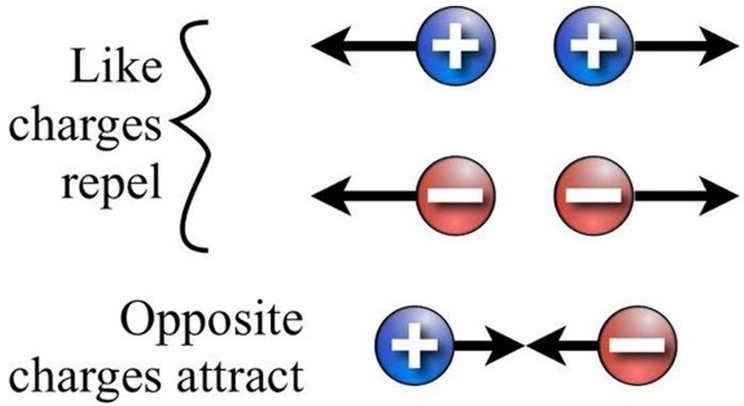
Lecture 1 : Electric Force

Quantity of charge : Q or q

Measuring unit : Coulomb (C)



Types of charges :

positive (+) , negative (−)

Dr. Khaled Zaky

Atoms:

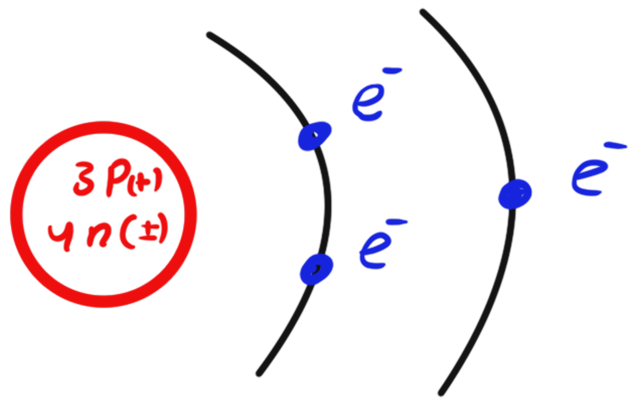
Atom is neutral because number of positive protons equal number of negative electrons.

$_{3}^{}Li$

3 protons (+)

4 neutrons (±) or Zero charge

3 electrons (−)



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

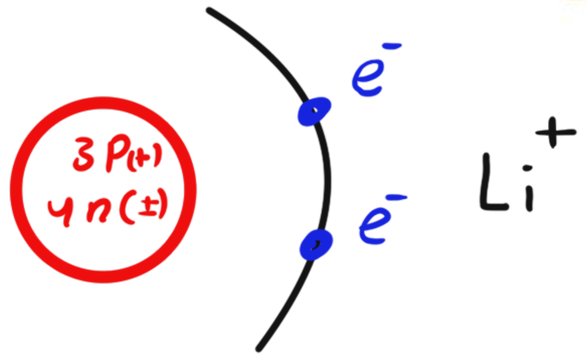
$e = -1.6 \times 10^{-19}\ C$

Dr. Khaled Zaky

Ions :-

positive ion (when atom loses electrons)

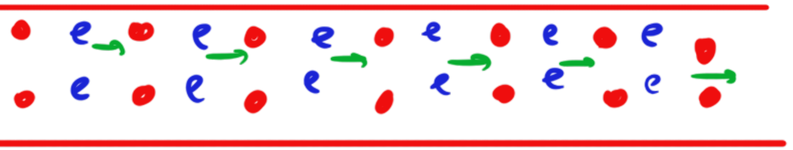
negative ion (when atom gains electrons)



Conductors

rich of free charges

Metals (Copper_ Iron_ Aluminum)

⇒ 

Insulators

poor of free charges

nonmetals (wood - glass)

Dr. Khaled Zaky

Coulomb's Law!.

$$F = k \frac{q_1 q_2}{r^2}$$

$$k = 9 \times 10^9$$

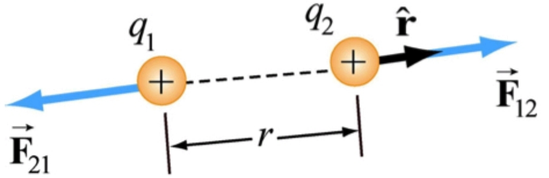
F = Force (N)

k = Constant ($N.m^2/C^2$)

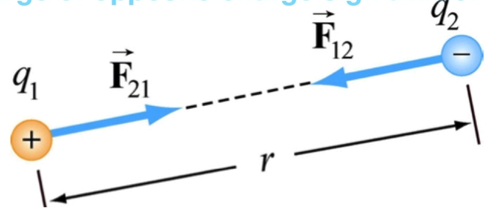
q_1 & q_2 = Charge (C)

r = distance (m)

Charges of the same sign repel



Charge of opposite charge sign attract



$$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$$

$$\varepsilon_0 = 8.85 \times 10^{-12}$$

Dr. Khaled Zaky

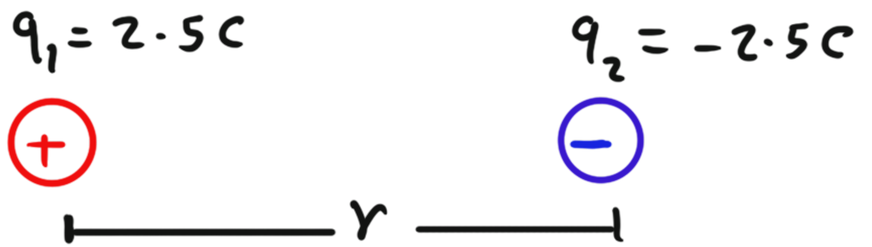
21.7 •• An average human weighs about 600 N. If each of two average humans could carry 2.5 C of excess charge, one positive and one negative, how far apart would they have to be for the electric attraction between them to equal their 600-N weight?

$F = -600\ N$ (attraction force)

$q_1 = 2.5\ C$

$q_2 = -2.5\ C$

$k = 9 \times 10^9\ N.m^2/C^2$



$$F = k \frac{q_1 q_2}{r^2}$$

$$r = \sqrt{k \frac{q_1 q_2}{F}} = \sqrt{9 \times 10^9 \frac{2.5 \times -2.5}{-600}} = 9.68 \times 10^3\ m = 9.68\ km$$

Dr. Khaled Zaky