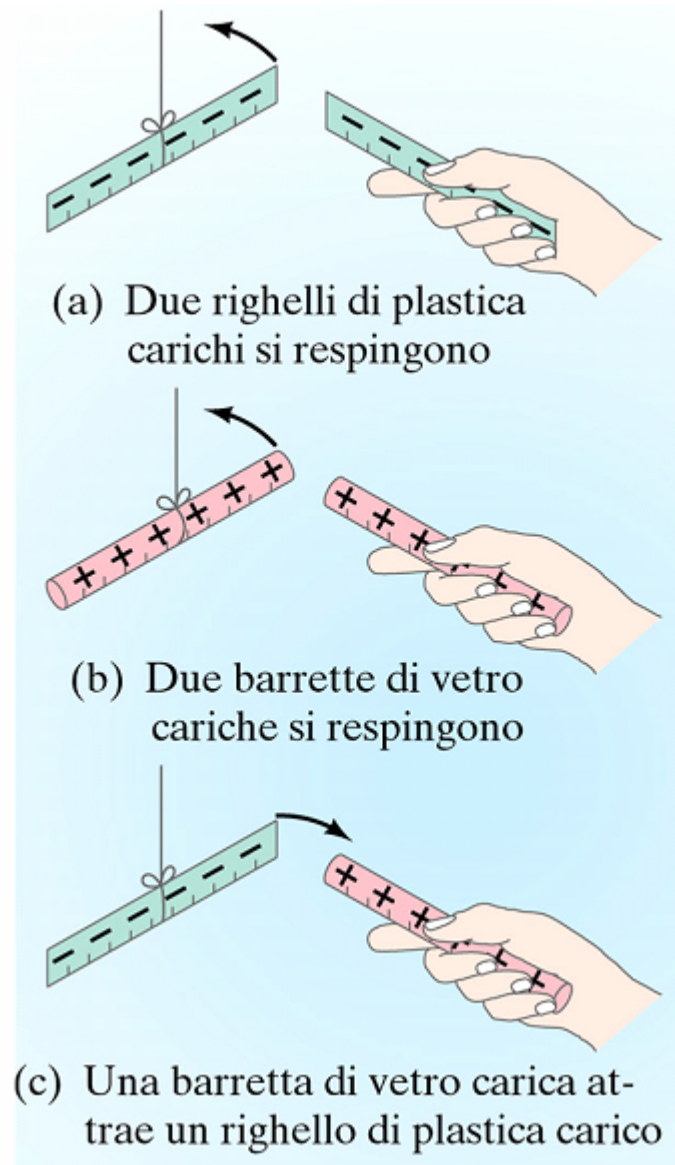
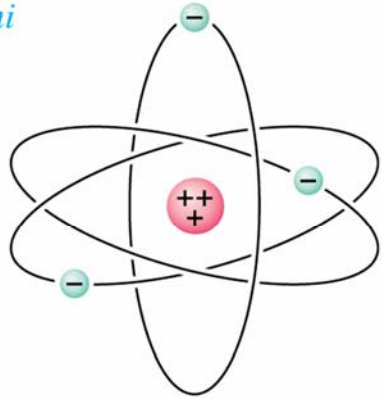


Alcuni oggetti mostrano la proprietà che se strofinati hanno il potere di attrarre altri oggetti

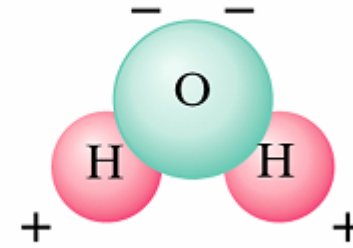


Struttura della materia

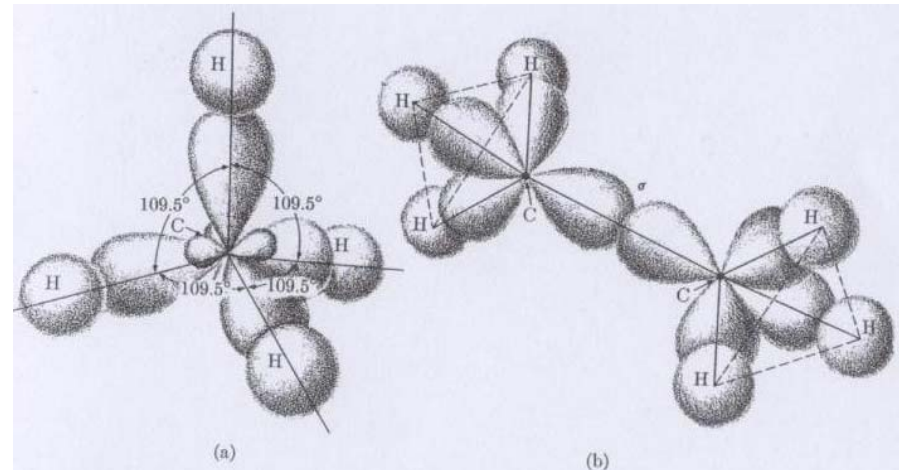
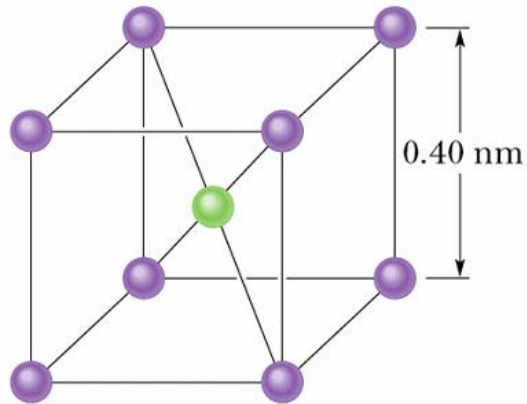
Ioni



