

Electricity ▪ *Section Summary*

Electric Charge and Static Electricity

Guide for Reading

- How do electric charges interact?
- What is an electric field?
- How does static electricity build up and transfer?

The charged parts of atoms are electrons and protons. Protons and electrons have opposite charges. The charge on the proton is called positive (+) and the charge on the electron is called negative (–). **Charges that are the same repel each other. Charges that are different attract each other.** The interaction between electric charges is called electricity.

Force is a push or pull on an object. In electricity, **electric force** is the attraction or repulsion between electric charges. Electric charges exert force over a distance. An **electric field** extends around a charged object. **An electric field is a region around a charged object where the object's electric force is exerted on other charged objects.** When one charged object is placed in the electric field of another charged object, it is either pushed or pulled. It is pushed away if the two objects have the same charge. It is pulled toward the other charged object if their charges are different. You can use electric field lines to represent an electric field. The electric force always points away from positive charges. The strength of an electric field is related to the distance from the charge object. The greater the distance, the weaker the electric field.

Electrons can sometimes leave their atoms. An uncharged object becomes charged by gaining or losing electrons. If an object loses electrons, it has an overall positive charge. If an object gains electrons, it has an overall negative charge. The buildup of charges on an object is called **static electricity**. **In static electricity, charges build up on an object, but they do not flow continuously.**

Charges are neither created nor destroyed. If an object gives up electrons, another object gains those electrons. This is known as the law of **conservation of charge**. **There are three methods by which charges can be transferred to build up static electricity: charging by friction, by conduction, and by induction.** Charging by **friction** is the transfer of electrons from one uncharged object to another by rubbing. Charging by **conduction** is the transfer of electrons from a charge object to another by direct contact. Charging by **induction** is movement of electrons to one part of an object that is caused by the electric field of a second object. The electric field around the charged object attracts or repels electrons in the second object.

If an object gains a static charge, the object doesn't hold the charge forever. **When a negatively charged object and a positively charged object are brought together, electrons transfer until both objects have the same charge.** The loss of static electricity as electric charges transfer from one object to another is called **static discharge**. Lightning is an example of a huge spark of static electricity.