



LEARN ABOUT

Static Electricity

FIND OUT

- about a property of matter called charge
- how charges move from one piece of matter to another
- how electric fields cause forces

VOCABULARY

charge
static electricity
electric field

Two Kinds of Charge

Remember that matter is made of particles that have mass and volume. Particles of matter also have a property called *electric charge*. A particle can have a positive (+) charge, a negative (−) charge, or no charge at all.

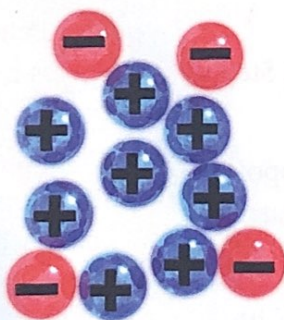
Matter in an object normally has equal numbers of positive and negative particles. It is *neutral*. Rubbing two objects together, however, can move negative particles from one object to the other. In the investigation, rubbing made the number of positive charges different from the number of negative charges.

Charge is a measure of the extra positive or negative particles that an object has. Rubbing gave one object an overall *positive charge*, and it gave the other an overall *negative charge*.

The charge that stays on an object is called **static electricity** (STAT•ik ee•lek•TRIS•ih•tee). *Static* means “not moving.” Even though the charges moved to get there, they stay on the charged object.

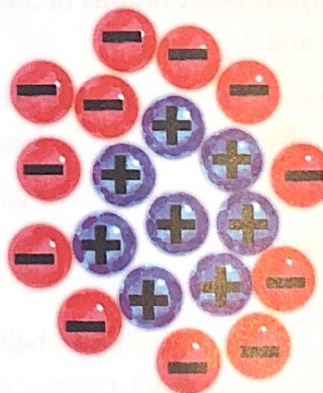
✓ What are the two types of charges?

Positive Charge



▲ A single positive charge is labeled +. A single negative charge is labeled −. When an object has more positive charges than negative charges, its overall charge is positive.

Negative Charge



▲ If an object has more negative charges than positive charges, its overall charge is negative. How many extra negative charges are shown here?

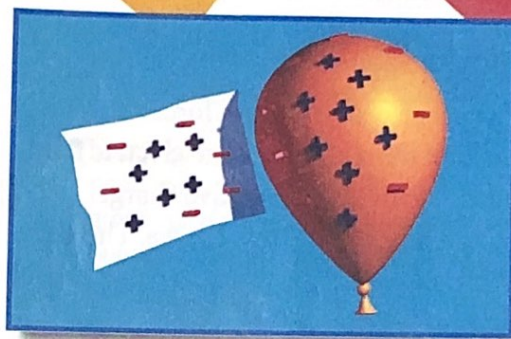
separating Charges

Most of the time, you, a balloon, and a doorknob have neither an overall negative charge nor an overall positive charge. You and the objects are neutral. To see the effects of forces between charges, you must separate negative charges from positive charges.

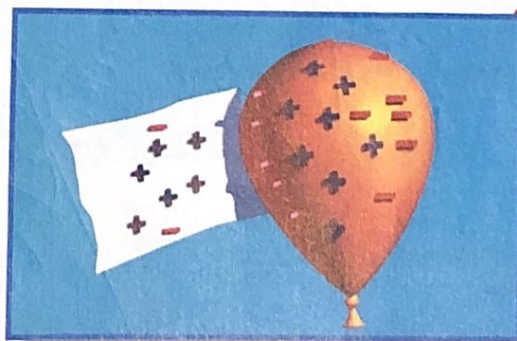
Only the negative charges move. When you rubbed the balloons, only the negative particles were pulled away. Combing dry hair is another example of separating charges. As you comb, the teeth of the comb rub negative charges from your hair. The comb gets extra negative charges, so it has an overall negative charge. Your hair loses some negative charges. It now has an overall positive charge.

✓ Which kind of charge moves to make a static charge?

As clothes tumble in a dryer, different fabrics rub against each other. Negative charges move from one piece of clothing to another. When this happens the clothes stick together. ▼



▲ If you hold a piece of wool next to a balloon, nothing happens. So you know that neither the wool nor the balloon is charged. The numbers of positive and negative charges on the balloon are equal. The charges are also equal on the wool. Both items have a neutral charge.