Molecole polari



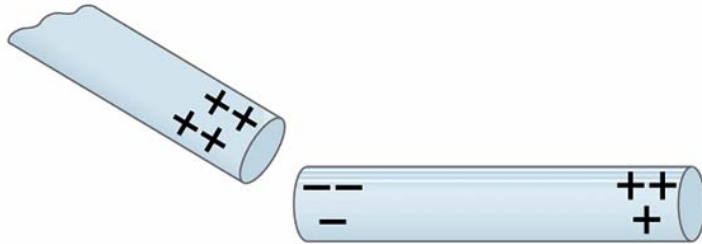
● Cl⁻
● Cs⁺



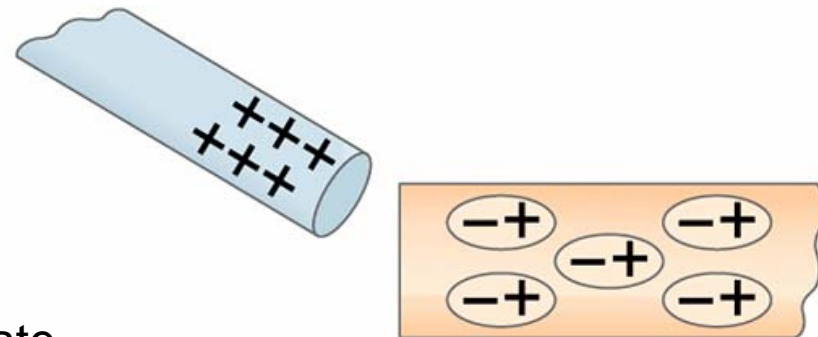
Conduttori: cariche libere di muoversi



(a) Barretta di metallo neutra



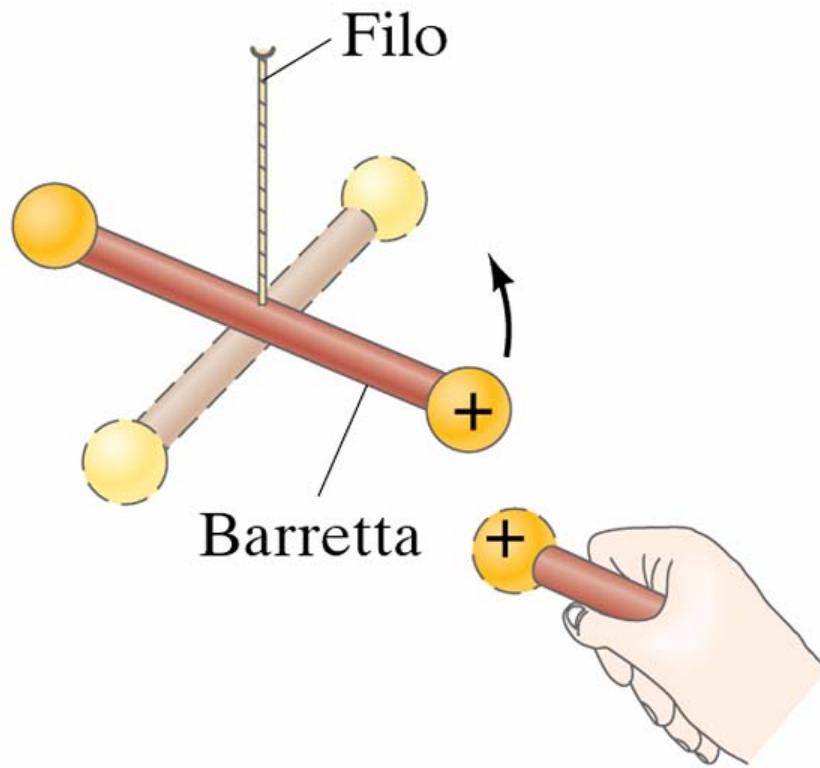
(b) Barretta di metallo ancora neutra, ma con una separazione di carica



Isolanti: cariche sono parzialmente vincolate

Isolante

Legge di Coulomb



$$\vec{F} = \frac{1}{4\pi\epsilon_0} \cdot \frac{Qq}{r^2} \vec{u}_r$$

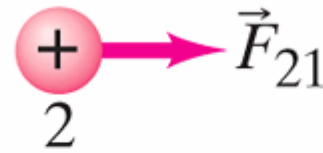
[q]=Coulomb

ϵ_0 = costante dielettrica de vuoto

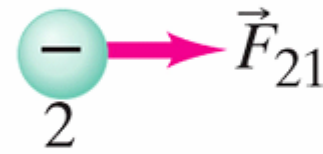
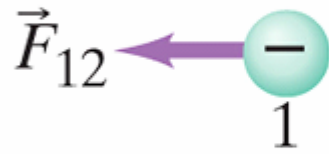
$$\frac{1}{4\pi\epsilon_0} = 8.98 \cdot 10^9 \text{ Nm}^2 / \text{C}^2$$

F_{12} = forza su 1
dovuta a 2

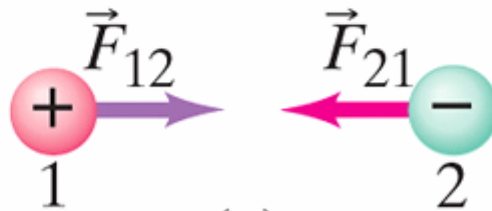
F_{21} = forza su 2
dovuta a 1



(a)

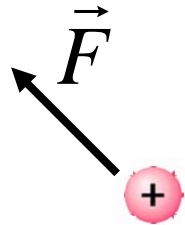


(b)

