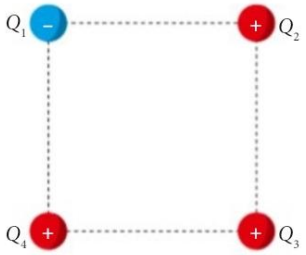
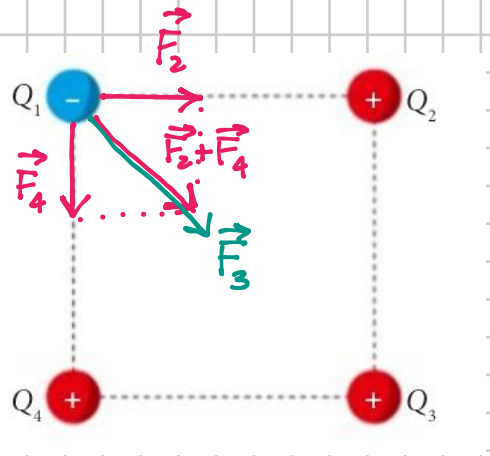
7/10/2022

73 Quattro cariche puntiformi ($Q_1 = -2{,}0 \times 10^{-9}$ C, $Q_2 = Q_4 = +5{,}0 \times 10^{-9}$ C, $Q_3 = +3{,}0 \times 10^{-9}$ C) sono disposte in senso orario sui vertici di un quadrato di lato $l = 40$ cm.



- Determina direzione, verso e modulo della forza elettrica risultante sulla carica Q_1 nel vuoto.
- Determina direzione, verso e modulo della forza elettrica risultante sulla carica Q_1 supponendo che le cariche siano immerse in acetone ($\varepsilon_r = 21$)
- Al centro del quadrato ora è posta una carica $Q = -3{,}0 \times 10^{-9}$ C. Determina direzione, verso e modulo della forza elettrica risultante sulla carica Q.

[$9{,}6 \times 10^{-7}$ N verso Q_3; $4{,}6 \times 10^{-8}$ N; $1{,}7 \times 10^{-6}$ N]



$|\vec{F}_2 + \vec{F}_4| = F_2\sqrt{2}$ $\qquad F_3$

$$F_{TOT} = F_2\sqrt{2} + F_3 = K_0\frac{|Q_1||Q_2|}{l^2}\cdot\sqrt{2} + K_0\frac{|Q_1||Q_3|}{\underbrace{2l^2}_{(\sqrt{2}l)^2}} =$$

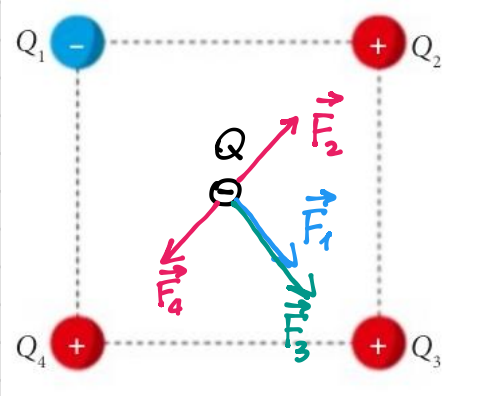
$$= \frac{K_0|Q_1|}{l^2}\left(|Q_2|\sqrt{2} + \frac{|Q_3|}{2}\right) =$$

$$= \left(8{,}99\times10^9\ \frac{N\cdot m^2}{C^2}\right)\frac{2{,}0\times10^{-9}\ C}{40^2\times10^{-4}\ m^2}\left((5{,}0\times10^{-9}\ C)\sqrt{2} + \frac{3{,}0\times10^{-9}\ C}{2}\right) =$$

$$= 0{,}0963173\ldots\times10^{-5}\ N \simeq \boxed{9{,}6\times10^{-7}\ N} \quad \text{verso } Q_3$$

$$F_{TOT_{acetone}} = \frac{F_{TOT}}{\varepsilon_r} = \frac{9{,}6317\ldots\times10^{-7}\ N}{21} = 0{,}4586\ldots\times10^{-7}\ N$$

$$\simeq \boxed{4{,}6\times10^{-8}\ N}$$



$Q = -3{,}0 \times 10^{-9}\ C$

$Q_1 = -2{,}0 \times 10^{-9}\ C$

$Q_2 = Q_4 = 5{,}0 \times 10^{-9}\ C$

$Q_3 = 3{,}0 \times 10^{-9}\ C$

$\vec{F}_{TOT\,Q} = ?$

$\vec{F}_2 + \vec{F}_4 = \vec{0}$ $\quad \vec{F}_2$ e $\vec{F}_4$ si equilibrano

$F_{TOT\,Q} = F_1 + F_3$

DISTANZA QQ_3 = DISTANZA $Q_1Q = \frac{\ell\sqrt{2}}{2}$

$$F_{TOT\,Q} = F_1 + F_3 = k_0 \frac{|Q||Q_1|}{\frac{\ell^2}{2}} + k_0 \frac{|Q||Q_3|}{\frac{\ell^2}{2}} = \frac{2k_0|Q|}{\ell^2}\left(|Q_1| + |Q_3|\right) =$$

$\left(\frac{\ell\sqrt{2}}{2}\right)^2$

$$= \frac{2\left(8{,}99 \times 10^9\ \frac{N \cdot m^2}{C^2}\right)\left(3{,}0 \times 10^{-9} C\right)}{40^2 \times 10^{-4}\ m^2}\left(2{,}0 + 3{,}0\right) \times 10^{-9}\ C =$$

$$= 0{,}1685625 \times 10^{-5}\ N \simeq \boxed{1{,}7 \times 10^{-6}\ N}$$