▲ Rubbing wool on a balloon separates charges. Negative charges move from the wool to the balloon. The balloon now has more negative charges than positive charges. The balloon is negatively charged. The wool loses negative charges. Now it has more positive charges than negative charges. It is positively charged.

Electric Forces

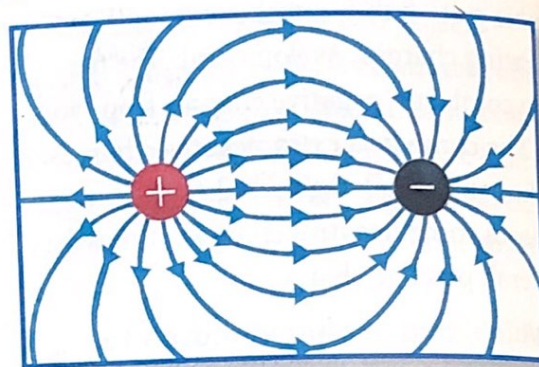
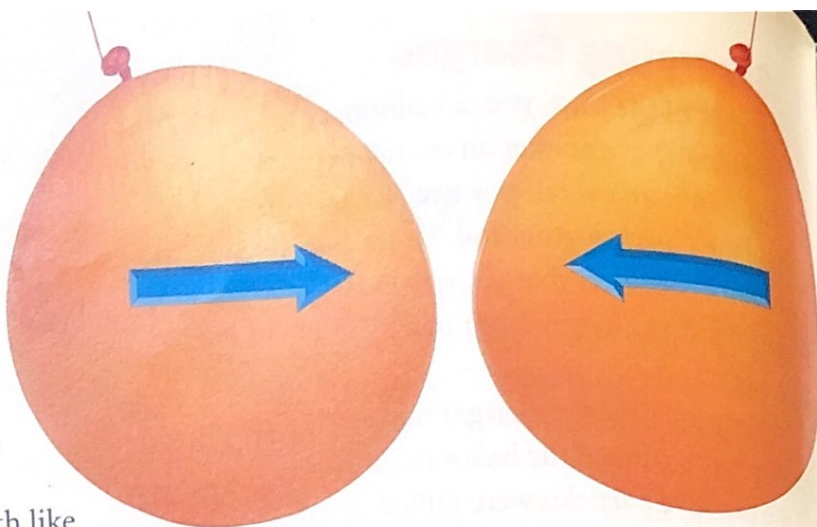
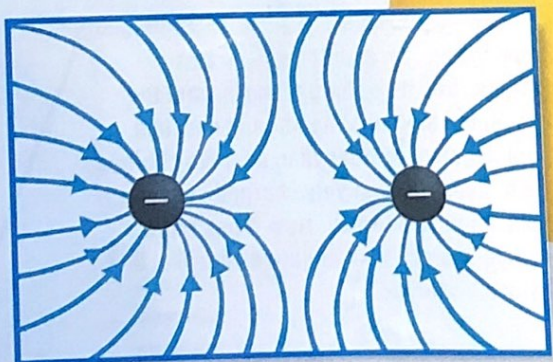
In the investigation you saw how a charged balloon pushed or pulled another charged balloon. The push or pull between objects with different charges is an *electric force*. The electric force causes two objects with opposite charges to *attract*, or pull, each other. The electric force also causes two objects with like charges to *repel* (rih•PEL), or push away from, each other.

The space where electric forces occur around an object is called an **electric field**. The electric field of a positive charge attracts a nearby negative charge. The electric field of a positive charge repels a nearby positive charge.

