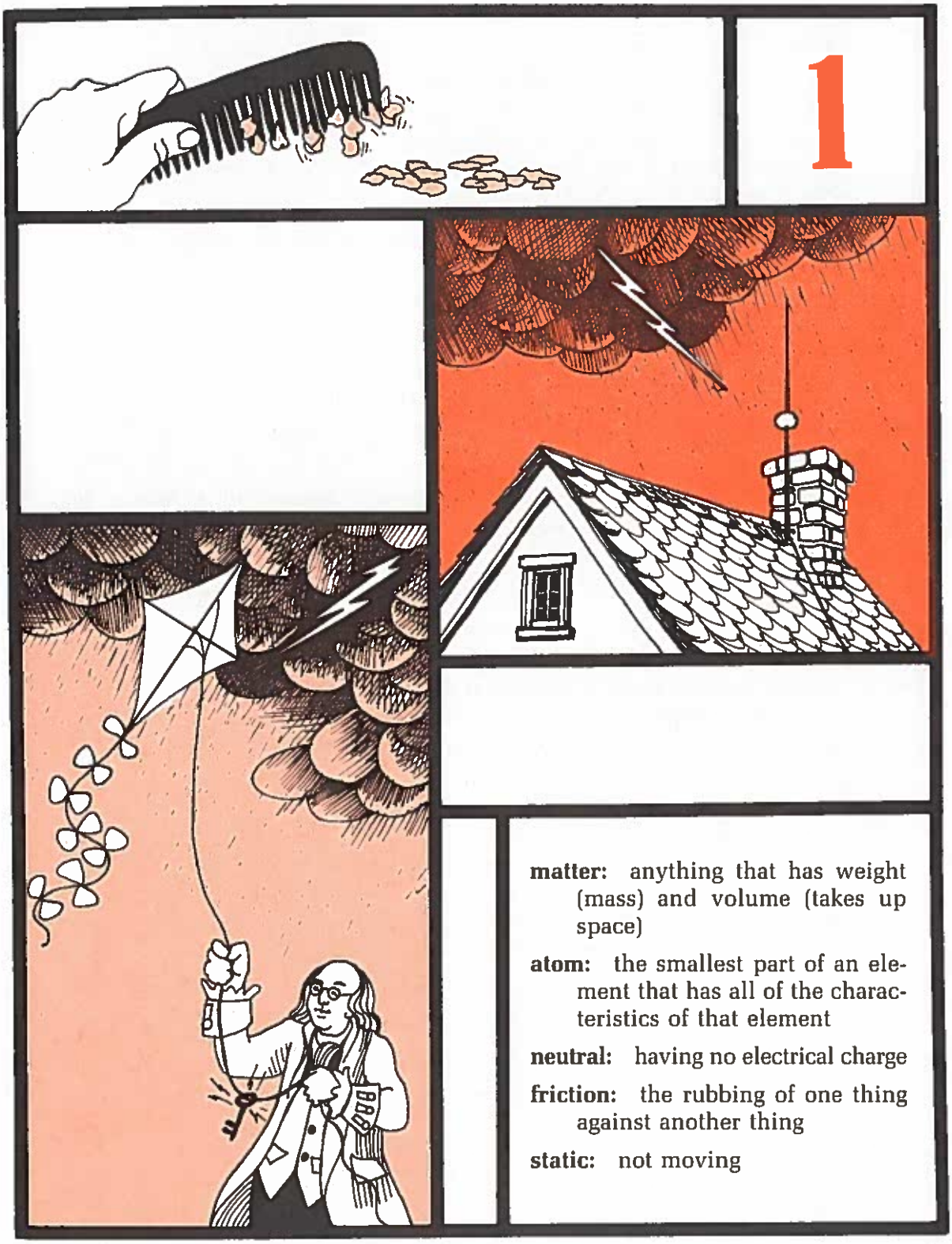
WHAT IS STATIC ELECTRICITY?



matter: anything that has weight (mass) and volume (takes up space)

atom: the smallest part of an element that has all of the characteristics of that element

neutral: having no electrical charge

friction: the rubbing of one thing against another thing

static: not moving

AIM 1 | What is static electricity?

Did you ever walk across a rug, touch something, and get a shock? That shock was caused by static electricity [STAT ik i leck TRISS it ee]. *Static* means not moving. Static electricity is electricity that is not moving along a path. What causes static electricity?

To understand what causes static electricity, you have to know about the *atom*. Scientists have learned that all matter is made up of tiny parts called atoms. An atom is the smallest part of an element that has all of the properties of that element.

