Unit 10: Electrostatics

Topic: Coulombs Law

Review Charge Q q big little

"opposites attract" + −

similar Q repel + + − −

Q is a vector = magnitude + direct + or −

calc

↓

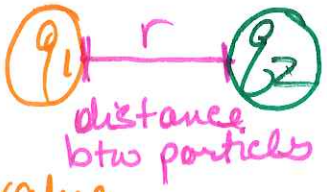
Coulombs Law

Coulomb's Law (size / amount)

Calculation of magnitude of the Electrostatic Force of attraction or repulsion

e $F = F_e$

of 2 charged particles



Electrostatic Constant K_e

$8.987 * 10^9 \frac{N m^2}{C^2}$

$9 * 10^9 \frac{N m^2}{C^2}$

absolute value dont care about + or − after know attraction or repel Magnitude only

q * Charge of particle in C Coulombs

Electrostatic Force in N

$$F_e = \frac{K_e |q_1 q_2|}{r^2}$$

← inverse relationship as r ↑ F_e ↓ as F_e ↑ r ↓

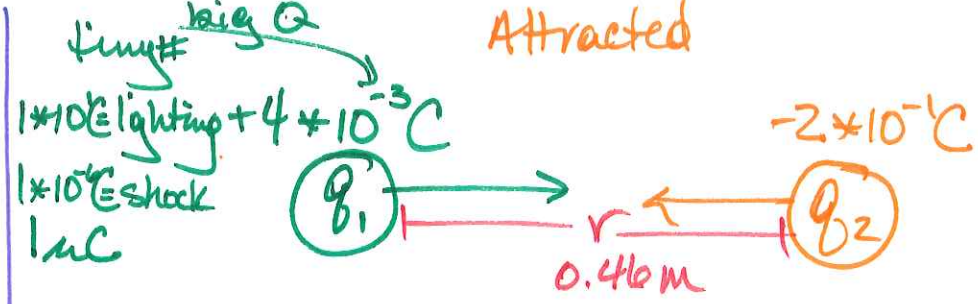
r = distance between particles must be squared in m

if particles are close = r smaller = $\frac{1}{5}$ = Force attract + repulsion bigger $\frac{25}{1}$

$$F_e = \frac{K_e q_1 q_2}{\frac{1}{5^2} r^2} = \frac{1}{\frac{1}{5^2}} = \frac{1}{\frac{1}{25}} = 1 \cdot \frac{25}{1} = 25$$

if particles are far = Force $\frac{1}{6}$

$F_e = \frac{K_e q_1 q_2}{6 r^2} = \frac{1}{6^2} = \frac{1}{36}$



$$F_e = \frac{K_e q_1 q_2}{r^2}$$

$$= \frac{9*10^9 \frac{N m^2}{C^2} (4*10^{-3} C)(2*10^{-1} C)}{(0.46 m)^2}$$

$$= \frac{7.2*10^6}{.2116}$$

$$F_e = 3.4*10^7 N$$

magnitude of F of attraction between particle 1+2 at this distance