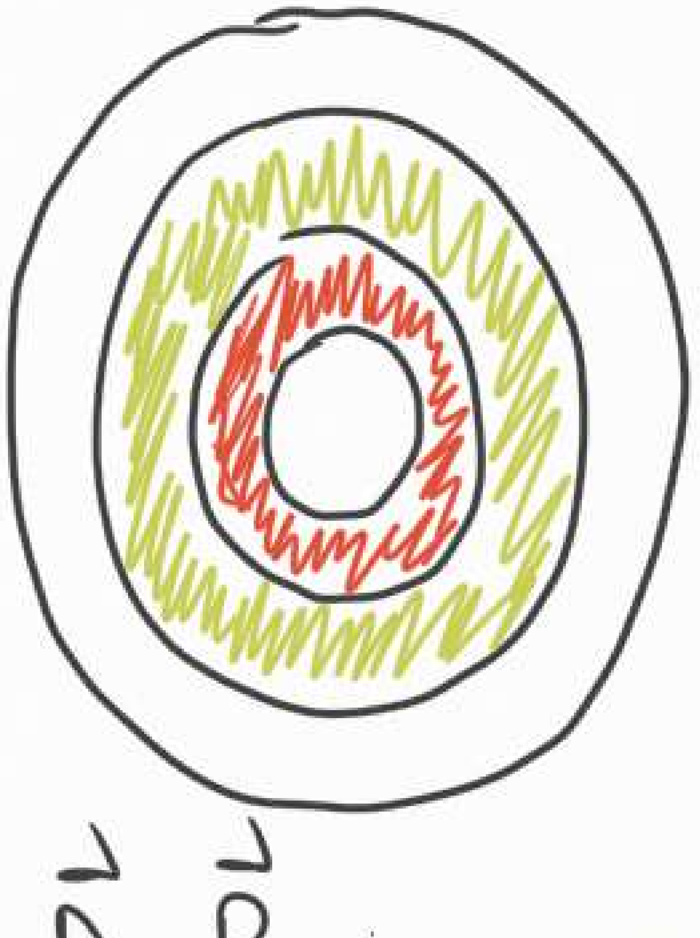
$y<h$

$$\Delta V = Ey = \frac{\sigma}{\kappa\varepsilon_0} y$$

$y>h$

$$\Delta V = \frac{\sigma}{\kappa\varepsilon_0} h + \frac{\sigma}{\varepsilon_0}(y-h)$$