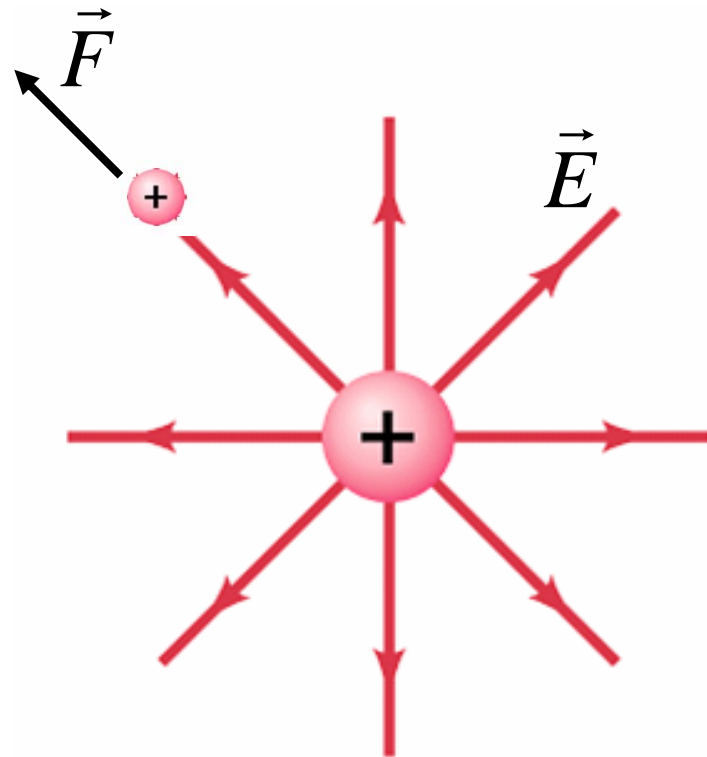


(c)

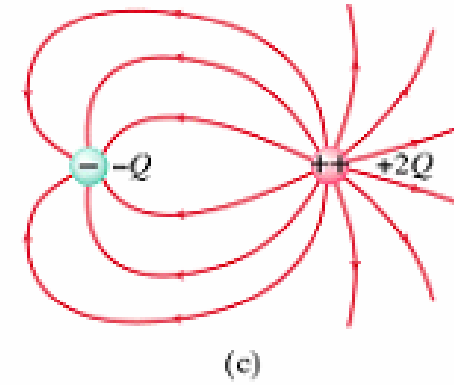
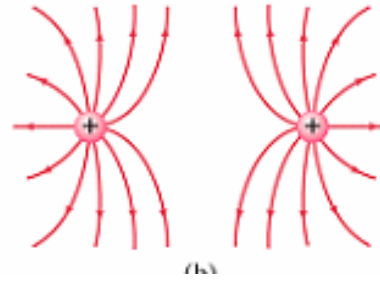
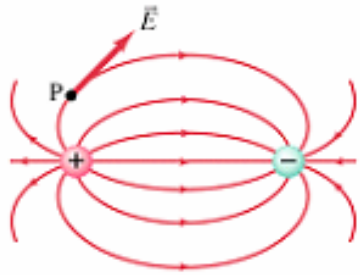
Campo elettrico: se pongo una carica unitaria in una regione dello spazio e su di essa mi accorgo che agisce una forza, allora in quel punto ci sarà un campo elettrico E



$$\vec{E} = \frac{\vec{F}}{q}$$

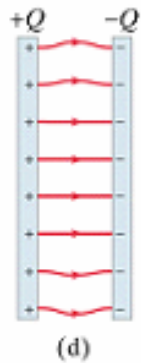


Linee di campo & Teorema di Gauss

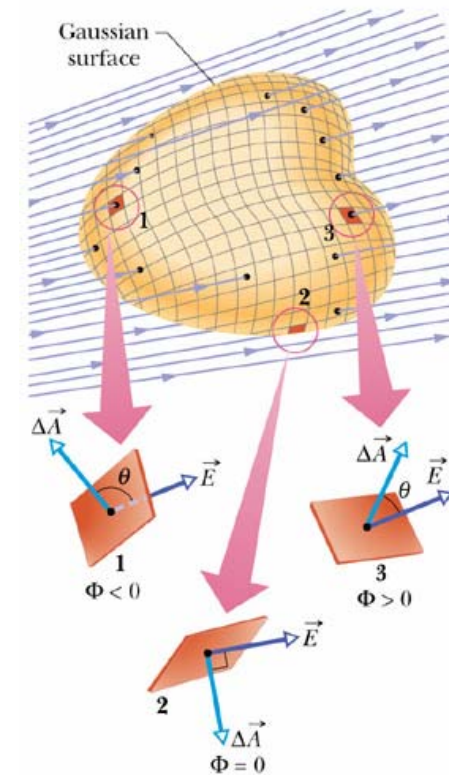
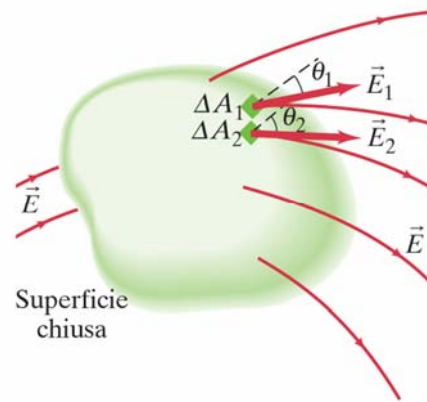


