

Ch 18

Electrostatics

statics - _____
_____ - _____

Fundamental quantities in physics

mass, length, time, electric charge

amount of substance, temperature, light intensity

Seven fundamental units

kilogram, meter, second, ampere, kelvin, mole, candela

Four fundamental forces

gravity, electromagnetism,

weak force – involved in radioactive decay

strong force, n—n interaction to hold nuclei together

- Electric charge
- Similar to gravity
 - inverse square relation (coulomb's law)

$$F = \frac{kq_1q_2}{r^2}$$

- Different from gravity:
 - can repel as well as attract

- Fundamental principle
 - like charges repel
 - unlike charges attract
- Charges in the atom
 - atom means “_____”
 - electron 1897, J.J. Thompson
 - proton, 1919 Ernest Rutherford
 - neutron, 1932 James Chadwick

- As far as is known, only two types of charge exist.
- We always “see” unit charges, although quarks are hypothesized to carry fractional charges ($1/3$ and $2/3$)

- electroscope
- conductors and insulators
- electrophorus
- charging by induction

- Gravity and electromagnetism are both important forces, let's look at which is stronger by examining the H atom

Just the facts:

$$m_e = 9.1095 \times 10^{-31} \text{ kg}$$

$$m_p = 1.6726 \times 10^{-27} \text{ kg}$$

$$r_H = 5.29 \times 10^{-11} \text{ m}$$

$$q_e = -1.602 \times 10^{-19} \text{ C}$$

Perhaps we could calculate:

$$\frac{F_E}{F_G}$$

I always find this a surprising result!