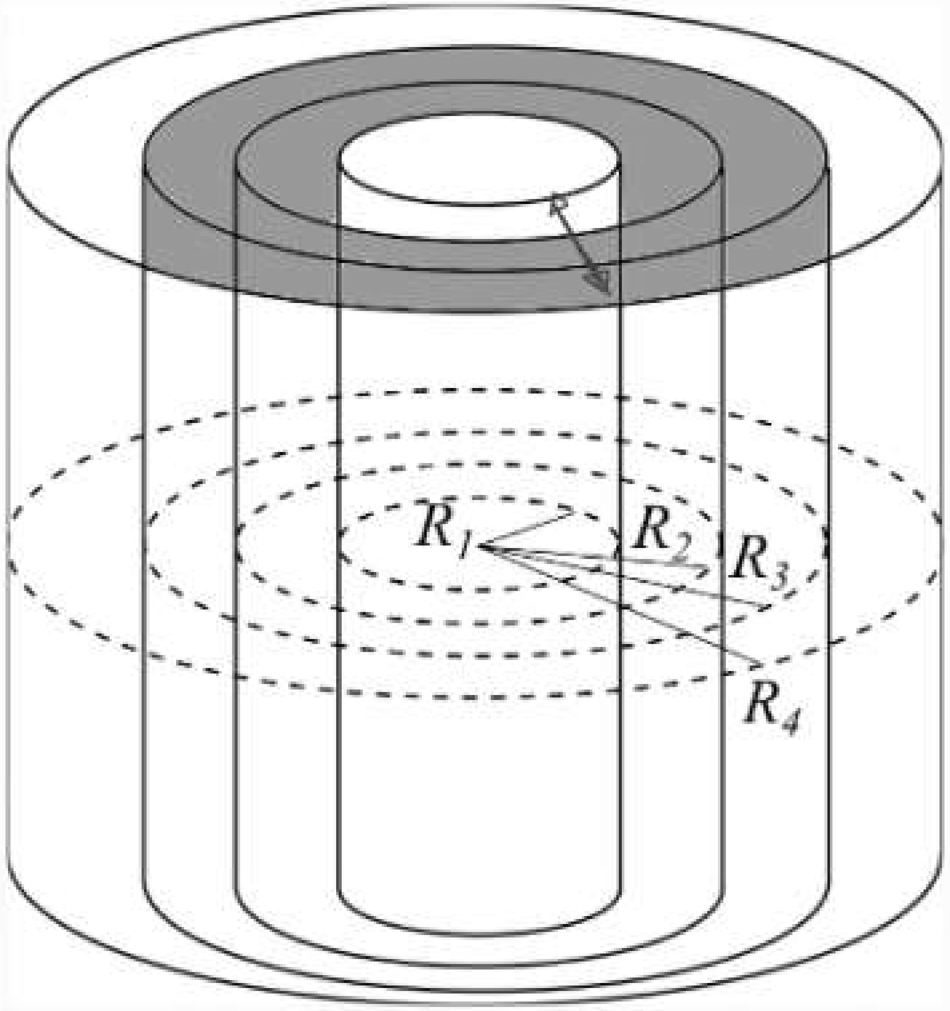


1) $\vec{E}, \vec{D}, \vec{P}$

2) σ_p

3) $V(R_1) - V(r) \quad r > R_4$

4) $V(R_1) - V(r) \quad r > R_4$ con /...



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

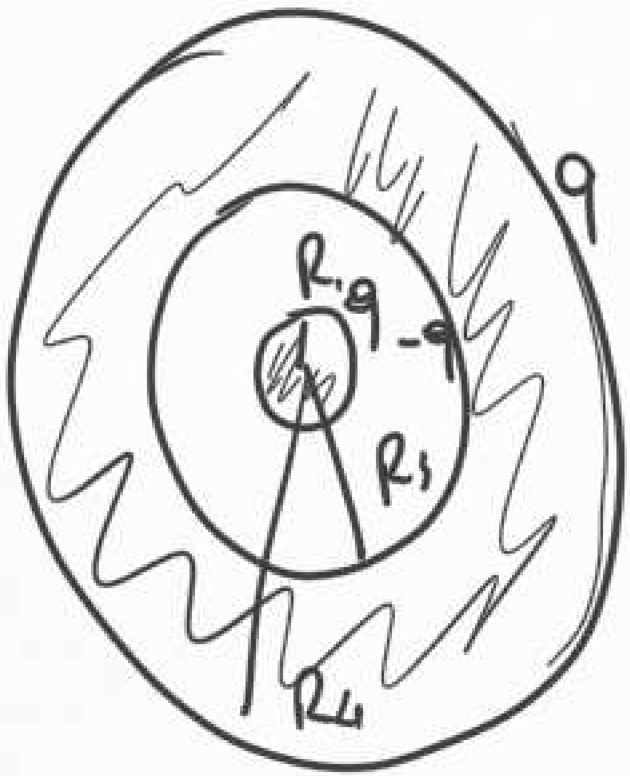
$$\Phi_\Sigma(\vec{E}) = \frac{q}{\varepsilon_0}, \quad \Phi_\Sigma(\vec{D}) = q$$

$$\vec{D} = \frac{\sigma R_1}{r}\hat{r} \Rightarrow \vec{E} = \frac{D}{\varepsilon}$$

$$E_1 = \frac{\sigma R_1}{\varepsilon_1 r} \quad R_1 < r < R_2$$

$$\boxed{E_2 = \frac{\sigma R_1}{\varepsilon_2 r}} \quad R_2 < r < R_3$$

$\sigma = \frac{q}{2\pi R_1 h}$, $\boxed{\lambda = \sigma 2\pi R_1}$,



$$q = 2\pi R_1 h \sigma = 2\pi R_4 h \sigma_4 \Rightarrow$$

$$R_1 \sigma = R_4 \sigma_4 \Rightarrow$$

$$\sigma_4 = \frac{R_1 \sigma}{R_4} < \sigma$$

$$\vec{D} = \frac{\sigma_4 R_4}{r}\hat{r} = \frac{\sigma R_1}{r}\hat{r} \quad r > R_4 \Rightarrow$$

$$\vec{E} = \frac{\sigma R_1}{\varepsilon_0 r}\hat{r} \; , \quad \begin{cases} \vec{P} = 0 & \text{FUORI DAI DIELETTRICI} \\ \vec{P} = \varepsilon_0 (K-1)\vec{E} & \text{NEI DIELETTRICI} \end{cases}$$

$$\sigma_p = \vec{P} \cdot \hat{n}$$