Teorema di Gauss

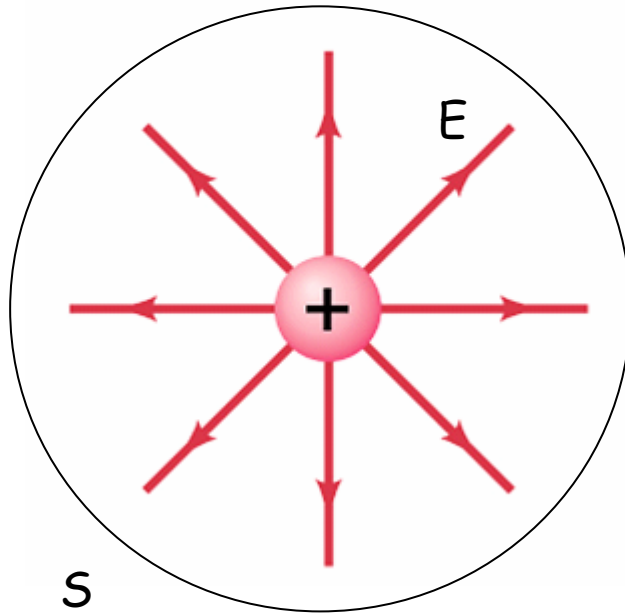
Condensatore



$$\Phi_E = ES = \frac{q}{\epsilon_0}$$



Teorema di Gauss applicato al caso di una carica puntiforme



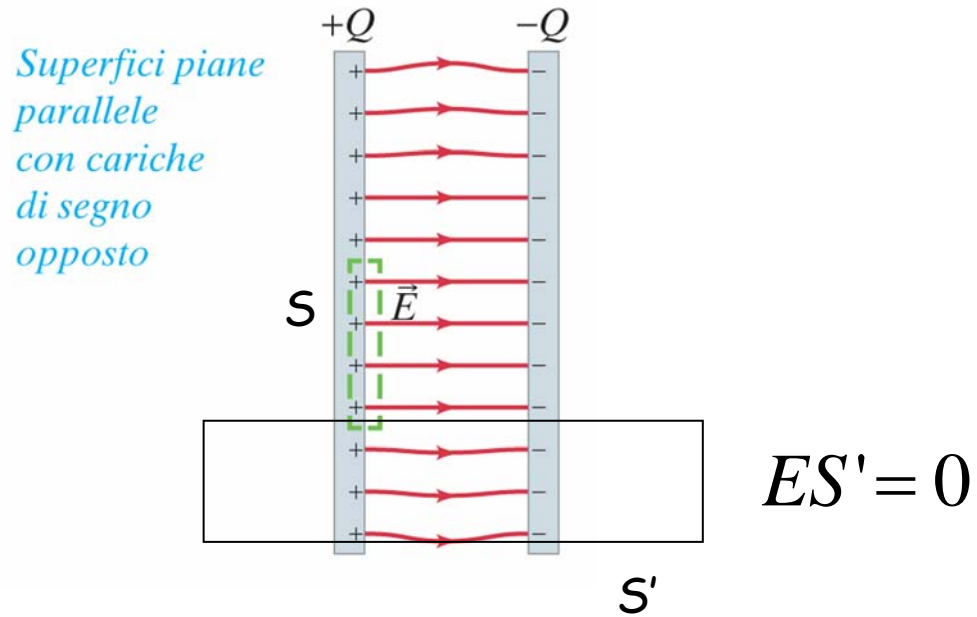
$$ES = E4\pi r^2 = \frac{q}{\epsilon_0}$$