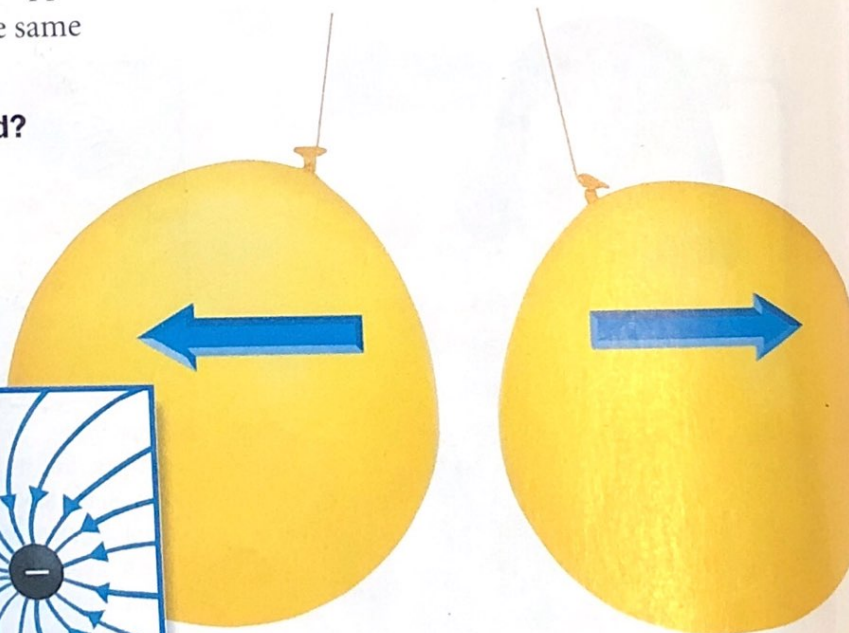
In diagrams, arrows are used to show an electric field. They point the way one positive charge would be pulled by the field. The pictures here show the electric fields of two pairs of balloons. One pair has opposite charges. The other pair has the same charges.

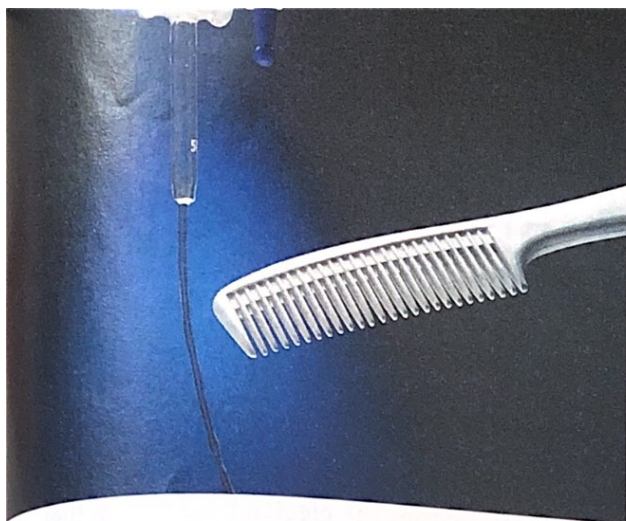
✓ What is an electric field?

Both balloons have negative charges. Their electric fields do not form a closed pattern of field lines. Balloons with the same type of charge repel each other.



▲ One balloon has a positive charge. The other has a negative charge. Their electric fields form a closed pattern of field lines. Balloons with opposite charges attract each other.





▲ After you comb your hair, your comb has a negative charge. Its electric field repels the negative particles in the stream of water. Negative particles are pushed to the opposite side of the stream. That leaves extra positive charges on the side near the comb. The stream bends toward the comb.

Summary

Objects become electrically charged when they gain or lose negative charges. A charge causes an electric field. The electric fields of charged objects interact to produce electric forces. Objects with like charges repel each other. Objects with unlike charges attract each other.

Review

1. What is static electricity?
2. What is charge?
3. What is an electric field?
4. **Critical Thinking** How can you make a piece of rubber that has an overall positive charge neutral again?
5. **Test Prep** A plastic ruler can get a positive charge by —
 - A gaining a single negative charge
 - B losing a single negative charge
 - C gaining a single positive charge
 - D losing a single positive charge



LINKS



MATH LINK

Charge Count The two pictures on page C34 show charges. How many single negative charges must each object gain or lose to become neutral? Use numbers and math symbols to show how you found your answer.



WRITING LINK

Informative Writing—Description Suppose you are a balloon. Write a paragraph for a classmate describing what happens to you as you gain a negative charge from a piece of wool.



HEALTH LINK

Lightning Safety Lightning is a big movement of charged particles. It can kill people and animals, and it can start fires. Find out the safety rules you should follow during a thunderstorm. Make a poster illustrating the rules.



TECHNOLOGY LINK

Learn more about early use of electricity by visiting the National Museum of American History Internet site.
www.si.edu/harcourt/science