Università
degli Studi
di Padova

Fisica 1

Lezione 44: Conduttori

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Conduttori

↳ cariche libere di muoversi

Semiconduttori

Isolanti → cariche non si muovono

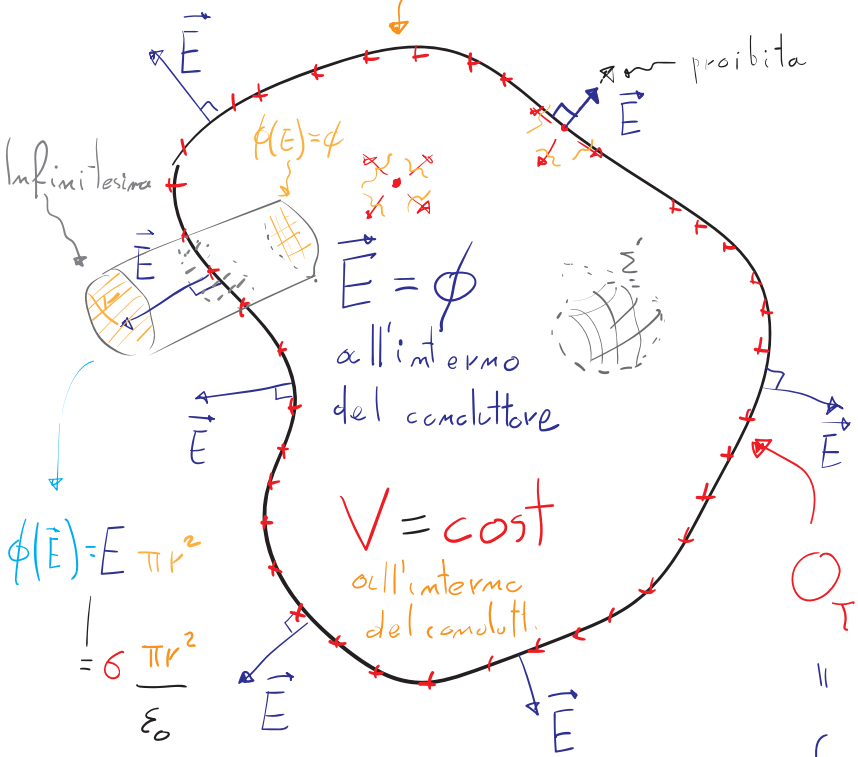
Elettrostatica → cariche sono ferme

↳ $\sum_i F_i = \phi$

$[C] = [A \cdot s]$ (Ampere)

↳ Corrente

Conduttore $\begin{cases} Q_T = \phi \rightarrow \{ q^+ = q^- \\ Q_T \neq \phi \rightarrow \text{Carica} \end{cases}$



$\Downarrow$

$|\vec{E}| = \frac{\sigma}{\varepsilon_0}$ } Campo sup. conduttore

Ferme le une rispetto alle altre

Localmente

?

$Q_T > \phi$

$\vec{F} = q\vec{E} = m_q \vec{a}_q = \phi$

↳ ϕ quiete in tutto il conduttore

$\int_\Sigma \sigma \, d\Sigma$

σ: densità superficiale di carica

$d\Sigma$: superficie inf.