Atoms have charges of electrical energy. There are two kinds of charges. There are *positive* (plus or +) charges. There are also *negative* (minus or −) charges. An atom has both positive and negative charges.

Usually, an atom has the same number of positive charges as it has negative charges. The positive and negative charges cancel each other out. The charges are *balanced*. The atom is *neutral* [NEW trul]. A neutral atom has no electrical charge.

Sometimes, the positive and negative charges of an atom are not equal. Then the atom is not neutral. If the atom has more positive charges than negative charges, the whole atom has a positive charge. If there are more negative charges, the whole atom has a negative charge.

Matter that has charged atoms has static electricity.

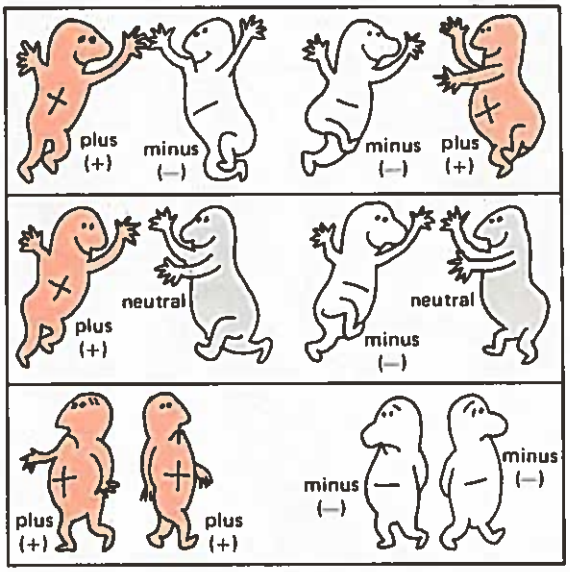
Static electricity can develop in several ways. One way is by rubbing certain substances together. The rubbing of one object against another object is called *friction* [FRIK shun]. Static electricity is sometimes called friction electricity.

Static electricity is not the same as the electricity we use for light bulbs, motors, toasters and other "electrical" appliances.

PLUS AND MINUS CHARGES

Charged matter may have a plus (+) charge or a minus (−) charge.

- *Opposite* charges *attract*.



- A *plus* or *minus* charge
  and
  a *neutral* charge *also* attract.

- *Same* charges *repel*.

Four of these pairs will attract. Two pairs will repel.

Which pairs will attract?

Which pairs will repel?

Write your answers below.

+ and +
+ and −
− and −
− and +
neutral and +
neutral and −

ATTRACT

_____

_____

_____

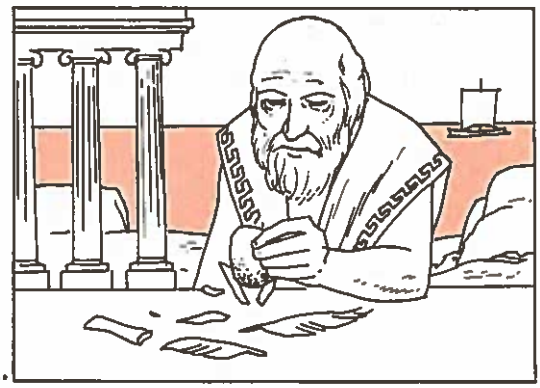
_____

REPEL

_____

_____

A.



The word "electricity" comes from the Greek word meaning "amber."

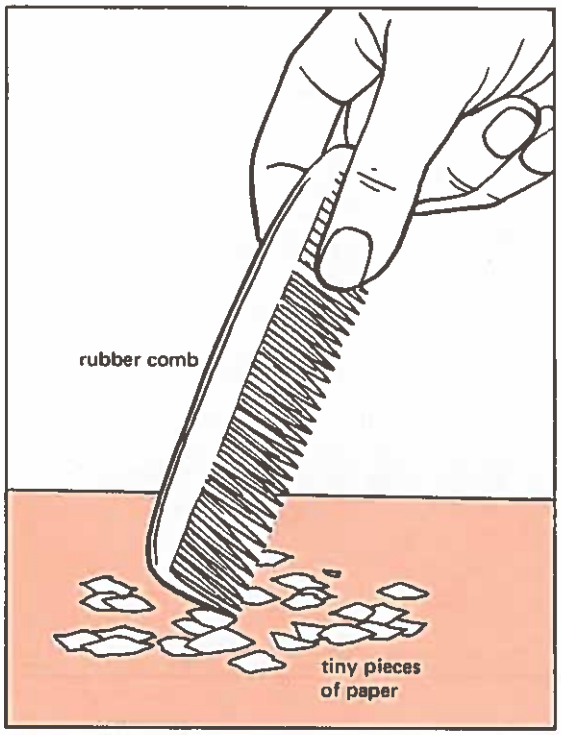
Amber is hardened tree sap.

