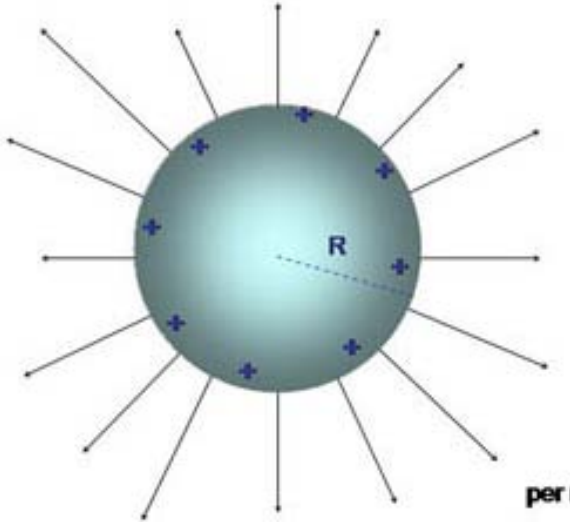
Conduttori Capacità e Dielettrici

- Conduttori Capacità e Condensatori
- Condensatori in serie e in parallelo
- Energia elettrostatica
- Proprietà elettrostatiche dei dielettrici
- Descrizione molecolare dei dielettrici

Capacità e condensatori

Sfera conduttrice carica



$$E = 0$$

all'interno della sfera

$$E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{R^2}$$

sulla superficie della sfera

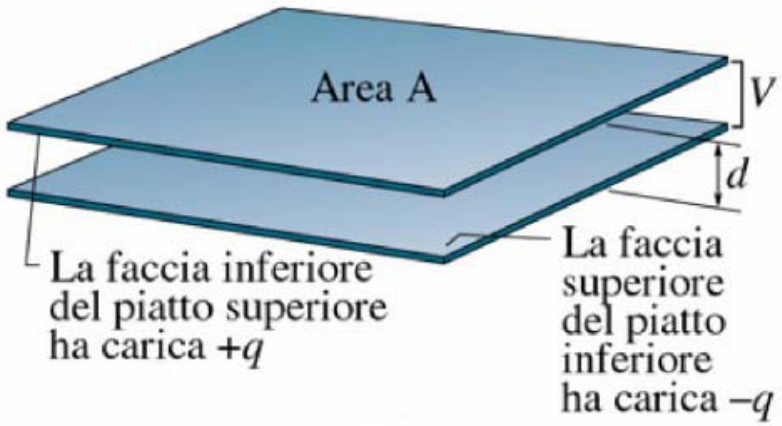
$$E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}$$

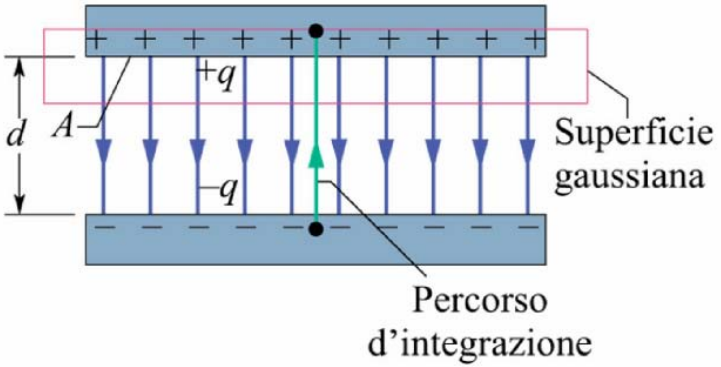
per r > R (all'esterno della sfera)

