Notes

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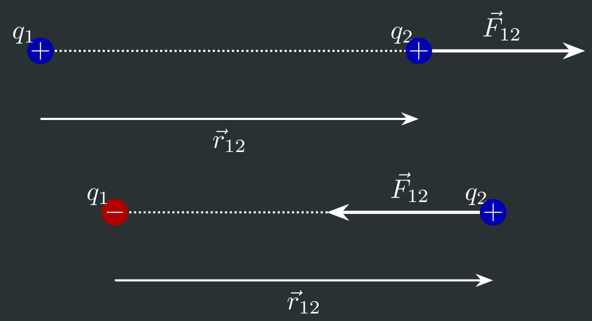
Contents

1 Coulomb's Law

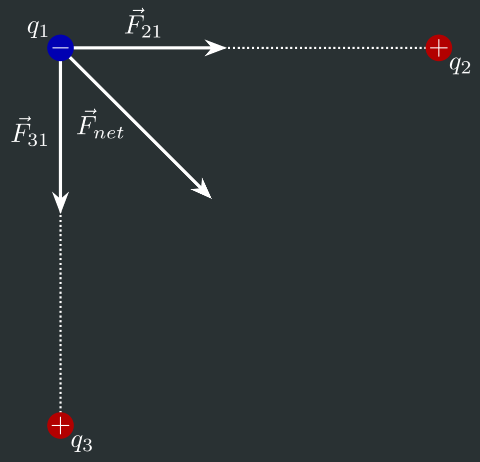
Coulomb's Law

$$\vec{F_{12}} = k\frac{q_1 q_2}{r_{12}^2}\hat{r_{12}} \tag{1}$$

Gives a force along the line of two charges.
If q_1 and q_2 have the same sign (i.e. charge) then the force must be repulsive. But if they have the *same* sign, then it must be attractive.
Because of Newton's second law, $F_{12} = -F_{21}$



$$\boxed{F_{1,net} = F_{21} + F_{31}}$$



Superpostion Principle

$$F_{net} = \sum_i \vec{F}_i \tag{2}$$

Electron Charge

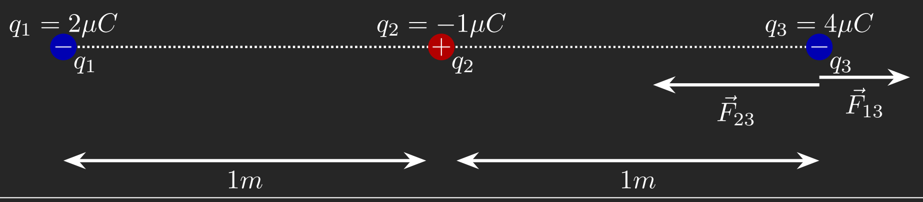
$$e = -1.6 \times 10^{-19} C$$

k

$$k = 9 \times 10^9 \frac{NM^2}{C^2}$$

1.1 Examples

Example 1.1 $\boxed{F_{3,net} = ???}$



Using Coulomb's Law[1]...

$$\vec{F_{3,net}} = \vec{F_{31}} + \vec{F_{32}}$$

$$\vec{F_{31}} = k\frac{q_3 q_1}{r_{31}^2}\hat{r_{32}}$$

$$\vec{F_{32}} = k\frac{q_3 q_2}{r_{32}^2}\hat{r_{32}}$$

$$k = 9 \times 10^9 \frac{NM^2}{C^2}, \qquad q_1 = 2\mu C, \qquad q_2 = -1\mu C, \qquad q_3 = 4\mu C$$

$$\vec{F_{31}} = 1.800 \times 10^{-2}\,\mathrm{N}, \quad \vec{F_{32}} = -3.600 \times 10^{-2}\,\mathrm{N}$$

$$\boxed{\vec{F}_{3,net} = -1.800 \times 10^{-2}\,\mathrm{N}}$$

2 Equations

$$\vec{F_{12}} = k\frac{q_1 q_2}{r_{12}^2}\hat{r_{12}} \tag{1} \quad (Coulomb's\ Law)$$

$$F_{net} = \sum_i \vec{F_i} \tag{2} \quad (Superpostion\ Principle)$$

3 Constants

$$e = -1.6 \times 10^{-19} C \tag{1} \quad (Electron\ Charge)$$

$$k = 9 \times 10^9 \frac{NM^2}{C^2} \tag{2} \quad (k)$$