

Lessons at a Glance

Electrical Circuits Unit Overview

The Electrical Circuits Unit introduces students to the basics of electricity. Through a variety of explorations, students observe, describe, and investigate static electricity and low-voltage current electricity. They test their ideas on how to light a bulb. They further investigate circuits that produce motion, sound, and magnetic effects. They explore everyday materials and classify them as either conductors or insulators of electricity. And finally, they wrap up their studies by recognizing electrical hazards and the safe use of electricity.

Science Content: Big Ideas

The Electrical Circuits Unit concentrates on the following Big Ideas. Along with the scientific Habits of Mind discussed on pages 6-7, these concepts are reinforced throughout the unit. The lessons in which each Big Idea is introduced or is a major focus are indicated in parentheses.

- Electrically charged objects attract or repel other objects. (Lessons 1-2)
- For an electric current to flow, there must be a complete path or loop for it to follow around a circuit and return to its source. (Lessons 3-5)
- The flow of electric current can produce light, heat, sound, motion, or magnetic effects. (Lesson 5)
- Some materials allow electric current to flow more easily than others. (Lessons 6-7)
- It is important to avoid electrical hazards by using electricity safely. (Lesson 7)

Lesson Overviews

The following overviews briefly summarize each lesson in the Electrical Circuits Unit. Additional notes and suggestions for scheduling are shown in gray. An asterisk after the lesson title indicates a core lesson.

Lesson 0: Doing Science

Students sharpen their awareness of scientific thinking and become familiar with the “I Wonder” circle as they conduct a self-directed exploration and then reflect on the processes they engaged in. In the context of these experiences, they are introduced to the work of scientists and to the Science Companion “I Wonder” circle, which provides a visual representation of many of the facets of scientific inquiry, exploration, and discovery.

Lesson 1: Discovering What Happens When Something Is Electrically Charged

Students get an introduction to the concept of static electricity in this lesson and the next one in this unit. In this lesson, students also discuss some experiences with static electricity and then observe the effects of electrically charged objects.

Lesson 2: Exploring Static Electricity Further

Students continue their exploration of static electricity. They electrically charge a variety of objects and observe how the electrically charged object attracts or repels other objects around it. In doing so, they further their understanding of static electricity; in particular that it can exert a force on other objects without touching them.

If you have access to other Science Companion units, consider teaching Skill Building Activity “Observing and Describing” prior to this lesson. (See the Level 4 Matter Unit or Nature’s Recyclers Unit or the Level 5 Earth’s Changing Surface Unit or Human Body in Motion Unit.)

*Lesson 3: Discovering How to Light a Bulb**

This lesson introduces the concept of electric current and how it flows through a circuit. Students begin by drawing how they would light a bulb using one battery and one wire. Students then test their initial ideas and explore other configurations until they find some that work, learning the difference between a closed and an open circuit and how a switch and a source function.

This lesson may be conducted over two sessions.

Lesson 4: Making More Light Connections*

This lesson reinforces concepts students put into practice in the previous lesson. They build a battery-bulb circuit using two wires. After holding materials together with their hands, they use a bulb holder and attach the wires with clips to observe how this method creates a complete circuit. They examine the inside of a light bulb, and observe that the circuit makes a complete loop through the wires of the bulb and its filament.

Lesson 5: Making Effects with Electric Current*

Students build on their experiences with constructing electrical circuits to make bulbs light. In a series of four brief investigations, they look into electrical circuits that produce motion, sound, and magnetic effects. They observe that adding a source of electric current makes a motor turn or a buzzer sound. They also take apart a motor, and observe the connections, copper wiring, and electromagnet inside it. Finally, students build and use an electromagnet.

This lesson is conducted over two sessions.

Lesson 6: Identifying Conductors and Insulators*

In this lesson, students identify and classify objects and materials as either conductors or insulators of electricity. After predicting whether an object will conduct electric current, they use a bulb and battery circuit as a tester. They record their results, and then find a pattern in the types of materials that work as conductors. Finally, they apply their knowledge of the materials to evaluating the design of a light bulb, extension cord, and an electrician's glove.

Lesson 7: Recognizing Electrical Hazards in Everyday Life

In this final lesson of the Electrical Circuits Unit, students extend their understanding of conductors and insulators by identifying potential electrical hazards, discussing what makes them hazardous, and recognizing what they can do to prevent electrical hazards from occurring.