

Name: Key

Notes - 18.1 Static Electricity and Charge: Conservation of Charge

1. Benjamin Franklin demonstrated a connection between lightning and static electricity.
2. Besides being a scientist, what other endeavors was Benjamin Franklin involved with?
inventor revolutionary statesman writer
3. What experiment did Luigi Galvani perform?
used static electricity to stimulate contractions in frogs legs
4. Who developed the battery?
Alessandro Volta
5. All the macroscopic forces that we experience directly, such as the sensations of touch and the tension in a rope, are due to the electromagnetic force. This force is one of the four fundamental forces in nature. The gravitational force, another fundamental force, is actually sensed through the electromagnetic interaction of molecules, such as between those in our feet and those on the top of a bathroom scale. (The other two fundamental forces are the weak nuclear force and the strong nuclear force.)
6. The first record of the effects of static electricity dates to ancient Greeks who noted more than 500 years B.C. that polishing amber temporarily enabled it to attract bits of straw. The word "electric" derives from the Greek word for amber (electron).
7. What are the two types of charges? + -
8. Like charges repel and unlike charges attract.
9. In atoms, electrons carry negative charge and protons carry positive charge.
10. The SI unit of charge is the coulomb (C). The charge on an electron is equal to $1.60 \times 10^{-19} \text{ C}$. It takes 6.25×10^{18} electrons to make 1.00 C.

11. The electron seems to have no substructure; in contrast, when the substructure of protons is explored by scattering extremely energetic electrons from them, it appears that there are point-like particles inside the proton. These sub-particles, named quarks, have never been directly observed, but they are believed to carry fractional charges. The charge on an up quark is $\frac{+2}{3}$ and the charge on a down quark is $\frac{-1}{3}$.

12. When materials are rubbed together, charges can be separated, particularly if one material has a greater affinity for electrons than another.

13. What is the Law of Conservation of Charge? The total charge is constant in any process.

14. Whenever a charged particle is created such as in collisions in particle accelerators, another having an opposite charge is always created along with it, so that the total charge created is zero.

15. What is the antimatter counterpart of the electron? positron

16. Besides charge, name three other physical quantities that are always conserved.

1. Energy
2. Momentum
3. Angular momentum