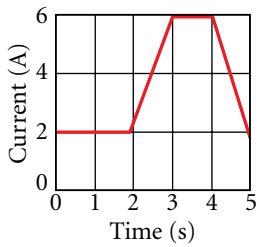
78. The current in a conductor varies over time as shown in the graph below.

a. How many coulombs of charge pass through a cross section of the conductor in the time interval $t = 0$ to $t = 5.0$ s?

b. What constant current would transport the same total charge during the 5.0 s interval as does the actual current?



79. Birds resting on high-voltage power lines are a common sight. A certain copper power line carries a current of 50.0 A, and its resistance per unit length is 1.12×10^{-5} Ω/m. If a bird is standing on this line with its feet 4.0 cm apart, what is the potential difference across the bird's feet?

80. An electric car is designed to run on a bank of batteries with a total potential difference of 12 V and a total energy storage of 2.0×10^7 J.

a. If the electric motor draws 8.0 kW, what is the current delivered to the motor?

b. If the electric motor draws 8.0 kW as the car moves at a steady speed of 20.0 m/s, how far will the car travel before it is "out of juice"?

Alternative Assessment

1. Imagine that you are assisting nuclear scientists who need to accelerate electrons between electrically charged plates. Design and sketch a piece of equipment that could accelerate electrons to 10^7 m/s. What should the potential difference be between the plates? How would protons move inside this device? What would you change in order to accelerate the electrons to 100 m/s?

2. Tantalum is an element widely used in electrolytic capacitors. Research tantulum and its properties. Where on Earth is it found? In what form is it found? How expensive is it? Present your findings to the class in the form of a report, poster, or computer presentation.

3. Research an operational maglev train, such as the commercially operating train in Shangai, China, or the demonstration trains in Japan or Germany. Alternatively, research a maglev system that is under construction or being proposed for development. Investigate the cost of development, major hurdles that had to be overcome or will need to be overcome, and the advantages and disadvantages of the train. Suppose that there is a proposal for a maglev train in your area. Develop an argument for or against the proposed train, based on your research. Write a paper to convince other citizens of your position.

4. Visit an electric parts or electronic parts store or consult a print or on-line catalog to learn about different kinds of resistors. Find out what the different resistors look like, what they are made of, what their resistance is, how they are labeled, and what they are used for. Summarize your findings in a poster or a brochure entitled *A Consumer's Guide to Resistors.*

5. The units of measurement you learned about in this chapter were named after four famous scientists: Andre-Marie Ampere, Michael Faraday, Georg Simon Ohm, and Alessandro Volta. Research their lives, works, discoveries, and contributions. Create a presentation about one of these scientists. The presentation can be in the form of a report, poster, short video, or computer presentation.

6. A *thermistor* is a device that changes its resistance as its temperature changes. Thermistors are often used in digital thermometers. Another common temperature sensor is the *thermocouple*, which generates a potential difference that depends on its temperature. Many thermostats use thermistors or thermocouples to regulate temperature. Research how thermistors or thermocouples work, and how they are used in one of the applications mentioned above. Create a slideshow or a poster with the results of your research.