Electric charge

Electric charge is an intrinsic property of matter. An object can have positive or negative charge, or it can be neutral. In the international system of units (SI), the unit of charge is the “Coulomb”.

Nowadays, we believe that the fundamental unit of charge is that of the electron, which has a negative charge of 1.6×10^{-19}C.

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

Coulomb’s Law

Coulomb’s law describes the force between charged particles. Coulomb found that it is given by:

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

In this context, a positive force is a repulsive one, whereas a negative force is an attractive one. As a consequence,

Equal charges repel each other

Opposite charges attract each other

Homework

Problem 1.

The number of atoms in a penny is about 10^{22} and the total number of electrons is of the order of 10^{24}. The charge of each electron is -1.6×10^{-19} C. If you could possibly separate the electrons from all the nuclei in a single penny, how much total charge would you get from the electrons?

Problem 2.

Two identical pieces of dust at distance d=5cm repel electrostatically with the force $F=10^{-6}$ N. Find the electric charge on each of them.