Using Key Terms

2. In your notebook, state whether the following statements are true or false. If a statement is false, rewrite it to make it true.
   (a) If an object is neutral, it has no positive and negative charges.
   (b) When an object is charged positive, it has gained protons.
   (c) Grounding an object is allowing charge to flow into Earth.
   (d) An insulator does not allow charge to move easily.
   (e) The load in a circuit converts electrical energy into other forms of energy,
   (f) The battery in a circuit is the source of electric current.
   (g) Resistors slow down the flow of current.
   (h) In a series circuit, the potential difference of the source is equal to the potential difference across each load.
   (i) In a parallel circuit, the current entering the junction point equals the current leaving the junction point.

Checking Concepts

7

3. (a) What is the name of the device used for detecting static charge?
   (b) How does this device indicate the presence of a static charge?
4. What two names are given to oppositely charged objects?
5. (a) Which two parts of the atom have a charge?
   (b) What is the charge on each of these parts?
6. What is the charge on an object after it is grounded?
7. What particle is transferred when a neutral object is charged?
8. (a) Give two examples of materials that are electrical conductors.
   (b) Give two examples of materials that are electrical insulators.
9. State the three laws of static charge.

8

10. Define voltage in terms of electric potential energy and charge.
11. What is the difference between kinetic energy and potential energy?
12. State what each of the following meters is designed to measure:
    (a) voltmeter
    (b) ammeter
    (c) ohmmeter
13. What is the difference between static electricity and current electricity?
14. Contrast conventional current and electron flow.
15. What happens to the electrical energy when a charge passes through a resistor?
16. State Ohm's law in terms of voltage, current, and resistance.
17. Describe the purpose of the coloured bands on a resistor.

9

18. What is the difference between a series circuit and a parallel circuit?
19. Use the words "same," "different," "increases," and "decreases" to complete the following table.

	Series	Parallel
Current in every part of the circuit		
Voltage across different size resistors in the circuit		
Total resistance when a resistor is added		

20. In any complete circuit, how does the voltage supplied by the battery compare to the sum of the voltages lost on each resistor?
21. If 4.0 A of current enters the junction point of a parallel circuit, how much total current must leave that junction point?
22. State the relationship of power, voltage, and current.

23. Two light bulbs, a 60 W bulb and a 100 W bulb, are left on for the same amount of time. Which bulb consumes more energy?
24. The joule (J) is a unit used for measuring energy. What energy unit is used when the amount of energy is large?
25. State the relationship of energy, power, and time.

Understanding Key Ideas

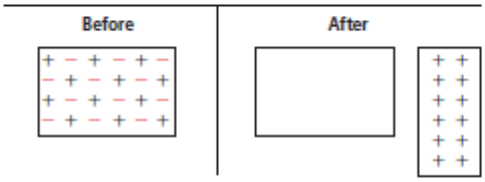
26. Explain the cause of lightning.
27. Explain why a charged balloon sticks to the wall.
28. Using a charged rod and an electroscope, explain how you can determine if an object is a conductor.
29. Suppose that you rub a piece of plastic on your sweater and it gains a charge. Describe how you could use a negatively charged acetate strip to determine the charge on this piece of plastic.
30. Two charged objects are placed 10 cm apart. Describe two ways of increasing the electric force between these two charged objects.
31. Explain, using the motion of electrons, the difference between charging by conduction and charging by induction.
32. Describe two ways to increase the current in a circuit.
33. When a battery is connected to a complete circuit, electrons flow throughout the circuit instantaneously. Explain.
34. A resistor is connected to a battery and a 4.0 A current leaves the battery. The resistor is now replaced by a new resistor with half the resistance. How much current will now leave the battery?
35. Explain why household wiring is constructed in parallel instead of in series.
36. Two identical light bulbs are connected to a battery in a series circuit.
    (a) What will happen to the brightness of the second bulb if the first bulb is unscrewed?
    (b) Would this result be the same if the bulbs were connected in parallel? Explain.
37. A string of 12 identical holiday lights is connected in series. If this string is plugged into a 120 V source, what is the voltage across each light?

Thinking Critically

38. A charged object is brought near a pile of puffed rice cereal. Some pieces of the cereal are attracted to the charged object, but as soon as they contact the charged object they fly off in all directions. Explain this observation.
39. You are caught in a thunderstorm while playing golf. Your caddy suggests that you either keep playing or stand under a tree. Do you think these are good ideas? Give reasons for your answer.
40. Two wires can be placed across the terminals of a battery. One wire has a high resistance, whereas the other has a low resistance.
    (a) Which wire will produce heat energy at a faster rate?
    (b) Why?

Developing Skills

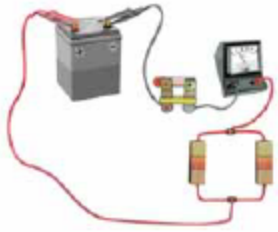
41. Copy the following diagram into your notebook. Place positive (+) and negative (−) signs in the blank object to demonstrate the induced charge distribution.



42. Draw a circuit diagram for each of the following circuits.

A

B

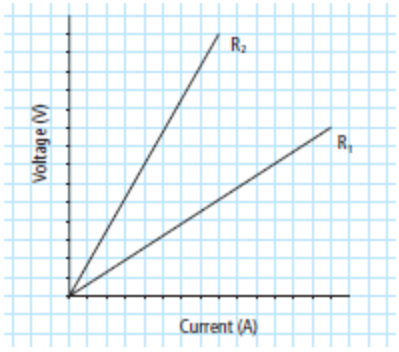


43. A 2.0 A current flows through a 220 Ω resistor. What is the voltage across this resistor?

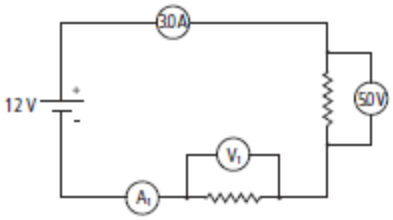
44. A circuit takes 0.45 A of current from a 9.0 V battery. What is the resistance of this circuit?

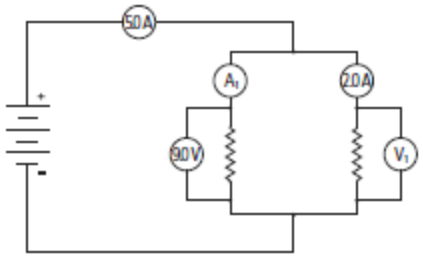
45. A 18 MΩ resistor is connected to 120 kV high power lines. What is the current, in milliamperes (mA) through this resistor?

46. Two different resistors, R_1 and R_2, are connected to various batteries, and the current is measured. The data for each resistor are plotted on the graph below. Which resistor has the largest resistance? Explain.



47. Determine the voltage V_1 and the current A_1 in each of the following circuits.





48. A circuit draws a current of 25 mA from a 12 V battery. What is the power output of this battery?

49. A 1400 W toaster oven is used for 30 min.

(a) Find the amount of energy consumed by this toaster oven. Give your answer in:
  (i) joules (J)
  (ii) kilowatt hours (kW·h)

(b) If the electric company charges 7 cents for every kW·h of energy, how much did it cost to operate the toaster oven in (a)?

Pause and Reflect

In less than 300 years, our understanding of electricity has progressed from creating a static charge by friction to the design of powerful computers. What have you learned in this unit that has helped you better understand the importance of electricity in your life?