Early Greeks experimented with amber. They rubbed amber against fur or cloth. This caused a slight spark and a "crackling" sound. After the amber was rubbed, it was able to pick up feathers or thin wood chips.

EXPERIMENTING WITH STATIC ELECTRICITY

First do step **1.** Then do step **2.** Answer the questions next to each step.

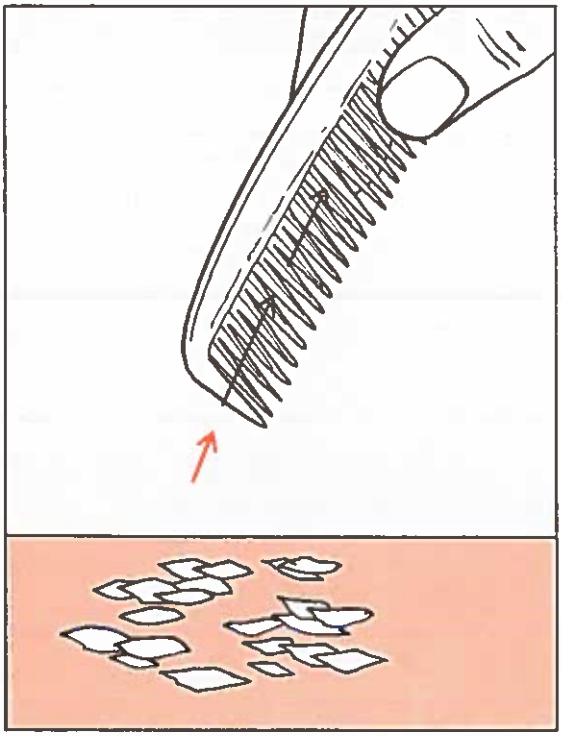
A.



STEP 1

1. Touch a rubber comb to a few tiny pieces of paper. (See Figure A.)

B.



Then lift the comb. (See Figure B.)

a) The comb _____ (does, does not) pick up the paper.

b) The comb _____ (is, is not) charged.

c) The paper _____ (is, is not) charged.

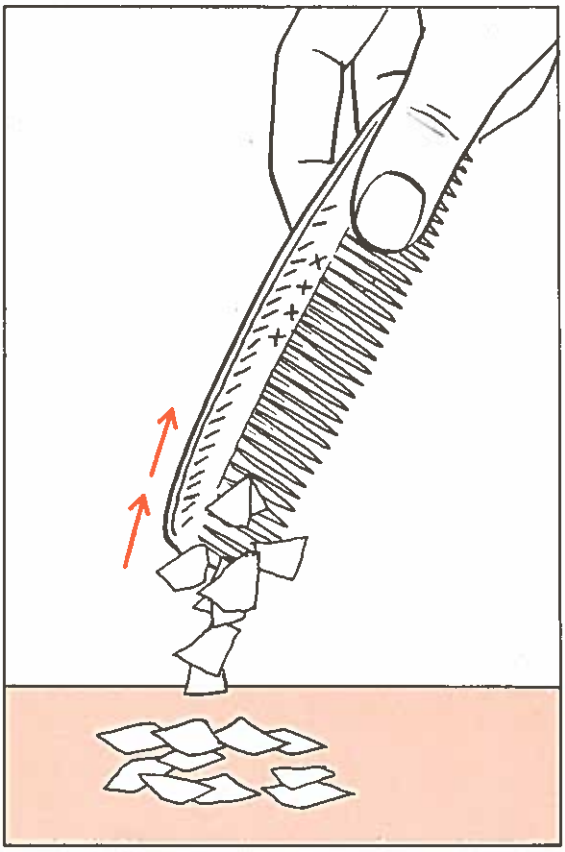
d) This shows that objects with no charge _____ (do, do not) attract each other.

C.

STEP 2

2. Rub the comb with a piece of cloth or fur. [Combing your hair may also do the job.] This rubbing causes minus (negative) charges to move from the cloth to the comb. (Figure C.)

D.