$$E = \frac{q}{4\pi\epsilon_0} \cdot \frac{1}{r^2}$$

$$[E]=V/m$$

S: superficie di una sfera centrata sulla carica puntiforme

Campo elettrico all'interno di un condensatore



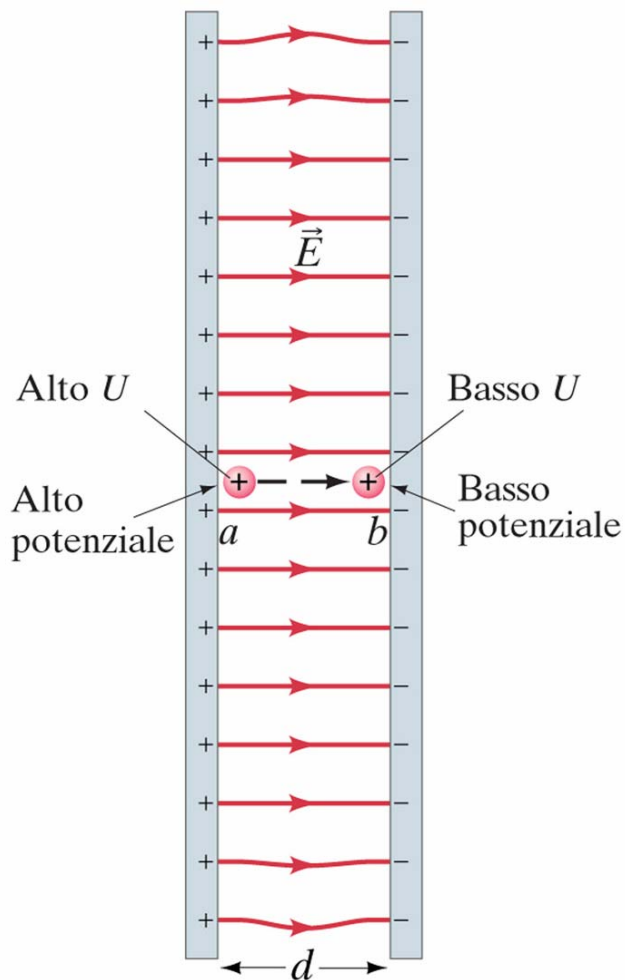
$$ES = q / \varepsilon_0$$

$$E = \sigma / \varepsilon_0$$

$$\sigma = q / S$$

Il campo
elettrico è
uniforme

Il campo elettrico è conservativo



$$W = Fd = qEd$$

$$U_a - U_b = qEd$$

Potenziale elettrostatico:
energia potenziale per una
carica di 1C

$$V_a - V_b = Ed$$

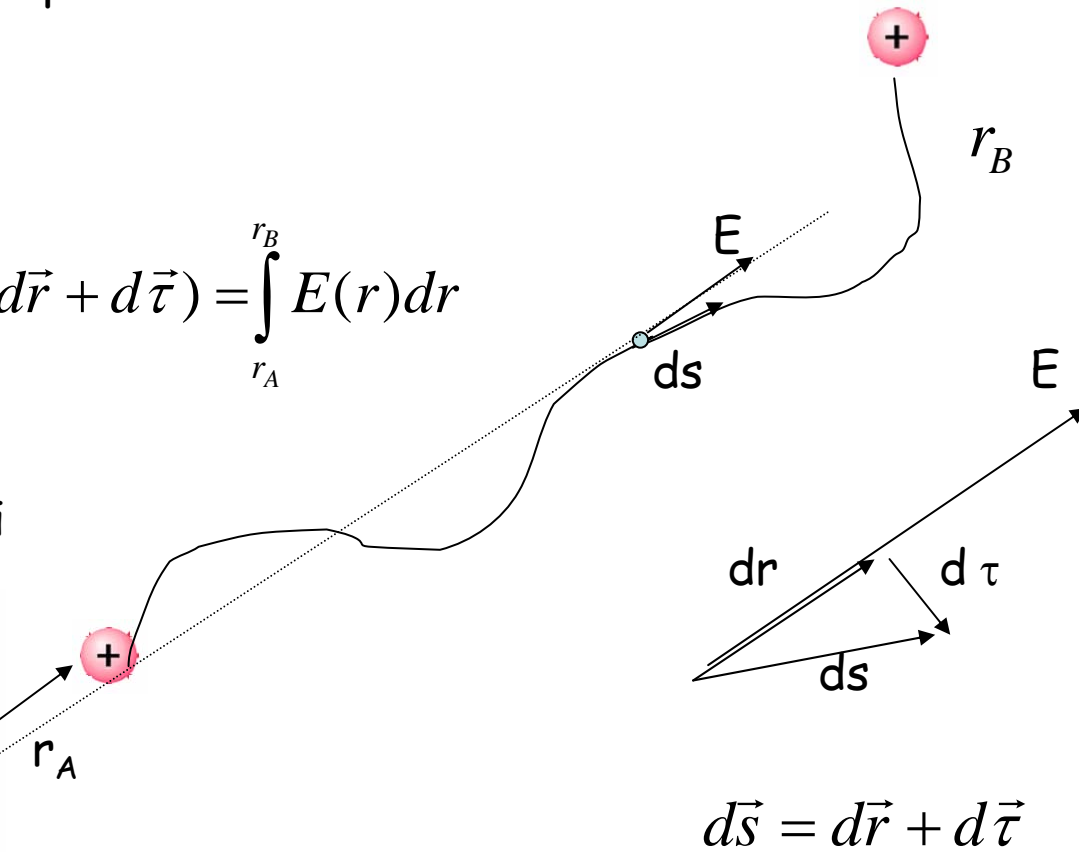
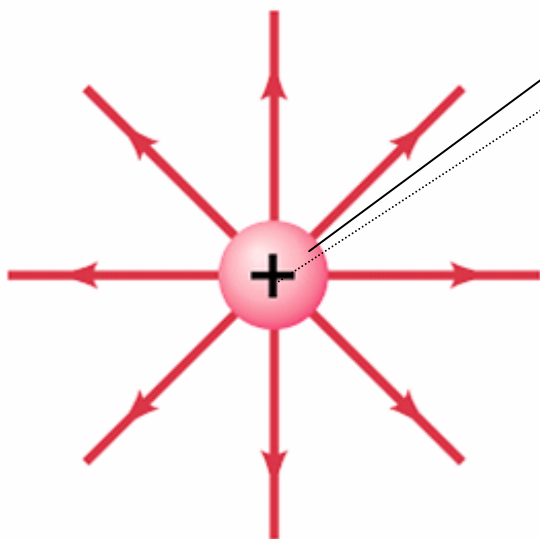
Differenza di potenziale

Potenziale per una carica puntiforme

$$dL = \vec{E} \cdot d\vec{s}$$

$$L_{r \rightarrow \infty} = \int_{r_A}^{r_B} \vec{E} \cdot d\vec{s} = \int_{r_A}^{r_B} \vec{E} \cdot (d\vec{r} + d\vec{\tau}) = \int_{r_A}^{r_B} E(r) dr$$

Il lavoro è funzione delle coordinate iniziali e finali



$$d\vec{s} = d\vec{r} + d\vec{\tau}$$

$$V_A - V_B = V(r_A) - V(r_B) = L_{r_A \rightarrow r_B} = \frac{q}{4\pi\epsilon_0} \left(\frac{1}{r_A} - \frac{1}{r_B} \right)$$

Un elettrone nel tubo catodico di un televisore viene accelerato dalla sua posizione di riposo mediante la differenza di potenziale $V_b - V_a = 5000V$. Quanto vale la variazione di energia potenziale elettrica? Quanto vale la velocità finale dell'elettrone? ($m = 9.1 \cdot 10^{-31} \text{kg}$).

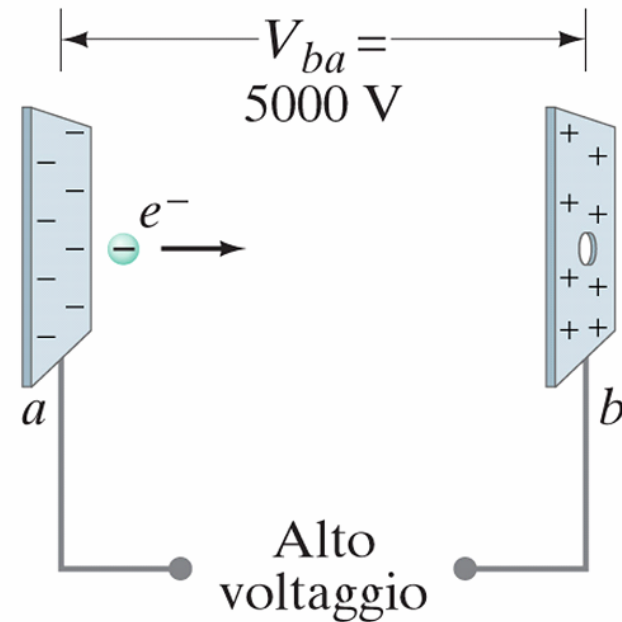
$$W = qEd = q\Delta V = 1.6 \cdot 10^{-19} \text{ C} \cdot 5000V = 8 \cdot 10^{-16} \text{ J}$$

