

CHAPTER 6

Electricity for Everyone

Chapter Overview

Chapter Challenge

This chapter introduces concepts of electricity, circuits, energy, power, thermodynamics, and electrical efficiency. Students are asked to decide which electrical appliances should power a home, using limited electricity produced by wind generators; how each appliance will contribute to the well-being of the people living in the dwelling; and if different options of appliances should be provided, depending on who lives in the dwelling. Students are also asked to create an outline of what to teach the people living in the dwelling that will prepare them to stay within the constraints of energy and power allowed for usage. They will need to construct a wiring diagram that includes outlets, switches, and fuses to show how the electricity will be distributed in the home.

Students may find the challenge difficult at first; however, by the end of the chapter they should have enough understanding of the concepts of electrical energy to be successful in completing the challenge. At the end of each section, students are asked to reflect on the section and consider what it means for the challenge. At the end of each set of *Physics to Go* questions is a question designed to guide students in applying the content of that section to the challenge. The *Inquiring Further* is also geared to help students meet the *Chapter Challenge*.

Chapter Summary

Students investigate and apply ideas involving circuits, batteries, series/parallel circuits, Ohm's law, power, load limits, energy, fuses, switches, heat

energy, specific heat, the laws of thermodynamics, utility bills, and electrical efficiency. Students

- identify energy transformations involved with the production and use of electrical energy. Describe how light bulbs work.
- use a physical model to describe the flow of electric charges in series and parallel circuits.
- compare series and parallel circuits and learn the language of electricity.
- explore, describe, and apply Ohm's law, describe the relationship between voltage and current in a circuit, and calculate the resistance of an unknown resistor.
- investigate and distinguish between energy and power usage in an electric circuit, construct a fuse, learn how it works, and its purpose. Distinguish between a fuse and a circuit breaker, as well as conductors and insulators.
- describe how currents, voltages and power are distributed in series and parallel circuits.
- describe how energy is transferred through a circuit, the role of the battery, and resistance.
- learn to calculate the relationship between electric energy and heat, heat lost and heat gained by two objects placed in thermal contact, describe and apply the laws of thermodynamics, and explain the concept of entropy.
- calculate the energy efficiency of electrical devices.
- distinguish between heat transferred by conduction, convection, and radiation.