Chapter 12 Generating and Using Electricity

What You Will Learn

In this chapter, you will learn how to...

- **compare** direct current and alternating current, and **describe** how alternating current can be used safely
- **explain** why Ontario has different types of generating plants, and **assess** methods of energy production
- **produce** an action plan to reduce your consumption of electricity and its environmental impact

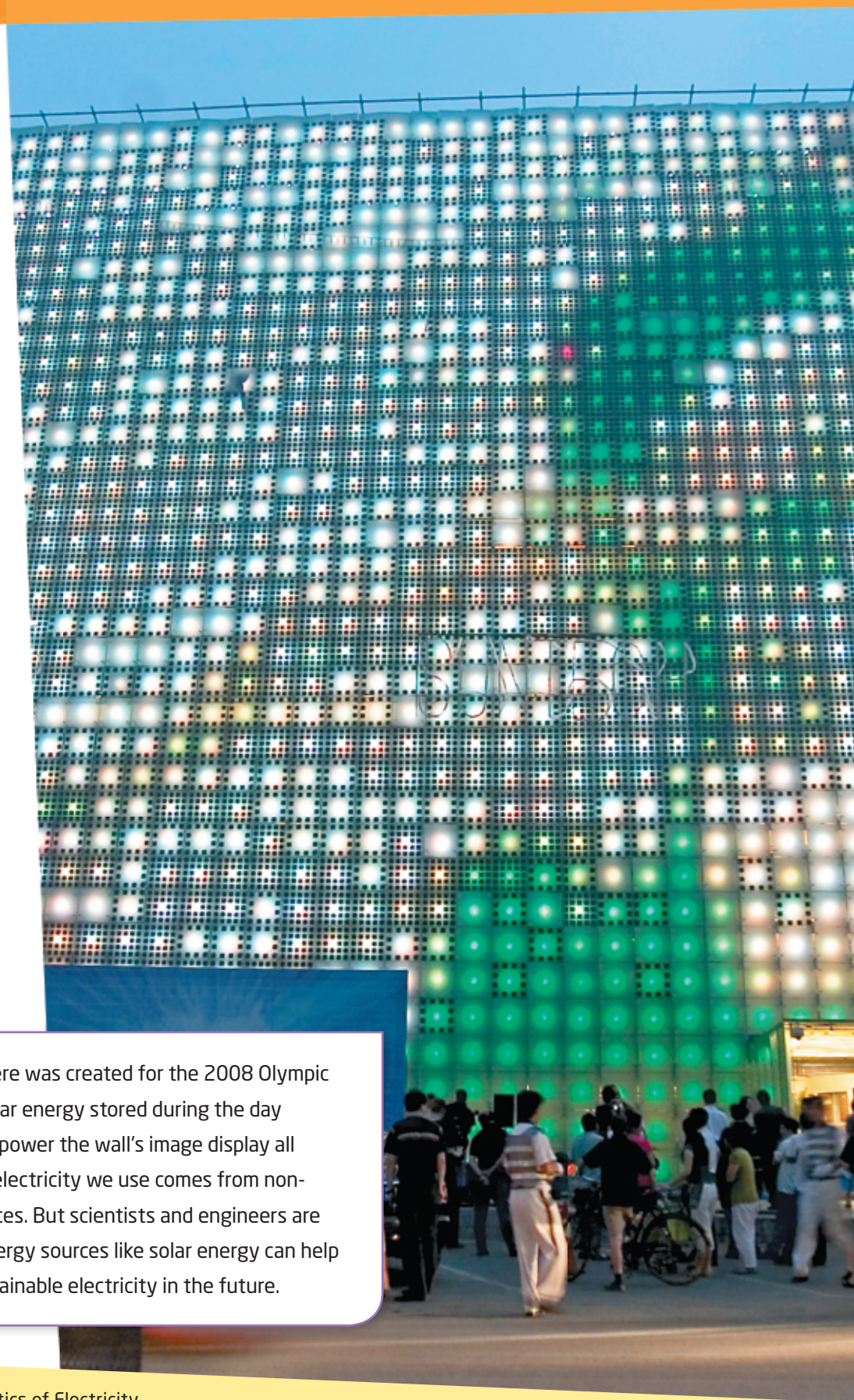
Why It Matters

Changing the ways you use electricity can help to reduce the amount of electricity that generating plants must produce, their impact on the environment, and your energy costs.

Skills You Will Use

In this chapter, you will learn how to...

