

# Static Charge

Textbook pages 248–257

## Before You Read

Why do you get a shock when you walk across a carpet in wool socks and then touch a metal door handle? Record your thoughts on the lines below.

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### Mark the Text

#### Identify Concepts

Highlight each question head in this section. Then use a different colour to highlight the answers to the questions.



### Reading Check

- Name the two types of charged particles in an atom.

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### What is static charge?

When materials are rubbed together, you might see them cling to each other or move away from each other. Materials that behave in this way are said to carry an electric charge. When a charge stays in place for some length of time, it is described as static electricity or **static charge**.

### Why does rubbing make materials charged?

Recall that all matter is made up of atoms. Most of the mass of an atom is in its nucleus—its central core region. The nucleus is made up of two types of particles. Protons are particles that have a positive (+) charge. Neutrons are particles that do not have a charge so they are neutral. The space around the nucleus contains fast-moving particles called electrons. Electrons have a negative (–) charge.

The overall charge of a material depends on the balance between the positive and negative charges in all the atoms of the material. A material may be neutral, have a positive charge, or have a negative charge.

When two materials are rubbed, electrons from the atoms of one material may move to the atoms of the other material. The movement of electrons from one atom to another changes the charge on the atoms. When an atom loses electrons, it is left with more protons than electrons, so its charge is positive. When an atom gains electrons, it has more electrons than protons, so its charge is negative. ✓

Charges in a material that is neutral (uncharged)	Charges in a material that is positively charged	Charges in a material that is negatively charged
+ + - + - - - - + - + +	+ + + + + - - - + + + +	- - - + - + - - - + - +
equal protons and electrons	more protons than electrons	more electrons than protons

### How else can charges be produced?

You already know that charges can be produced by rubbing (friction). This can happen in nature when air rubs against ice crystals and dust particles in clouds, producing lightning. Scientists also use a friction-producing machine called a **Van de Graaff generator** to create charges that they can study.

### How easily do charges move in different materials?

Electrons cannot move easily in materials such as **acetate** (a type of plastic), rubber, wool, and glass. Materials that do not let electrons move through them easily are called **insulators**. Charges tend to build up on insulators.

Electrons can move easily through materials such as metals. Materials that let electrons move through them easily are called **conductors**. Sometimes, a conductor is used to transfer static charges from an object to the ground. Allowing charge to flow into Earth's surface is called **grounding**. ✓

### How are charges measured?

Electric charges are measured in units called **coulombs (C)**. A bright light bulb, for example, allows about 1 C (one coulomb) of electric charge to pass through it each second.



Charges on insulator



Charges on conductor

#### ✓ Reading Check

2. What does a conductor allow to move easily through it?

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Name \_\_\_\_\_

Date \_\_\_\_\_

Use with textbook pages 248–254.

## Charge it

### Vocabulary

acetate	negative
atoms	neutral
conductors	neutrons
coulomb	nucleus
electric	positive
electrons	protons
grounding	static charge
insulators	Van de Graaff generator

Use the terms in the vocabulary box to fill in the blanks. You may use terms more than once. You will not need to use every term.

- Static electricity is also known as \_\_\_\_\_.  
This refers to the build-up of electric charge in one place.
- All matter is made of tiny particles called \_\_\_\_\_.
- The positively charged \_\_\_\_\_ is the centre of the atom.  
It consists of positively charged subatomic particles called \_\_\_\_\_  
and subatomic particles with no charge called \_\_\_\_\_.
- The negatively charged subatomic particles called \_\_\_\_\_  
occupy the area around the nucleus.
- An object is uncharged or \_\_\_\_\_ when the number of  
positive charges equals the number of negative charges.
- If an atom loses an electron, it has more protons than electrons. This atom will have  
an overall \_\_\_\_\_ charge.
- If an atom gains an electron, it has more electrons than protons. This atom will have  
an overall \_\_\_\_\_ charge.
- Glass and acetate are examples of \_\_\_\_\_ because they  
do not allow electrons to move easily through them. Metals like copper and aluminum  
are good \_\_\_\_\_ because they allow electrons  
to move freely through them.
- The \_\_\_\_\_ is a unit of electric charge.
- Scientists use a(n) \_\_\_\_\_ to create static charge.
- Lightning rods on top of buildings allow static charges from lightning to flow into  
Earth's surface. This is known as \_\_\_\_\_.