SECTION 1

Electric Charge

SECTION OBJECTIVES

- Understand the basic properties of electric charge.
- Differentiate between conductors and insulators.
- Distinguish between charging by contact, charging by induction, and charging by polarization.

PROPERTIES OF ELECTRIC CHARGE

You have probably noticed that after running a plastic comb through your hair on a dry day, the comb attracts strands of your hair or small pieces of paper. A simple experiment you might try is to rub an inflated balloon back and forth across your hair. You may find that the balloon is attracted to your hair, as shown in **Figure 1(a).** On a dry day, a rubbed balloon will stick to the wall of a room, often for hours. When materials behave this way, they are said to be *electrically charged.* Experiments such as these work best on a dry day because excessive moisture can provide a pathway for charge to leak off a charged object.

You can give your body an electric charge by vigorously rubbing your shoes on a wool rug or by sliding across a car seat. You can then remove the charge on your body by lightly touching another person. Under the right conditions, you will see a spark just before you touch, and both of you will feel a slight tingle.

Another way to observe static electricity is to rub two balloons across your hair and then hold them near one another, as shown in **Figure 1(b).** In this case, you will see the two balloons pushing each other apart. Why is a rubbed balloon attracted to your hair but repelled by another rubbed balloon?

There are two kinds of electric charge

The two balloons must have the same kind of charge because each became charged in the same way. Because the two charged balloons repel one another, we see that *like charges repel.* Conversely, a rubbed balloon and your hair, which do not have the same kind of charge, are attracted to one another. Thus, *unlike charges attract.*

Table 1 Conventions for Representing Charges and Electric Field Vectors

Positive charge	$+q$
Negative charge	$-q$
Electric field vector	$\mathbf{E}$
Electric field lines	

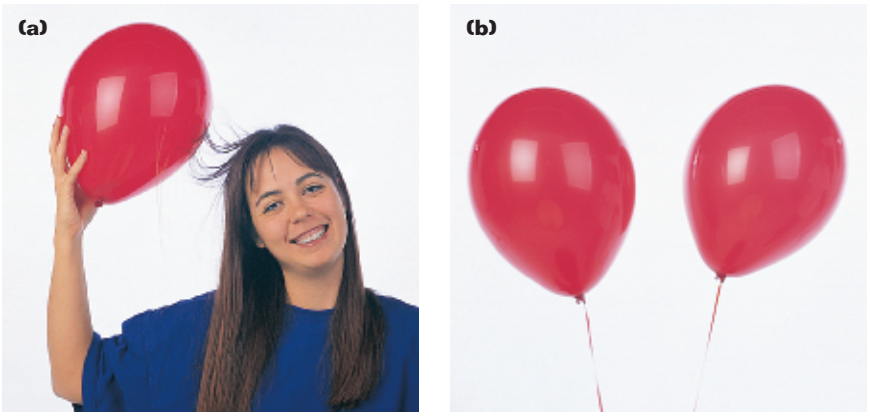

Figure 1
(a) If you rub a balloon across your hair on a dry day, the balloon and your hair become charged and attract each other. **(b)** Two charged balloons, on the other hand, repel each other.