Electrostatics

Wednesday, May 2, 2018 10:37 AM

electrons non-moving

positive charge: remove electrons

negative charge: add electrons

Elementary Charge: smallest unit of charge

proton +
electron − } $e^- = \pm 1.6 \times 10^{-19}$ C ← Coulomb

Charge on an object

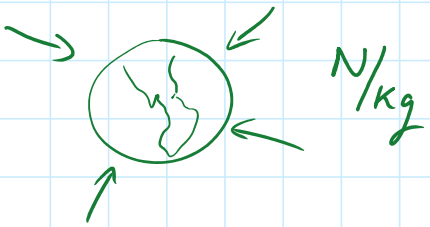
$Q = n \cdot e$

Q: charge

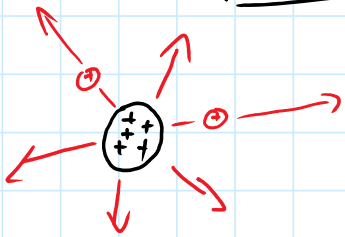
n: # of extra / lost electrons

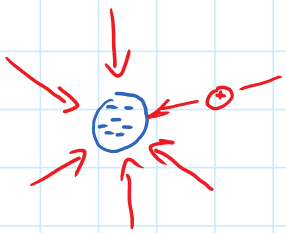
Electric Field

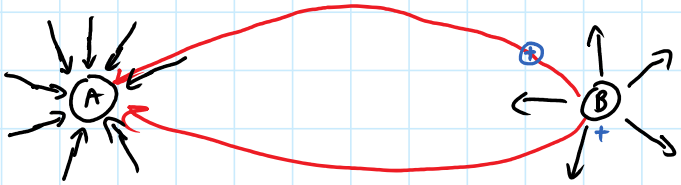
- around any charged object, an electric field exists.
- vector, mag., dir.
- $\vec{E}$, units are N/C



- Direction is determined by the direction a 2nd positive charge would travel.





ex: 

a) which charge is positive B

b) which charge is larger? A

more field lines

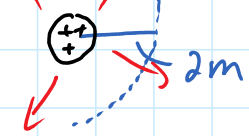
Strength of $\bar{E}$ field

$E = \frac{kQ}{r^2}$ K - Coulombs constant $= 9.0\times10^9 \frac{N m^2}{C^2}$

$g = \frac{Gm}{r^2}$

Q - charge producing the electric field

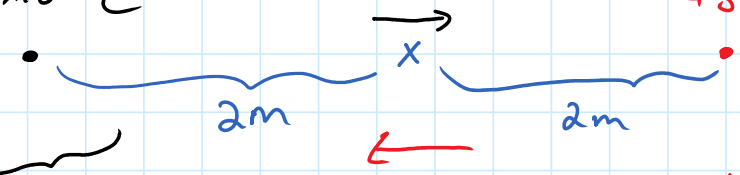
r - distance from charge

Ex 

$E = \frac{kQ}{r^2} = \frac{(9\times10^9 \frac{N m^2}{C^2})(3\times10^{-6} C)}{(2m)^2}$

$= 6750\ N/C$

Ex $+3\times10^{-6}$ C $\quad +5\times10^{-6}$



What is the E field strength at x.

6750 N/C (right)

$E = \frac{(9\times10^9)(5\times10^{-6})}{2^2}$

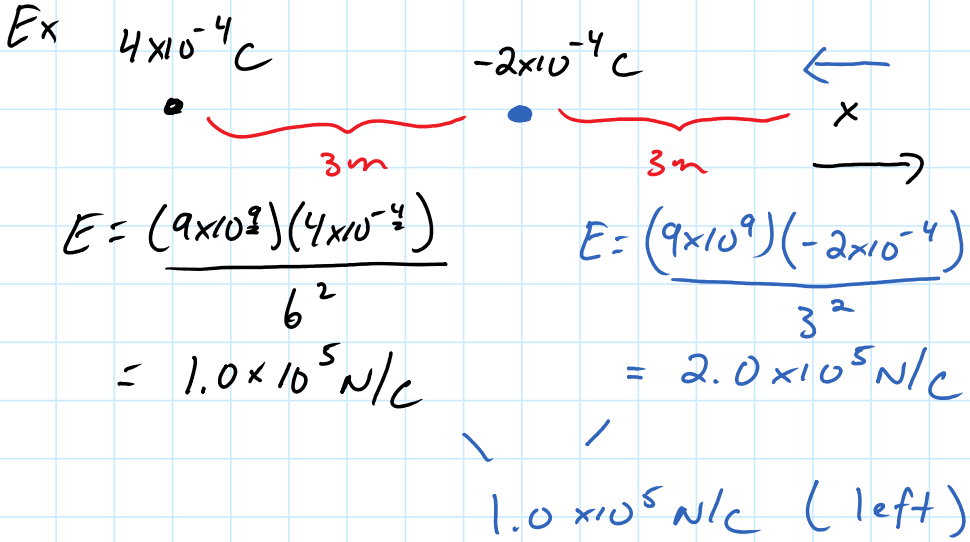
$= 1.125\times10^4\ N/C$

$= 11250\ N/C$ (left)

$11250 - 6750 =$ **4500 N/C (left)**

Ex 4×10^{-4} C $\quad -2\times10^{-4}$ C ← Electric Field at

Ex



Electric Field at x

$E = \frac{(9\times10^9)(4\times10^{-4})}{6^2}$

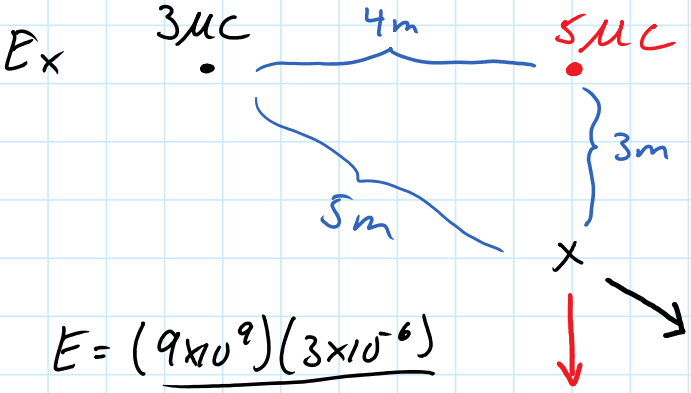
$= 1.0\times10^5$ N/C

$E = \frac{(9\times10^9)(-2\times10^{-4})}{3^2}$

$= 2.0\times10^5$ N/C

1.0×10^5 N/C (left)

Ex



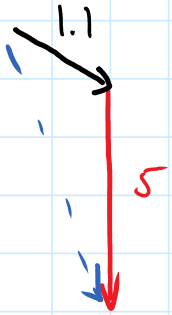
$5\mu C \rightarrow 5.0\times10^{-6}$ C

$\mu = \times10^{-6}$

micro = μ

$E = \frac{(9\times10^9)(3\times10^{-6})}{5^2}$

$= 1.1\times10^3$ N/C



$E = \frac{(9\times10^9)(5\times10^{-6}\text{C})}{3^2}$

$= 5\times10^3$ N/C