- **demonstrate** an understanding of electrical safety
- **gather** data on electrical energy consumption, and use spreadsheet software to record the data
- **analyze** data and **interpret** graphs related to the generation and use of electrical energy

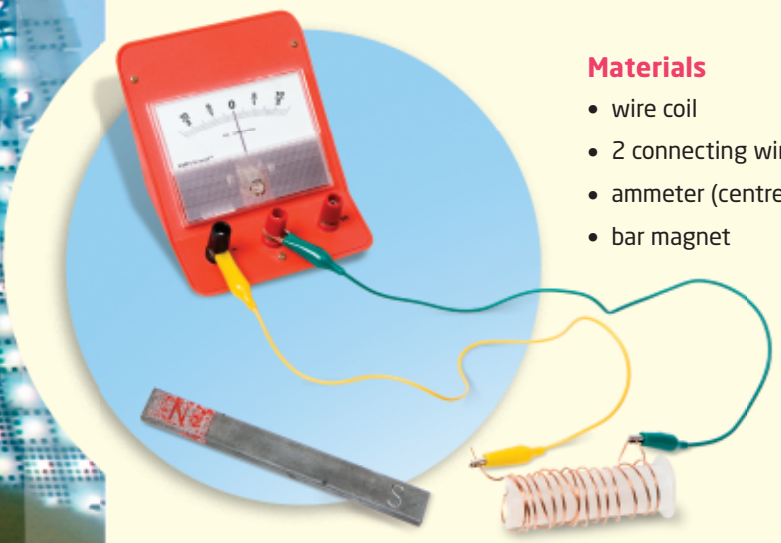


The giant "solar wall" shown here was created for the 2008 Olympic village in Beijing, China. The solar energy stored during the day produces enough electricity to power the wall's image display all night long. Today, most of the electricity we use comes from non-renewable, unsustainable sources. But scientists and engineers are finding ways to ensure that energy sources like solar energy can help us produce renewable and sustainable electricity in the future.

Activity 12-1

Generating an Electric Current

In almost all cases, the electricity that you use at home probably began with a spinning generator. In this activity, you will demonstrate the principle that enables generating plants to supply electricity to your home. Do you think a magnet can generate an electric current? How?



Materials

- wire coil
- 2 connecting wires
- ammeter (centre zero)
- bar magnet

Procedure

1. Connect the coil of wire to the ammeter, as shown here.
2. Rapidly move one pole of the bar magnet into the coil of wire. Record the direction in which the ammeter needle moves.
3. Rapidly pull the bar magnet out of the coil of wire. Record the direction in which the ammeter needle moves.
4. Repeatedly move the magnet into and out of the coil of wire. Observe and record the movement of the ammeter needle.
5. With the magnet stationary and inside the coil, move the coil of wire back and forth. Observe and record the movement of the ammeter needle.

Questions

1. Compare the movement of the ammeter needle when the magnet was moved into the coil with the movement of the needle when the magnet was pulled out of the coil.
2. Is there a current in the circuit when the magnet and the coil are stationary, relative to each other? Explain your reasoning.
3. Based on the movement of the ammeter needle, what do you think was happening to electrons in the circuit when the magnet was moved into and out of the coil of wire?
4. Compare the effect on the ammeter needle when you moved the magnet in step 4 with the effect when you moved the coil of wire in step 5.

Study Toolkit

These strategies will help you use this textbook to develop your understanding of science concepts and skills.
To find out more about these and other strategies, refer to the Study Toolkit Overview, which begins on page 561.

Organizing Your Learning

Using Graphic Organizers

When studying for a test, organize information in a way that makes sense to *you*. Different graphic organizers can be used for different purposes, as shown below.

Purpose	Possible Graphic Organizers	Pages Where Sample Is Shown
To organize a main idea and supporting details	Web	Page 566
To show cause and effect, the steps in a process, or a sequence	Cause-and-effect map Flowchart	Page 567
To organize information about a word or an idea	Web Word map	Page 566 At right
To compare and contrast	Venn diagram	Page 567
To analyze a series of numbers or results	Graph Table	Page 48 Page 440
To summarize	Chart	Page 136

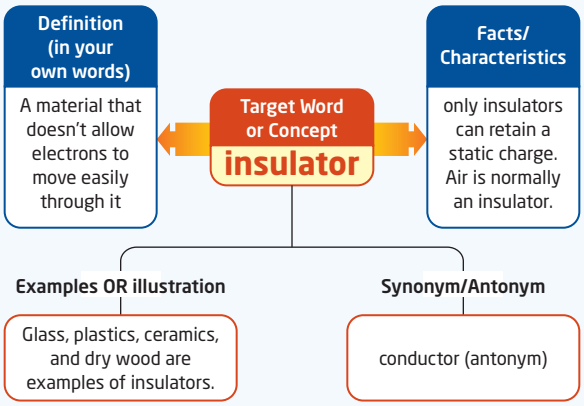
Use the Strategy

1. Identify the main idea and two supporting details in the first paragraph on page 485.
2. Organize this information using a **web**.
3. Organize the same information using a **chart**.
4. Which graphic organizer better helps you understand and remember the information better? Why?

Word Study

Creating a Word Map

A **word map** like this one can help you understand a new word or concept.



Use the Strategy

1. As you read this chapter, create a **word map** for the word *transformer*.
2. Exchange word maps with a partner.
3. Add any new information to your map that helps you understand the word or concept better.

Reading Effectively

Making Inferences

Making inferences about what is written means figuring out some things that a writer did not state directly. It involves connecting your prior knowledge with information from the text and visuals. As you read, ask yourself questions to help you identify any information that may be missing. For example, read page 485. Why did engineers build the generating station under the city? To answer that question, you could make these inferences:

- It was probably easier to access a water source under the city.
- The water would not have to be pumped above ground before being converted to electrical power.

Use the Strategy

Read page 485. Write three questions about information that may be missing and then make three inferences.