

AP Physics - Electrostatics - Coulomb's Law

Note Title

2/29/2008

Remember the Universal Law of Gravitation? :

$$F_g = \frac{Gm_1m_2}{d^2}$$

-or, the Force (F) between two masses (m_1 and m_2) is proportional to the product of the two masses, divided by the square of the distance between them.

There exists a similar relationship between two charged objects, called Coulomb's Law:

$$F_{\text{electrostatic}} = \frac{kq_1q_2}{d^2}$$

F_e = Electrostatic Force [N]

q_1 = charge #1 [Coulombs]

q_2 = charge #2 [Coulombs]

d = distance between charges [m]

-or, the Force (F) between two charges (q_1 and q_2) is proportional to the product of the two charges, divided by the square of the distance between them.

* k is "Coulomb's Constant"

$$k = 9 \cdot 10^9 \frac{Nm^2}{C^2}$$

Electrons have a negative charge:

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

Protons have a positive charge:

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

Neutrons have no charge.

Total charge on object = (charge of one electron) \times (# of excess electrons)

$$Q_{\text{TOTAL}} = nq_e$$