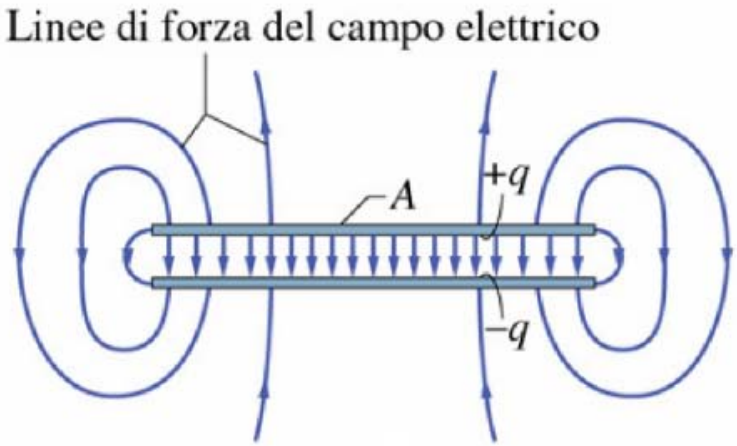
$$Q = CV$$

[C]=Farad

Capacità e condensatori





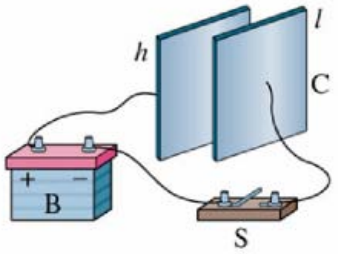


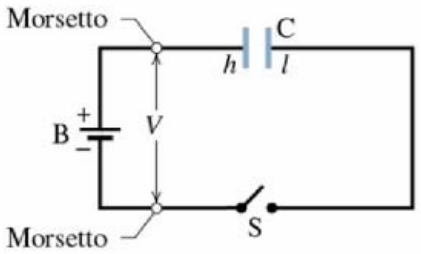
$$E = \frac{|\sigma|}{\varepsilon_0}$$

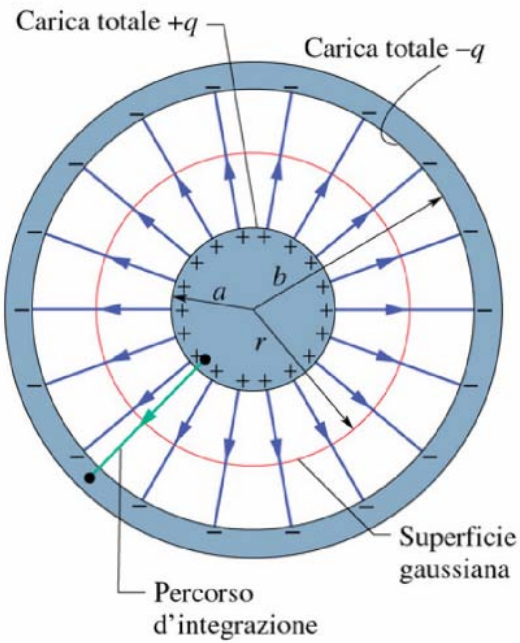
$$V = Ed = \frac{qd}{\varepsilon_0 A}$$

Capacità e condensatori

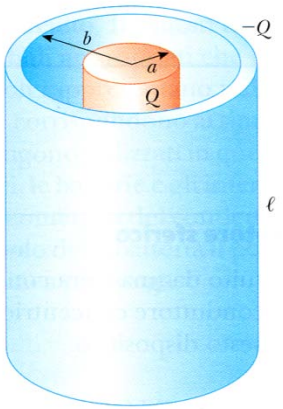
$$C = \frac{q}{V} = \frac{q}{qd/\varepsilon_0 A} = \frac{\varepsilon_0 A}{d}$$



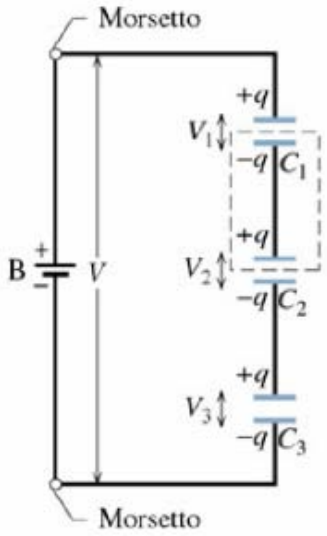


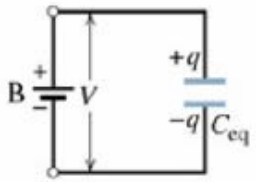


Condensatore cilindrico



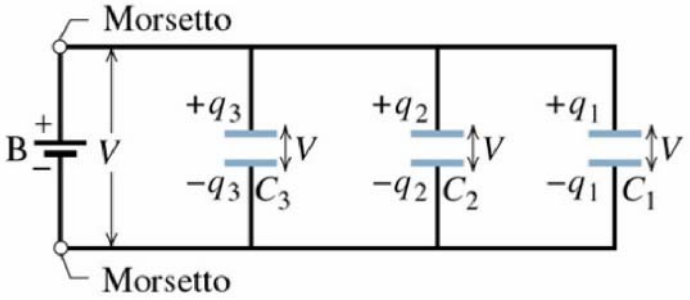
Condensatori in serie e parallelo

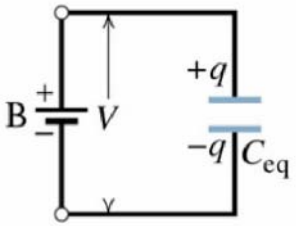




Serie

$$\frac{1}{C_{eq}} = \sum \frac{1}{C_i}$$





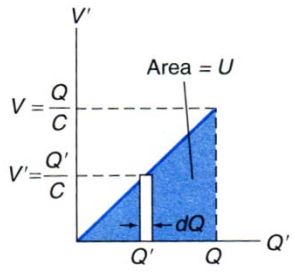
$$C_{eq} = \sum C_i$$

Parallelo

Energia elettrostatica

Distribuzione di cariche puntiformi:

$$U = \frac{1}{4\pi\varepsilon_0}\frac{1}{2}\sum_{i\neq j}\frac{q_i q_j}{r_{ij}}$$

