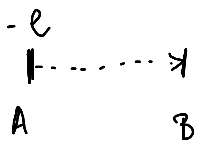
Cariche positive si muovono verso i pot. decrescenti
// negative // // // // // crescenti



$$V_B - V_A = 1\ V$$

$$K_B - K_A = -q\Delta V = 1.6\cdot 10^{-19}\ C\cdot V = 1.6\cdot 10^{-19}\ e\cdot \frac{J}{e} = 1.6\cdot 10^{-19}\ J$$

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

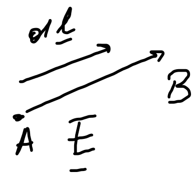
Se $K_A = 0$ (el. inizialmente fermo)

$$K = 1.6\cdot 10^{-19}\ J \overset{def}{=} 1\ eV$$

1 eV en. cinetica acquisita da un elettrone quando si muove spontaneamente tra 2 punti con d.d.p. di 1 V

$$\Delta V_{AB} = -\int_A^B \underline{E} \cdot d\underline{l}$$

Se $\underline{E} = \overrightarrow{const}$



Scelgo $d\underline{l} \parallel \underline{E}$

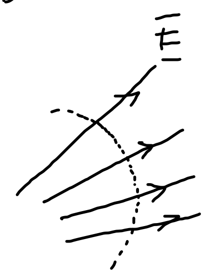
$$\underline{E} \cdot d\underline{l} = E\,dl$$

$$\Delta V_{AB} = V_B - V_A = -\int_A^B E\,dl = -E\int_A^B dl = -E\,d_{AB}$$

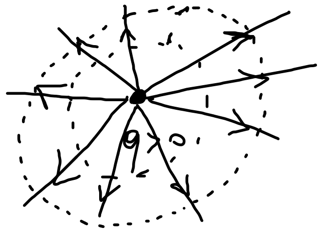
E uniforme

$\Delta V_{AB} = 0$ se $\underline{E} \perp d\underline{l}$

perché, in questo caso, $\underline{E} \cdot d\underline{l} = 0$



Le sup. equipotenziali sono il luogo dei punti $\perp$ alle linee di campo

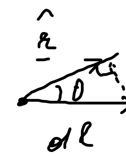


Sup. equipotenziali per la carica ptiforme sono sfere centrate nella carica q

Carica ptiforme

$$\Delta V_{AB} = -\int_A^B \underline{E}\cdot d\underline{l} \qquad \underline{E} = k_e \frac{q}{r^2}\,\hat{\underline{r}}$$

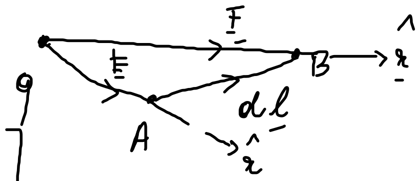
carica ptiforme



$$d\underline{l}\cdot\hat{\underline{r}} = (\text{proiezione di } d\underline{l} \text{ su } \hat{\underline{r}})\cdot|\hat{\underline{r}}|$$

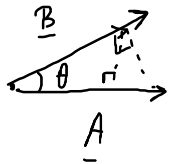
$$= 1\cdot dr$$

$$= -\int_A^B k_e \frac{q}{r^2}\,\hat{\underline{r}}\cdot d\underline{l}$$



$$= -\int_{r_A}^{r_B} k_e \frac{q}{r^2}\,dr = -k_e q\left[-\frac{1}{r}\right]_{r_A}^{r_B} = -k_e q\left[-\frac{1}{r_B}+\frac{1}{r_A}\right] = k_e q\left(\frac{1}{r_B}-\frac{1}{r_A}\right)$$

$\underline{A}\cdot\underline{B} = |\underline{A}||\underline{B}|\cos\theta = (\text{proiezione di } \underline{A} \text{ su } \underline{B})\cdot|\underline{B}| =$



$= (\text{proiez. di } \underline{B} \text{ su } \underline{A})\cdot|\underline{A}|$

$$d\underline{l}\cdot\hat{\underline{r}} = (\text{proiez. di } d\underline{l} \text{ su } \hat{\underline{r}})\cdot\overbrace{|\hat{\underline{r}}|}^{1}$$

$d\underline{l} \to \underline{A}$, $\hat{\underline{r}} \to \underline{B}$

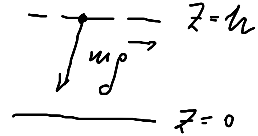
$= dr\cdot 1 = dr$

$$V_B - V_A = k_e q\left[\frac{1}{r_B} - \frac{1}{r_A}\right]$$

Supponiamo $r_A \longrightarrow +\infty$

d.d.p. tra un punto B a dist. finita da q e un punto A all'infinito

Scelgo $V_A = 0$ $(r_A \to +\infty)$ $\quad V_B - V_A = \dfrac{k_e q}{r_B} \quad V_B = \dfrac{k_e q}{r_B}$



$U = mgh + U_0$

$U = 0$

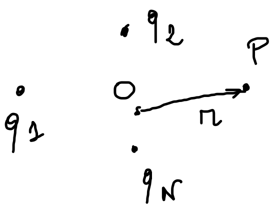
$U = U_0$

$\Delta K = mgh$

Potenziale della carica puntiforme q in un pto P distante r da q

$$V(r) = \frac{k_e q}{r} \qquad \left(\underline{\text{Oss}} \ V(+\infty) = 0 \right)$$

Pr. sovrapposizione per potenziali



$$\underline{E}(P) = \sum_{i=1}^{N} \underline{E}_i(P)$$

pr. sovrapp.

pr. sovr. per $\underline{E}$

$$V(P) = -\int_{\infty}^{r} \underline{E} \cdot d\underline{l} = -\int_{\infty}^{r} \sum_{i=1}^{N} \underline{E}_i(r) \cdot d\underline{l}$$

