

Coulomb's Law – Quiz 20a

$$F_{12} = k \frac{|q_1 q_2|}{r^2}$$

$\vec{F}_{12} = k \frac{q_1 q_2}{r^2} \hat{r}_{12}$ (in a vacuum) where $k = 9 \times 10^9$ using SI or MKS units.

$e = 1.6 \times 10^{-19} \text{ C (coulombs)}$ and $1 \text{ C} = 6.25 \times 10^{18} e$ (where “e” is the elementary unit of charge).

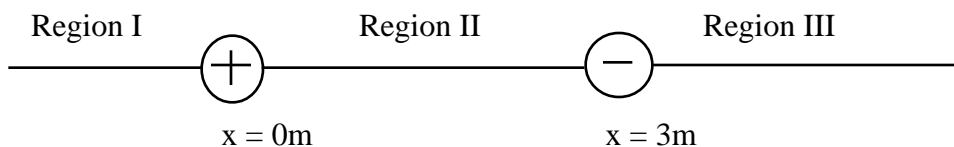
$m_e = 9.11 \times 10^{-31} \text{ kg}$ and $m_p \approx m_n \approx 1.67 \times 10^{-27} \text{ kg}$

1. What is the magnitude of the force of $q_1 = 4\text{C}$ on charge $q_2 = -2\text{C}$ if the distance between the two charges is 0.50m ?

2. Let $q_1 = 3\mu\text{C}$ and $q_2 = -2\mu\text{C}$ and let the two charges be separated by 0.40m . Find the force of charge, q_1 , on charge, q_2 . ($\mu = 10^{-6}$ or “micro”)

3. What happens to the electric force of q_1 on q_2 if:
 - (a) the distance, d , between them is doubled?
 - (b) the distance, d , between them is changed to one-third of d ?
 - (c) one charge is doubled and the other charge is tripled?

4.



If the positive charge at the origin of the x -axis is $q_1 = 5\text{C}$ and the negative charge is $q_2 = -3\text{C}$,

- (a) in what region could a third charge, q_3 , be placed and have a zero net force on it?
 - (b) Find this position!
-
5. Two identical metal spheres contain excess charges of -8C and 2C . The spheres are on insulated stands. They are touched together and then separated to a distance of 9m . What now is the electric force of the sphere on the left on the sphere on the right?