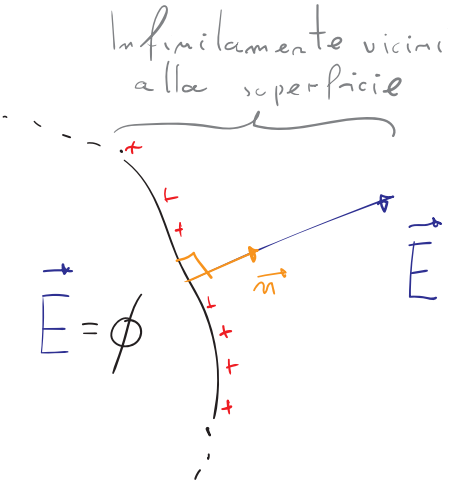
Σ: superficie conduttore

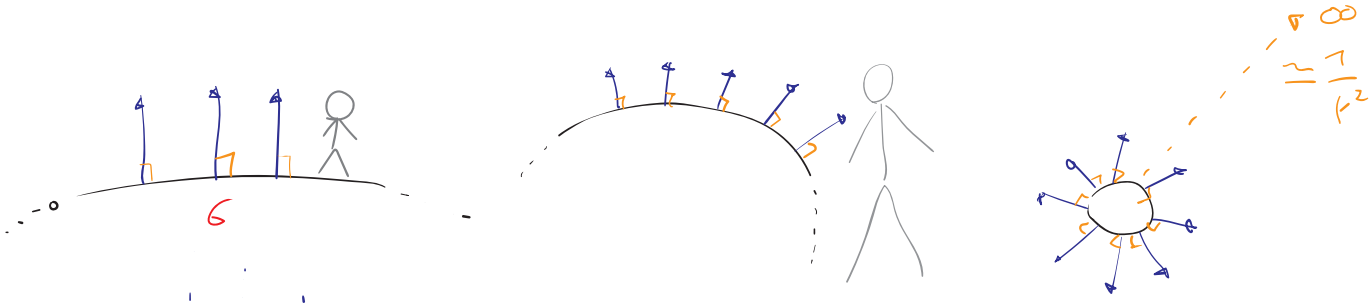
Conduttore

$\vec{E}_{interno} = \phi$

$\vec{E}_{superficie} = \frac{\sigma}{\varepsilon_0} \vec{n}_{superficie}$ ($\sigma \neq cost$)