$V(\infty) = 0$

$$= \sum_{i=1}^{N} \underbrace{\left[-\int_{\infty}^{r} \underline{E}_i(r) \cdot d\underline{l} \right]}$$

$V_{q_i}(r)$: pot. prodotto da q_i

$$= \sum_{i=1}^{N} V_{q_i}(r)$$

$$Q \approx \sum_{i=1}^{N} \Delta q_i \longrightarrow \sum dq$$

Δq_i molto piccolo

$$V_Q(r) \approx \sum_{i=1}^{N} \frac{k_e \Delta q_i}{r} \longrightarrow \int \frac{k_e\, dq}{r}$$

$\Delta q_i = \frac{Q}{N}$

$N \to +\infty$

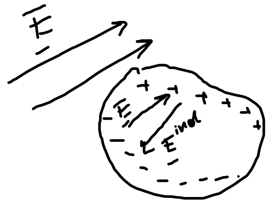
$\Delta q_i \to dq$

Volume occupato da Q

$$\underline{E}(\underline{r}) = -\underline{\nabla} V(\underline{r})$$

$$\underline{\nabla} f = \left[\frac{\partial f}{\partial x}\hat{\underline{i}} + \frac{\partial f}{\partial y}\hat{\underline{j}} + \frac{\partial f}{\partial z}\hat{\underline{k}}\right]$$

Proprietà dei conduttori ideali all'eq. elettrostatico

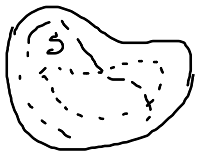


All'equilibrio ~~le~~ cariche sono ferme

$$\sum \underline{F} = 0 \quad \sum q\underline{E} = 0 \Rightarrow \sum \underline{E} = \underline{0}$$

$$\underline{E}_{TOT} = 0$$

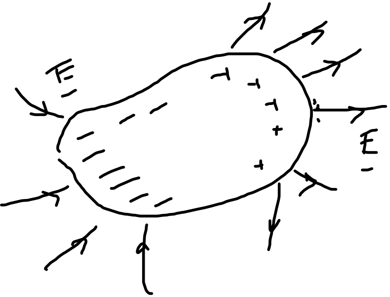
Distr. carica all'equilibrio



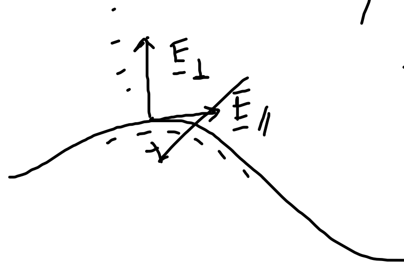
S é una generica sup. di Gauss dentro il conduttore

$$\int_S \underline{E} \cdot d\underline{S} = 0 \Rightarrow q^{int} = 0$$

q é $\underline{\underline{\text{solo}}}$ in superficie

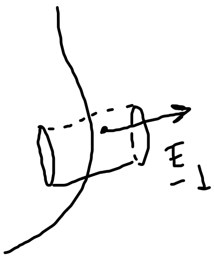


$\underline{E}$ vicino alla sup. conduttore?



$E_\parallel = 0$

$\underline{E}$ vicino al conduttore è <u>solo</u> $\perp$ sup.



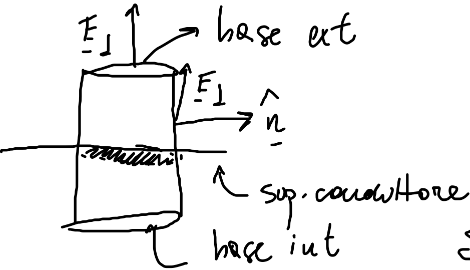
Appl. $\underline{\text{Th}}$ Gauss S: cilindretto "attorno" al pto che considero

1 Base esterna al conduttore

1 " dentro il conduttore

Cilindro sup. lat. $\perp$ sup. conduttore

$$\int_S \underline{E} \cdot d\underline{S} = \int_{\text{base est}} \underline{E} \cdot d\underline{S} + \int_{\text{base int}} \underline{E} \cdot d\underline{S} + \int_{\text{sup. lat.}} \underline{E} \cdot d\underline{S}$$



$$\int_{\text{base int}} \underline{E}\cdot d\underline{S} = 0$$ perché $\underline{E} = \underline{0}$ nel conduttore

Sulla sup. laterale $\underline{E}_\perp \cdot \hat{\underline{n}} = 0 \Rightarrow \int_{\text{sup. lat.}} \underline{E}\cdot d\underline{S} = 0$

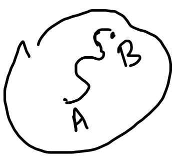
cilindro "piccolo" $\quad \hat{\underline{n}}$ è // alla sup. conduttore

$$\int_{\text{base ext}} \underline{E}\cdot d\underline{S} = \int \underline{E}\, d\underline{S} = \underline{E}\int_{\text{base ext}} d\underline{S} = \underline{E}\cdot A = \frac{Q^{\text{a cavallo}}}{\varepsilon_0} \; ; \quad E = \frac{Q^{\text{a cavallo}}}{A\,\varepsilon_0} = \frac{\sigma}{\varepsilon_0}$$

$\underline{E} \parallel \hat{\underline{n}}$: $\underline{E}\cdot d\underline{S} = E\, dS$

th Gauss

σ: dens. di carica sup. $\left[\frac{C}{m^2}\right]$ vicino al pto



$$\Delta V_{AB} = -\int_A^B \underline{E}\cdot d\underline{l} = 0 \Rightarrow V = \text{cost}$$

$\underline{E} = \underline{0}$