17 REVIEW

37. They are proportional.

38. They are inversely proportional.

39. At a higher temperature, atoms vibrate with greater amplitudes, which makes it more difficult for electrons to move through the material.

40. 0.20 A

41. 3.4 A

42. **a.** 1.8 A
b. 4.5 A
c. 0.45 A

43. $PE_{electric}$ of charges is converted to *KE* of charges in the device.

44. Batteries convert chemical energy, while generators convert mechanical energy. Batteries produce dc, while generators can produce dc or ac.

45. In dc, charges move in one direction, and in ac, charges oscillate; ac

46. Electric power is the rate at which electrical energy is converted. Mechanical power is the rate at which mechanical energy is converted. Electrical energy is a form of mechanical energy.

47. electrical energy; power

48. because resistance increases as length increases

49. 3.6×10^6 J

50. Batteries supply energy to free electrons in the conductor rather than supplying the charge.

51. the 75 W bulb

52. the conductor with the greater resistance

53. 2.0×10^{16} J

54. The wires have much less resistance than the filament of the light bulb.

55. 93 Ω

56. 0.62 A; 190 Ω

Conceptual Questions

37. For a constant resistance, how are potential difference and current related?

38. If the potential difference across a conductor is constant, how is current dependent on resistance?

39. Using the atomic theory of matter, explain why the resistance of a material should increase as its temperature increases.

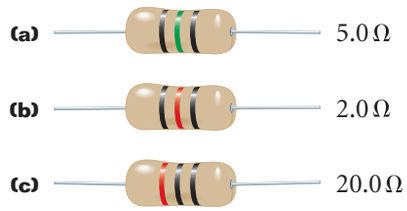
Practice Problems

For problems 40–42, see Sample Problem D.

40. A nichrome wire with a resistance of 15 Ω is connected across the terminals of a 3.0 V flashlight battery. How much current is in the wire?

41. How much current is drawn by a television with a resistance of 35 Ω that is connected across a potential difference of 120 V?

42. Calculate the current that each resistor shown below would draw when connected to a 9.0 V battery.



ELECTRIC POWER

Review Questions

43. Why must energy be continuously pumped into a circuit by a battery or a generator to maintain an electric current?

44. Name at least two differences between batteries and generators.

45. What is the difference between direct current and alternating current? Which type of current is supplied to the appliances in your home?

46. Compare and contrast mechanical power with electric power.

47. What quantity is measured in kilowatt-hours? What quantity is measured in kilowatts?

48. If electrical energy is transmitted over long distances, the resistance of the wires becomes significant. Why?

49. How many joules are in a kilowatt-hour?

Conceptual Questions

50. A student in your class claims that batteries work by supplying the charges that move in a conductor, generating a current. What is wrong with this reasoning?

51. A 60 W light bulb and a 75 W light bulb operate from 120 V. Which bulb has a greater current in it?

52. Two conductors of the same length and radius are connected across the same potential difference. One conductor has twice as much resistance as the other. Which conductor dissipates more power?

53. It is estimated that in the United States (population 250 million) there is one electric clock per person, with each clock using energy at a rate of 2.5 W. Using this estimate, how much energy is consumed by all of the electric clocks in the United States in a year?

54. When a small lamp is connected to a battery, the filament becomes hot enough to emit electromagnetic radiation in the form of visible light, while the wires do not. What does this tell you about their relative resistances of the filament and the wires?

Practice Problems

For problems 55–56, see Sample Problem E.

55. A computer is connected across a 110 V power supply. The computer dissipates 130 W of power in the form of electromagnetic radiation and heat. Calculate the resistance of the computer.

56. The operating potential difference of a light bulb is 120 V. The power rating of the bulb is 75 W. Find the current in the bulb and the bulb's resistance.