Electrostatics

Objectives

Understand the concept of electric charge!

Calculate the electrical force between two charged objects.

Electrostatics

Energy at rest - build-up of electric charges

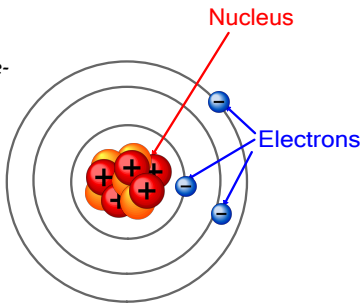
"Static Electricity"

Electric Charges

Atoms - electrons

Charge - gain/loss of e-
(−) (+)

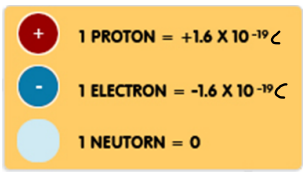
The symbol for charge is (q)



Coulomb

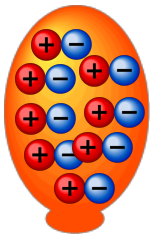
Metric unit for electric charge (C)

$1\mu C = 10^{-6}$ C

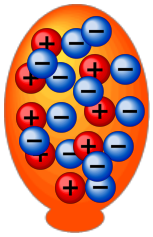


One Coulomb is the charge of 6.24×10^{18} electrons – about the charge going thru a 100 watt light bulb in about 1 second.

Electrically Neutral



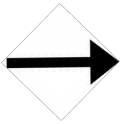
Electrically Charged



Triboelectric Series

Ranks materials according to their tendency to give up their electrons

THE TRIBOELECTRIC SERIES



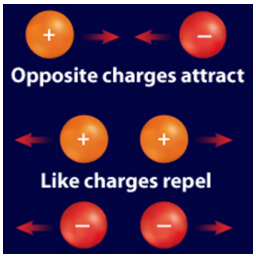
Positive
Rabbit's fur
Glass
Wool
Cat's fur
Silk
Felt
Cotton
Wood
Cork
Rubber
Celluloid
Negative

Electric Force

caused by an unbalanced charge

Fundamental Rule

"Like charges repel, unlike attract"



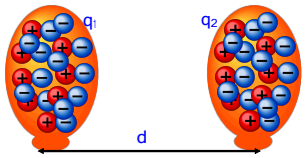
FBD of Electric Force

Coulomb's Law

The force between the charges

$$F_e = \frac{kq_1q_2}{d^2}$$

$k = 9.0 \times 10^9$ N-m²/C²



F_e vs. F_g

$$F_e = \frac{kq_1q_2}{d^2}$$

$k = 9.0 \times 10^9$ N-m²/C²

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

$G = 6.67 \times 10^{-11}$ N-m²/kg²

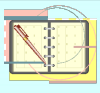
Calculating Coulomb's

Boppo the clown carries two mylar balloons which rub against a circus elephant causing the charges to separate. Each balloon acquires 2.0×10^{-7} C of charge. How large is the electric force between them when they are separated by a distance of 0.50 m?

$F_e = \frac{k q_1 q_2}{d^2}$ $\quad \frac{(9\times10^9)(2\times10^{-7})(2\times10^{-7})}{(0.50\text{m})^2}$

$F_e = 1.44 \times 10^{-3}$ N

Assignments . . .



- Begin Chapter 14 Homework # 1-6