$V_{interno} = cost$



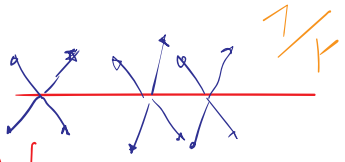


Planare

σ planare

$|E| = \frac{\sigma}{\varepsilon_0} \left[\frac{C}{m^2}\right]$

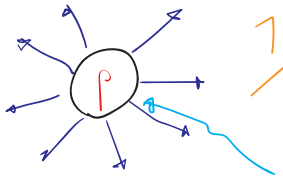
Lineare



λ lineare

$|E| = \frac{\lambda \left[\frac{C}{m}\right]}{2\pi\varepsilon_0 r}$

Sferica



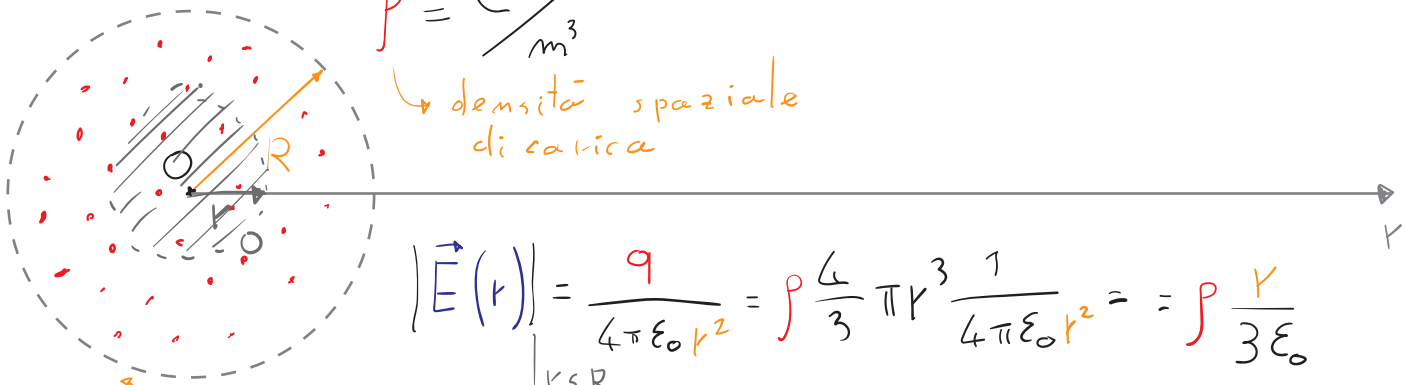
Densità $\left[\frac{C}{m^3}\right]$

$|E| = \frac{q}{4\pi\varepsilon_0 r^2}$

Distribuzione uniforme di carica

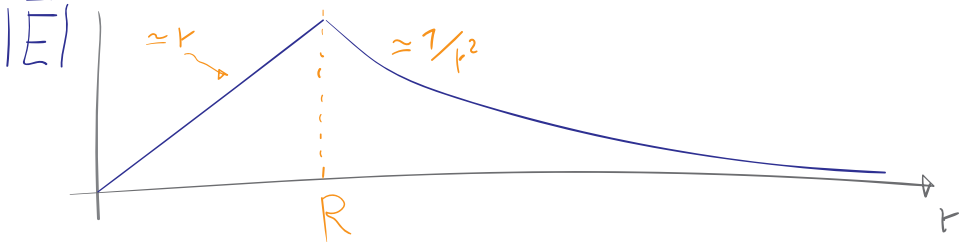
Distribuzione uniforme di carica

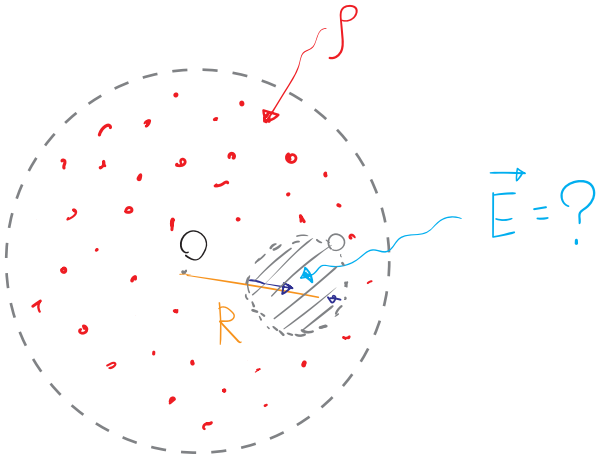
$\rho = C/m^3$ → densità spaziale di carica

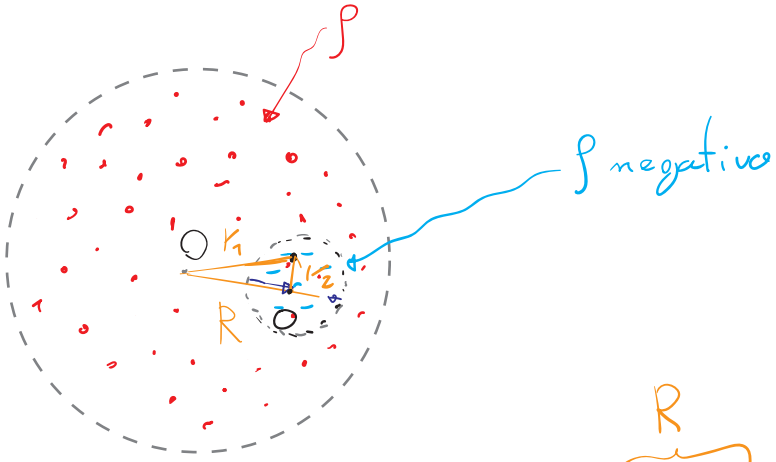


$$|\vec{E}(r)| = \frac{q}{4\pi\varepsilon_0 r^2} = \rho \frac{4}{3}\pi r^3 \frac{1}{4\pi\varepsilon_0 r^2} = \rho \frac{r}{3\varepsilon_0} \qquad r \le R$$

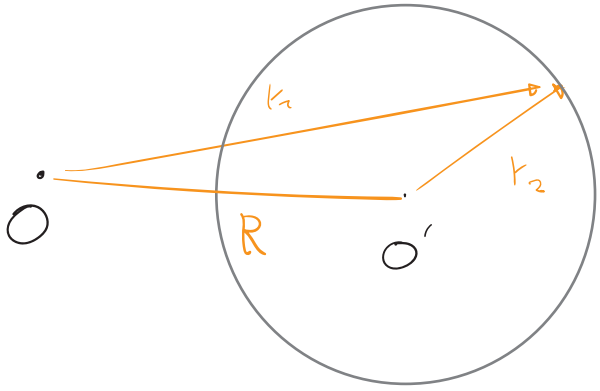
Distrib. sferica uniforme







$$\vec{E}_{tot} = \vec{E}_1 + \vec{E}_2 = \frac{\vec{r}_1}{3\varepsilon_0}\rho + \frac{\vec{r}_2}{3\varepsilon_0}(-\rho) = \frac{\rho}{3\varepsilon_0}\overbrace{(\vec{r}_1 - \vec{r}_2)}^{R}$$



$$R = \vec{r}_2 - \vec{r}_1$$