

**In this chapter, you will be able to**

- use a variety of technologies to investigate the electrical nature of matter
- derive, understand, test, and use equations related to electrical phenomena
- investigate technologies developed using the principles of electricity
- develop an understanding of how the different concepts in electricity are interrelated
- investigate how electrical principles are used at home and in industry
- develop an understanding of how physics concepts are created, tested, and used

# Electricity

How does the electrical nature of matter affect the way you live? When there's lightning outside (**Figure 1**) you probably tend to stay indoors. If the power goes out, many of your regular activities such as watching television, cooking, and working on a computer are no longer possible. You might not think about it all the time, but you depend on electricity for a lot. Just ask anyone in Eastern Canada who went without electricity for days after a major ice storm in January 1998 brought down hundreds of power lines (**Figure 2**).

To understand electricity, we must learn how it affects matter. Objects can develop an electric charge, and some objects allow a charge to flow through them. You've probably encountered static electricity in one form or another, like the shock you feel after touching a door knob on a cold, dry winter day. In **Figure 3** you can see a dramatic demonstration of some of the properties of static electricity, using a Van de Graaff generator.



**Figure 1**

Lightning is a phenomenon of nature to be respected. The lightning bolt is nature's most spectacular example of a static electric discharge.

## Reflect on your Learning

1. What are some objects or devices that can do the following:
  - (a) hold a static charge?
  - (b) allow an electric charge to flow through them?
2. Identify five activities of everyday life that would change if the supply of electricity was turned off during the winter months. In each case, describe alternatives.
3. Distinguish between alternating current and direct current.
4. Describe the energy transformations that occur when
  - (a) an electric fan is turned on
  - (b) wood burns in a fireplace
5. Distinguish between potential difference ( $V$ ) and current ( $I$ ).

Throughout this chapter, note any changes in your ideas as you learn new concepts and develop your skills.

**Try This  
Activity**

## Safety and Electricity

From previous studies and personal experiences, list seven safety rules that should be followed when dealing with electricity. These rules should involve electricity in the home and in the lab. Beside each rule, write a brief explanation of why the rule is important.

- (a) Use the following as a guide for your list of rules:
- electrical outlets
  - electric cords and cables
  - power supplies
  - electric devices near water
  - what to do when a device gets hot, begins to smoke, or catches fire
  - storage of equipment
  - electrical meters
- (b) Be prepared to discuss the rules with the class and your teacher. All the rules should be clear to you before starting lab activities.
- (c) Add any new rules or change any rules that need adjusting after the class discussion.



**Figure 3**

### Figure 2

After the ice storm in Quebec and Eastern Ontario in 1998, many hydro workers from all over Canada worked around the clock to repair power lines.