$$1eV = 1.6 \cdot 10^{-19} \text{ J}$$

$$8.0 \cdot 10^{-16} \text{ J} = 5keV$$

$$W = \Delta k = \frac{1}{2}mv^2$$

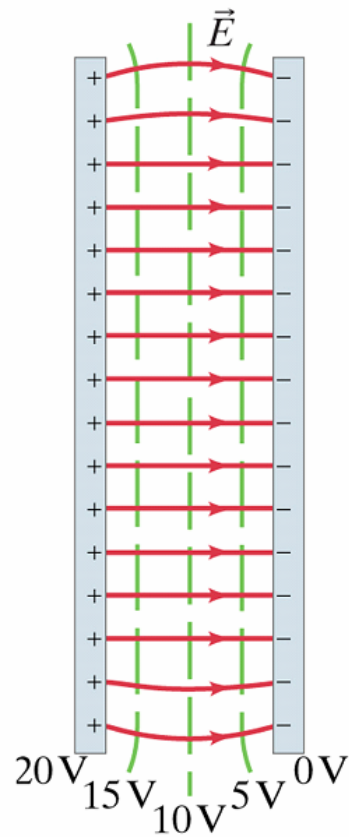
$$v = \sqrt{\frac{2W}{m}} = 4.2 \cdot 10^7 \text{ m/s}$$



Condensatore

$$Q = CV$$

C: Capacità (Farad)



$$W = \frac{1}{2} QV$$

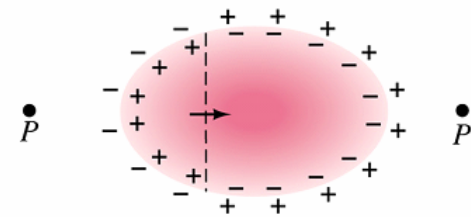
Defibrillatore



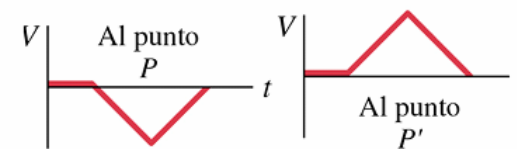
Elettro-Cardio-Gramma (ECG)



(a)



(b)

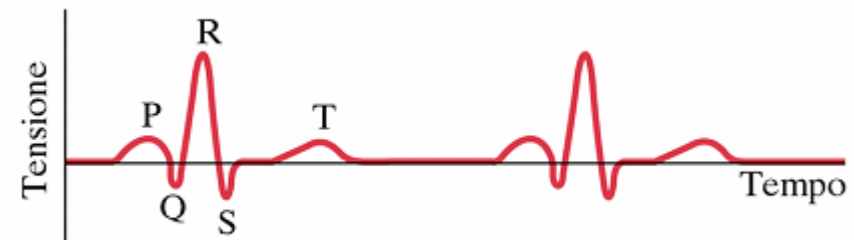


(c)

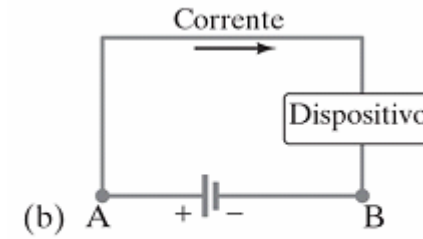
P: Contrazione atri

QRS: Contrazione ventricoli

T: Onda di ripristino

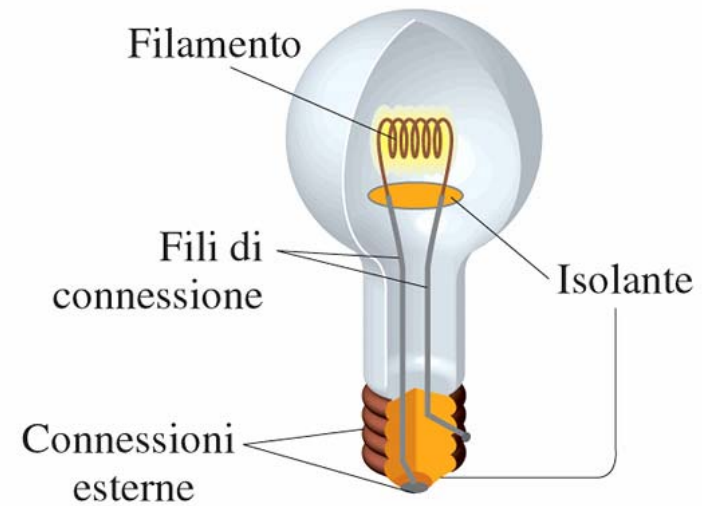
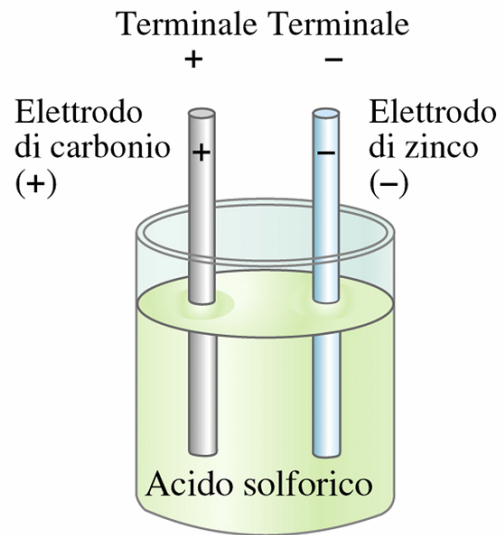


