RESEARCH

Cleaning the Air

In the early 1900s, factories with large smoke stacks were belching pollutants into the atmosphere. In 1907, Frederick G. Cottrell patented a device called the electrostatic precipitator. It not only cleaned the air, but also recovered products from the smoke that would otherwise pollute. Write a short biography of Cottrell, and a brief illustrated report on how electrostatic precipitators work. Begin your information search at www.pearsoned.ca/scienceinaction.

Van de Graaff Generators

Scientists often study electrical discharge with a device called a Van de Graaff generator (VDG). If you did the QuickLab earlier in this lesson, you may have used one of these generators. VDGs are particularly effective at building up static charge. They produce static build-up by using friction. Figure 1.4 shows how a VDG works. A rubber belt rubs on a piece of metal and transfers the charge to a sphere. The charge builds up on the sphere and transfers to you when you touch the sphere.

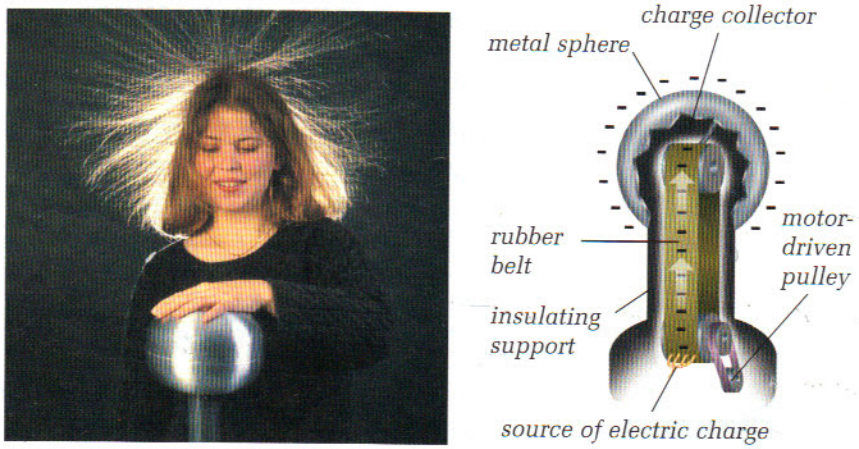

Figure 1.4 A Van de Graaff generator uses friction to build up a static charge on its sphere.

Check and Reflect

Key Concept Review

1. How does a proton differ from an electron?
2. What does it mean to be "statically charged"?
3. Explain how a Van de Graaff generator builds up a static charge.
4. a) What happens when like charges interact?
   b) What happens when unlike charges interact?

Connect Your Understanding

5. You rub your feet across a floor and electrons transfer from you to the floor. Are you now negatively or positively charged?
6. *A neutral object contains no charge.* Is this statement accurate? Explain.
7. Why is a neutral object attracted to a charged object?
8. You bring a negatively charged rod close to some tiny pieces of plastic. Some of the pieces jump up to the rod, but as soon as they make contact, they immediately fly away from the rod. Explain.

Extend Your Understanding

9. Large trucks that carry flammable liquids often have a metal wire or chain that drags on the ground. Why? (Hint: Have you ever been shocked when getting out of a car?)

Measuring Voltage with Computers

Another method of measuring voltage is with a voltmeter connected to a computer. With this device, you connect the terminals the same way as for other voltmeters, but your voltage reading appears on a computer screen.

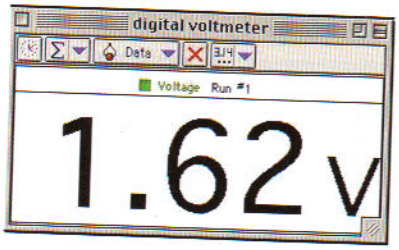

Figure 1.11 A voltage reading displayed on a computer screen

CHECK AND REFLECT

Key Concept Review

1. What is electrical energy?
2. How does current electricity differ from static electricity?
3. How would you describe voltage?
4. What are the units for measuring a) current and b) voltage?

Connect Your Understanding

5. You require a high-current battery to start a large tractor. While shopping for this battery, should you be more concerned with the battery's rating of volts or amps? Explain.
6. *A wire carrying more electrons will transfer more energy than a wire carrying fewer electrons.* Is this statement accurate? Explain.
7. Describe how electricity gets from the generating plant to an appliance in your home.
8. Electricity flows into a hairdryer when it is plugged into a socket. If electricity has been added to the hairdryer, why doesn't it keep operating for a while after being unplugged?

Extend Your Understanding

9. What is the reading on the voltmeter in Figure 1.12? Give your answer in both millivolts and volts.

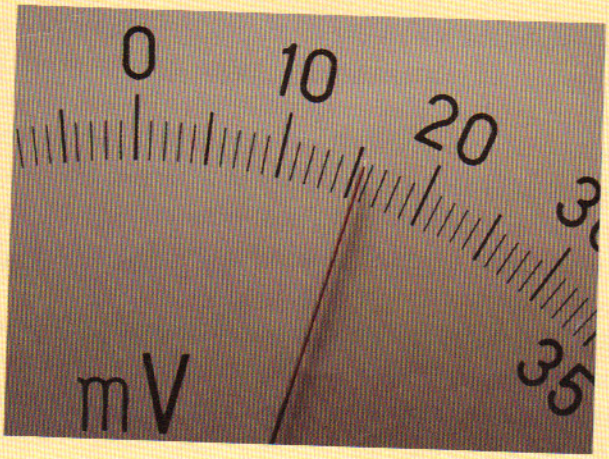

Figure 1.12 Voltmeter reading for question 9