Touch the comb to the pieces of paper. Then lift the comb. (Figure D.)

a) The comb _____ (does, does not) pick up the paper.

b) The comb _____ (has, has not) become charged.

c) The comb now
   a) has a plus charge.
   b) has a minus charge.
   c) is neutral.

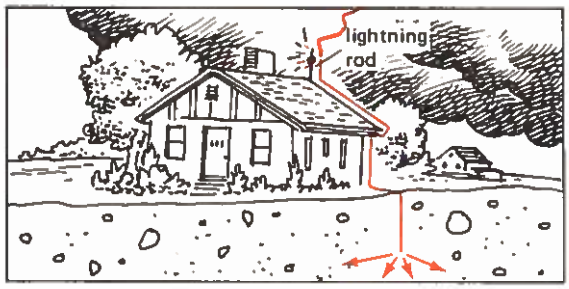
d) The paper
   a) has a plus charge.
   b) has a minus charge.
   c) is neutral.

e) This shows that a charged object _____ (does, does not) attract a neutral object.

LIGHTNING

Clouds can build strong static electricity. Scientists believe that static electricity causes *lightning*.

Lightning is very dangerous. In the United States alone, lightning kills nearly 400 people every year. About 1,500 more are injured.



Every house should have a *lightning rod*. The lightning hits the lightning rod instead of the house.

The electricity then travels through a wire into the ground. No one gets hurt.

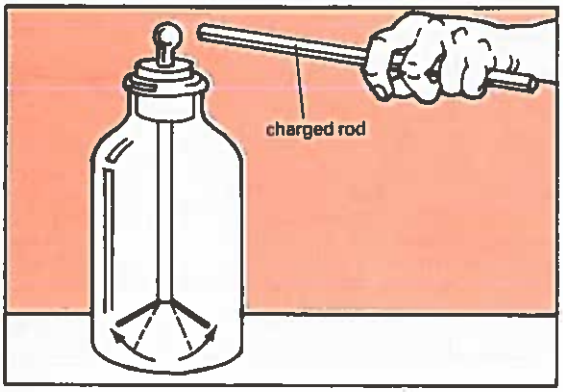
Lightning Safety Rules

During a lightning storm . . .

1. DON'T run onto an open field.
2. DON'T stay under a tree.
3. DO stay indoors or find a place indoors.
4. If you are in a car during a lightning storm, DO stay there. [Can you figure out why?]
5. If you are swimming, DO get out of the water.

WHAT DOES THE PICTURE SHOW?

Look at the picture. Then answer the questions.



An *electroscope* is a simple instrument. It tells us if an object has static electricity.

If you hold a charged object near the tip of an electroscope, the leaves move apart.

The leaves move apart because they have _____ charges.
(same, opposite)

MULTIPLE CHOICE

On the space on the right, write the letter that best completes each sentence.

1. An atom has _____ 1.
   a) only plus charges.
   b) only minus charges.
   c) plus and minus charges.

2. Usually, an atom has _____ 2.
   a) the same number of plus and minus charges.
   b) more plus charges than minus charges.
   c) more minus charges than plus charges.

3. "Neutral" charge means _____ 3.
   a) plus charge.
   b) no charge.
   c) minus charge.

4. Usually, an atom is _____ 4.
   a) charged.
   b) not charged.

5. Charged matter has _____ 5.
   a) no electricity.
   b) moving electricity.
   c) static electricity.

6. Static electricity _____ 6.
   a) moves in a path.
   b) does not move in a path.
   c) is neutral.

7. To make 100 minus charges neutral, you need _____ 7.
   a) 50 minus charges and 50 plus charges.
   b) 100 minus charges.
   c) 100 plus charges.

8. *Same* charges _____ 8.
   a) attract.
   b) repel.
   c) do not attract or repel.

9. *Opposite* charges _____ 9.
   a) attract.
   b) repel.
   c) do not attract or repel.

10. Static electricity can come from _____ 10.
   a) batteries.
   b) rubbing.
   c) ancient Greece.

MATCHING

Match the two lists. Write the correct letter on the line next to each number.

1. _____	opposite charges	**a)**	means "not moving"
2. _____	neutral	**b)**	repel
3. _____	rubbing	**c)**	attract
4. _____	static	**d)**	charges are balanced
5. _____	same charges	**e)**	can cause static electricity

REACHING OUT

Benjamin Franklin was a famous American. He invented many useful things.

Franklin did many experiments with electricity. It is said that during one experiment he flew a kite during a thunderstorm.

1. Why should you not do this? _____

_____

2. What can a kite act as? _____

_____