55. 93 Ω

57. 3.000 m; 2.00×10^{-7} C

59. 4.0×10^{3} V/m

61. **a.** 4.11×10^{-15} J
b. 2.22×10^{6} m/s

63. **a.** 1.13×10^{5} V/m
b. 1.81×10^{-14} N
c. 4.39×10^{-17} J

65. 0.545 m, −1.20 m

67. **a.** 7.2×10^{-13} J
b. 2.9×10^{7} m/s

69. **a.** 3.0×10^{-3} A
b. 1.1×10^{18} electrons/min

71. **a.** 32 V
b. 0.16 V

73. 1.0×10^{5} W

75. 3.2×10^{5} J

77. 13.5 h

79. 2.2×10^{-5} V

CHAPTER 18

Practice A, p. 650

1. **a.** 43.6 Ω
b. 0.275 A

3. 1.0 V, 2.0 V, 2.5 V, 3.5 V

5. 0.5 Ω

Practice B, p. 655

1. 4.5 A, 2.2 A, 1.8 A, 1.3 A

3. **a.** 2.2 Ω
b. 6.0 A, 3.0 A, 2.00 A

Practice C, p. 659

1. **a.** 27.8 Ω
b. 26.6 Ω
c. 23.4 Ω

Practice D, p. 662

R_a: 0.50 A, 2.5 V

R_b: 0.50 A, 3.5 V

R_c: 1.5 A, 6.0 V

R_d: 1.0 A, 4.0 V

R_e: 1.0 A, 4.0 V

R_f: 2.0 A, 4.0 V

18 Review, pp. 666–671

17. **a.** 24 Ω
b. 1.0 A

19. **a.** 2.99 Ω
b. 4.0 A

21. **a.** seven combinations
b. R, $2R$, $3R$, $\frac{R}{2}$, $\frac{R}{3}$, $\frac{2R}{3}$, $\frac{3R}{2}$

23. 15 Ω

25. 3.0 Ω: 1.8 A, 5.4 V
6.0 Ω: 1.1 A, 6.5 V
9.0 Ω: 0.72 A, 6.5 V

27. 28 V

29. 3.8 V

31. **a.** 33.0 Ω
b. 132 V
c. 4.00 A, 4.00 A

33. 10.0 Ω

35. **a.** a
b. c
c. d
d. e

37. 18.0 Ω: 0.750 A, 13.5 V
6.0 Ω: 0.750 A, 4.5 V

39. 4.0 Ω

41. 13.96 Ω

43. **a.** 62.4 Ω
b. 0.192 A
c. 0.102 A
d. 0.520 W
e. 0.737 W

47. **a.** 5.1 Ω
b. 4.5 V

49. **a.** 11 A (heater), 9.2 A (toaster), 12 A (grill)
b. The total current is 32.2 A, so the 30.0 A circuit breaker will open the circuit if these appliances are all on.

CHAPTER 19

Practice A, p. 689

1. 3.57×10^{6} m/s

3. 6.0×10^{-12} N west

Practice B, p. 692

1. 1.7×10^{-7} T in $+z$ direction

3. 1.5 T

19 Review, pp. 695–699

31. 2.1×10^{-3} m/s

33. 2.00 T

39. 2.1×10^{-2} T, in the negative y direction

41. 2.0 T, out of the page

43. **a.** 8.0 m/s
b. 5.4×10^{-26} J

45. 2.82×10^{7} m/s

CHAPTER 20

Practice A, p. 714

1. 0.30 V

3. 0.14 V

Practice B, p. 726

1. 4.8 A; 6.8 A, 170 V

3. **a.** 7.42 A
b. 14.8 Ω

5. **a.** 1.10×10^{2} V
b. 2.1 A

Practice C, p. 729

1. 55 turns

3. 25 turns

5. 147 V

20 Review, pp. 739–743

11. 0.12 A

27. **a.** 2.4×10^{2} V
b. 2.0 A