La corrente elettrica



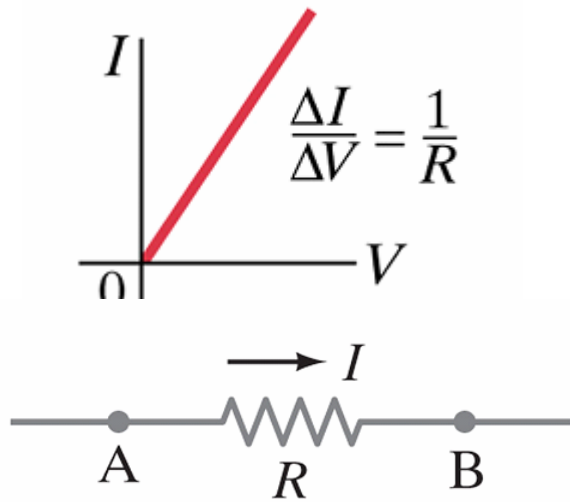
$$V_A - V_B = \mathcal{E}$$

Differenza di potenziale \Leftrightarrow
forza elettromotrice



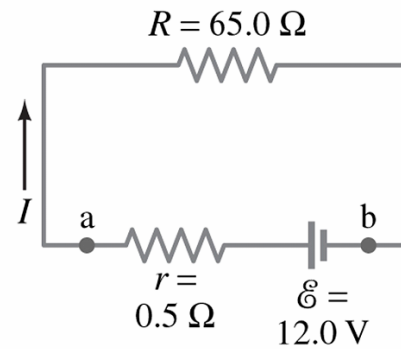
Legge di Ohm

Conduttori ohmici

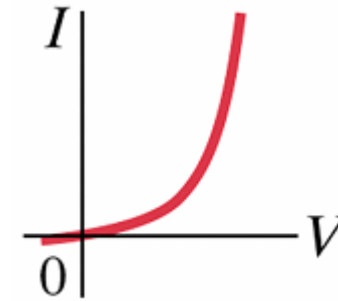


$$R = \rho \frac{L}{A}$$

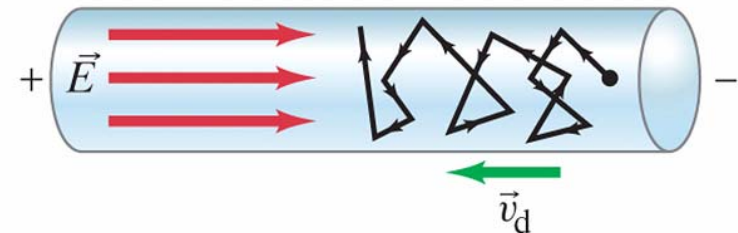
ρ resistività



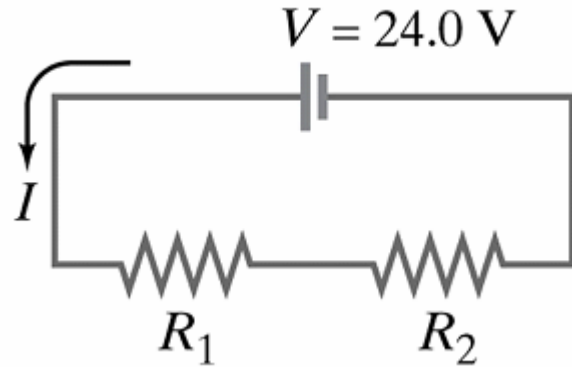
DIODI non sono conduttori ohmici



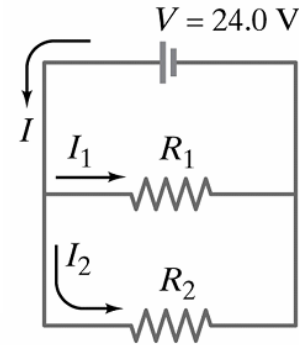
Moto di deriva uniforme



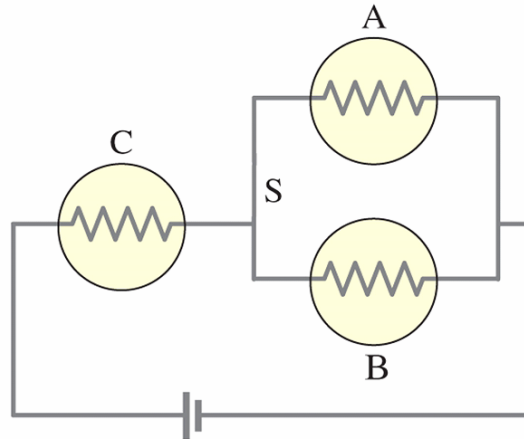
Resistenze in serie e in parallelo



$$R_{eq} = R_1 + R_2$$



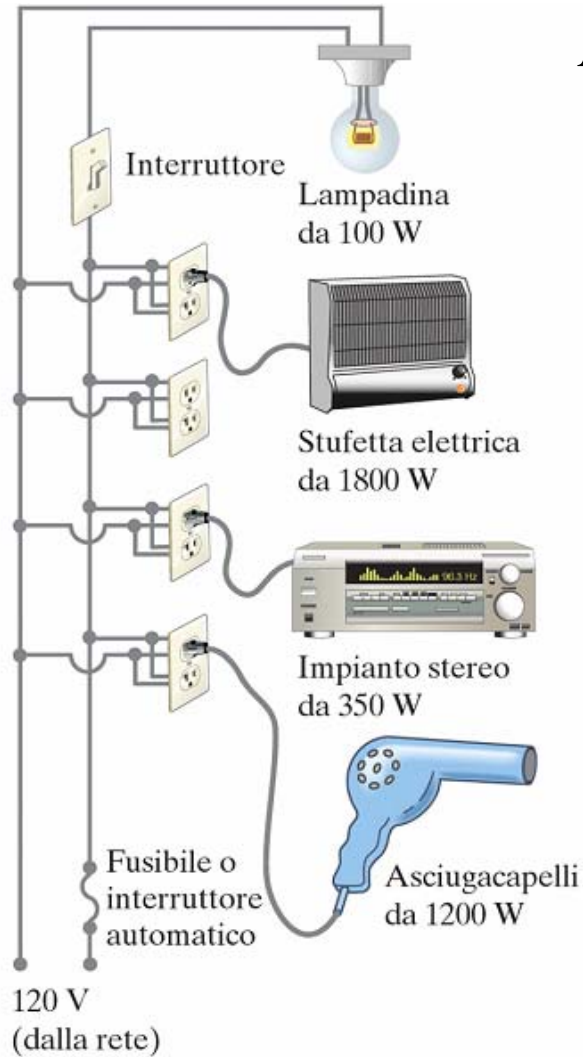
$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$