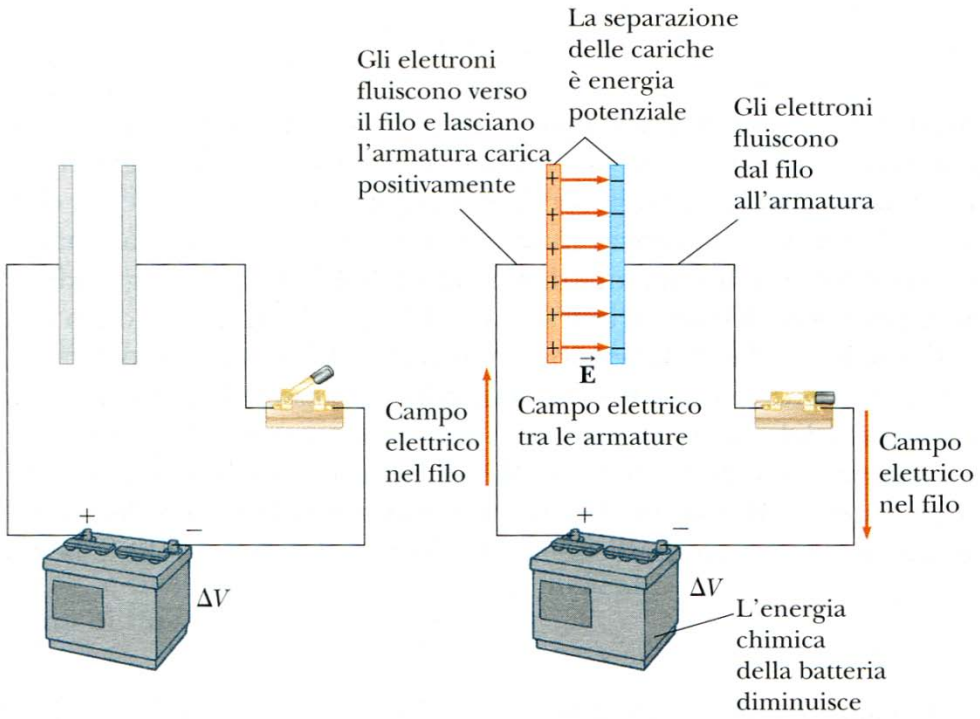


$$dU' = V' dQ'$$

$$U = \int_0^Q V' dQ'$$

$$U = \int_0^Q \frac{Q'}{C} dQ' = \frac{1}{2}\frac{Q^2}{C}$$

$$opp. = \frac{1}{2}CV^2$$



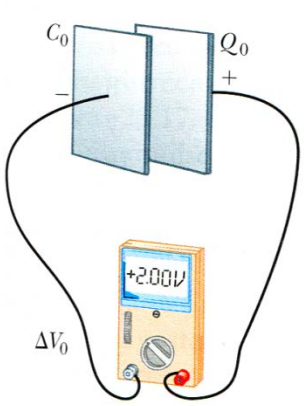
Densità di energia elettrostatica del campo E

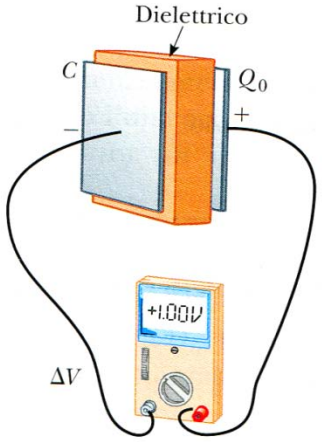
$$U = \frac{1}{2}CV^2 = \frac{1}{2}\left(\frac{\varepsilon_0 A}{d}\right)(Ed)^2 = \frac{1}{2}\varepsilon_0 E^2 (Ad)$$