$$R_{eq} = R_c + R_A // R_B = R_c + \frac{R_A \cdot R_B}{R_A + R_B}$$

Potenza

$$P = \frac{W}{t} = \frac{QV}{t} = iV$$



Determinare la corrente totale che viene assorbita di dispositivi collegati al circuito

$$i = P / V = 100W / 120V = 0.8A$$

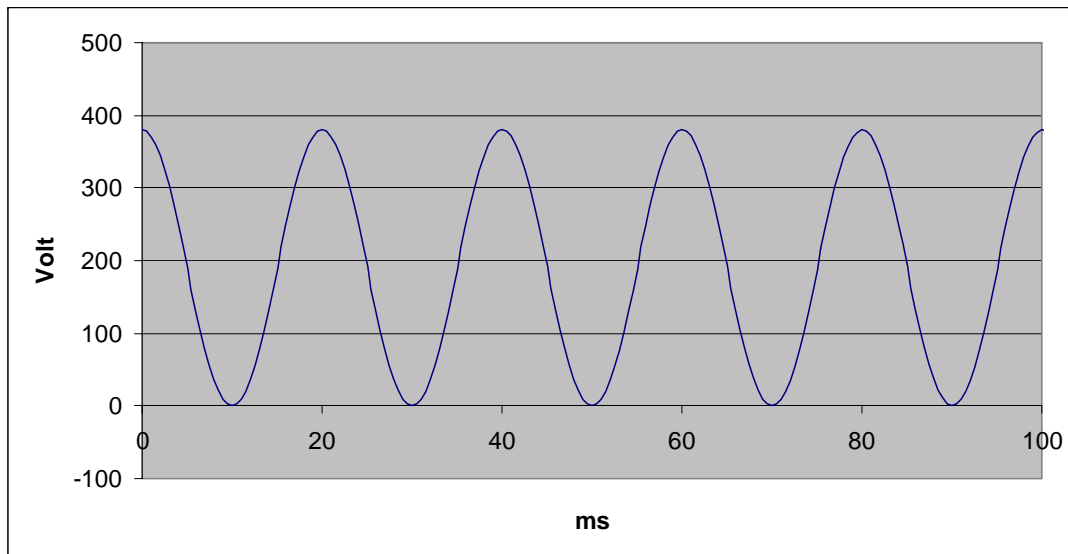
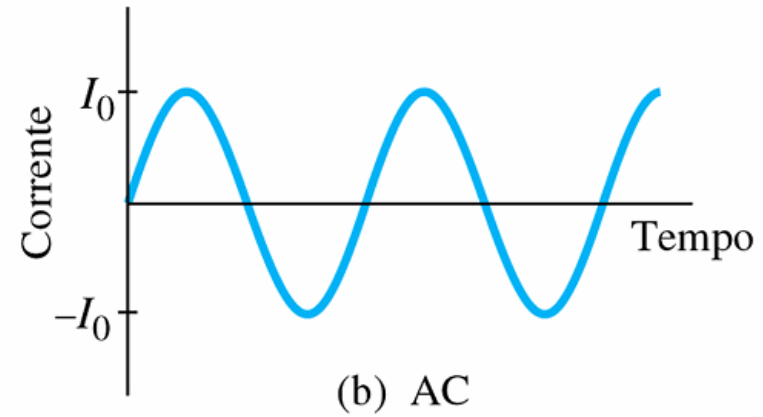
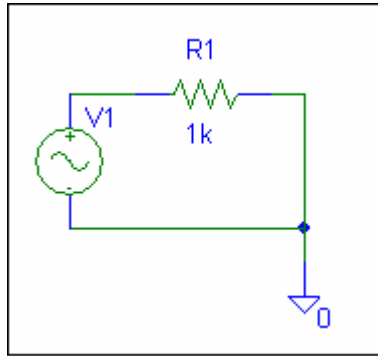
$$1800W / 120V = 15A$$

$$350W / 120V = 2.9A$$

$$1200W / 120V = 10A$$

$$i_{tot} = 28.7A$$

Corrente Alternata



$$\nu = 50Hz$$

$$T = \frac{1}{\nu} = 20ms$$

ν : N° di oscillazioni/sec

T: durata di 1 oscillazione

Potenza alternata

$$V = V_0 \sin \omega t$$

V_0 Tensione di picco

I_0 Corrente di Picco

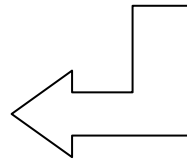
$$i = \frac{V}{R} = \frac{V_0}{R} \sin \omega t = I_0 \sin \omega t$$

Potenza istantanea

$$P = I^2 R = I_0^2 R \sin^2 \omega t$$

Potenza Media

$$\bar{P} = \frac{1}{2} I_0^2 R$$



$$i_{eff} = \frac{i_0}{\sqrt{2}}$$

$$V_{eff} = \frac{V_0}{\sqrt{2}}$$

$$\bar{P} = i_{eff} V_{eff}$$