Densità di energia

$$u = \frac{U}{Ad} = \frac{1}{2}\varepsilon_0 E^2$$

Proprietà elettrostatiche dei dielettrici

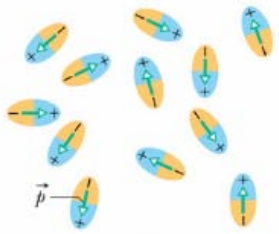




$$k = \frac{V_0}{V} = \frac{E_0 d}{E d} = \frac{E_0}{E}$$

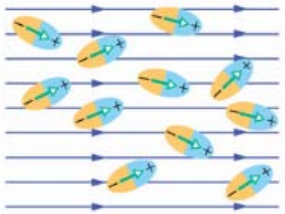
$$E = \frac{E_0}{k}$$

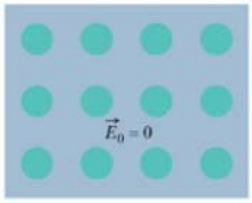
k= costante dielettrica relativa

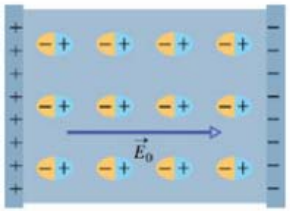


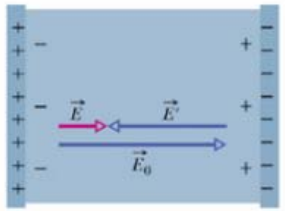
$$C = kC_0$$

$$k = \frac{V_0}{V} = \frac{Q/C_0}{Q/C} = \frac{C}{C_0}$$

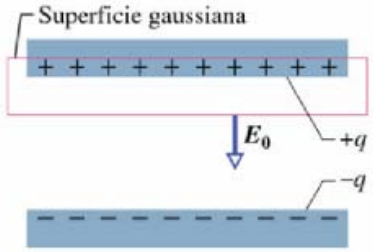


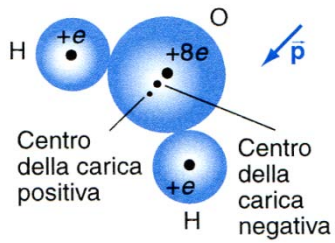


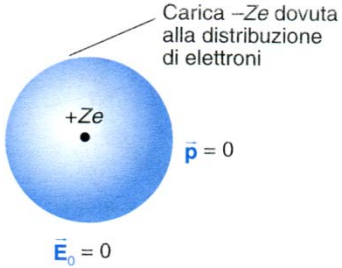


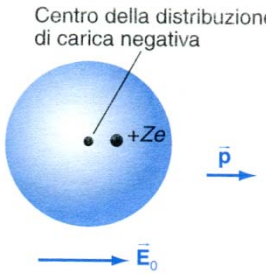


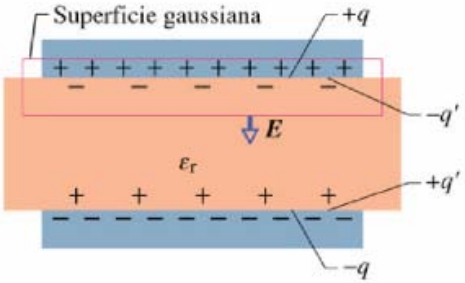
Descrizione molecolare





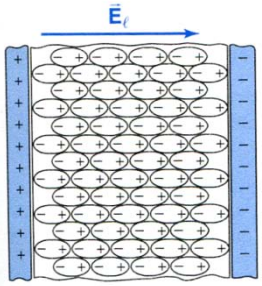


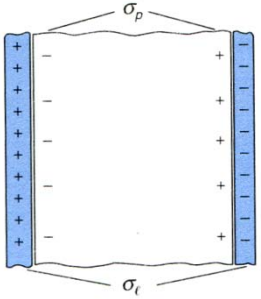




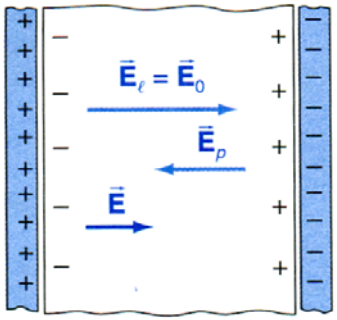
$$\vec{\mathbf{E}} = \vec{\mathbf{E}}_0 + \vec{\mathbf{E}}_p \qquad E = E_0 - E_p$$

$$E = \frac{|\sigma_l| - |\sigma_p|}{\varepsilon_0} \qquad E = \frac{E_0}{k} = \frac{|\sigma_l|}{k\varepsilon_0}$$





$$\frac{|\sigma_l|}{k\varepsilon_0} = \frac{|\sigma_l| - |\sigma_p|}{\varepsilon_0}$$



$$|\sigma_p| = \frac{k-1}{k}|\sigma_l|$$