Additional Exercises

A-1: Otto accidently leaves his automobile headlights on overnight and is unable to start his car in the morning. Each of the two headlights connected in parallel draws 2.00 A of current from the 12.0-V battery. If the battery stores 7.50×10^5 J of energy, how long will it take for the headlights to go off?
b) Why are the headlights connected in parallel?

A-2: Officer Moynihan is patrolling his beat with a 4.5-V flashlight whose lightbulb has a resistance of 12 Ω. How much current does the flashlight draw?

A-3: Each night before falling asleep, Linus turns on his electric blanket that is plugged into the 120.-V electrical outlet. A current of 1.20 A flows through the blanket. a) What is the blanket's resistance? b) Does Linus want his electric blanket to have a high resistance or a low resistance? Why?

A-4: Herbert had just suffered a heart attack but he was revived in the hospital emergency room with a device called a defibrillator. (The paddles of a defibrillator supply a short pulse of high voltage to restart the heart.) The defibrillator contains a 20.-μF capacitor that releases 0.15 C of charge. a) What is the potential difference between the defribrillator paddles during the discharge? b) Why do you think doctors yell "Clear!" to the attendants before discharging the defibrillator?

A-5: Sherm is typing his term paper on a computer that contains a high-speed switch, controlled with a small 100×10^{-12} F speed-up capacitor. What is the current flow created by the capacitor if it discharges every 0.1 s across a potential difference of 5 V?

A-6: Every Sunday morning Stuart makes "breakfast in bed" for his wife. However, because the household wires can only carry a maximum current of 15 A from the 120.-V line, it is difficult to run all of the appliances simultaneously without blowing a fuse. What is the most power Stuart may use while cooking, before blowing a fuse?

A-7: In the previous exercise, a) how much current will Stuart draw if he tries to run the 700.-W toaster and 1000.-W coffee maker at the same time? b) Will this cause him to blow the fuse?

A-8: Xiaoyi's aquarium operates for 24.0 h a day and contains a 5.0-W heater, two 20.0-W lightbulbs, and a 35.0-W electric filter. If Xiaoyi pays \$0.100 per kWh for her electricity bill, how much will it cost to maintain the aquarium for 30.0 days?

A-9: The average power plant, running at full capacity, puts out 500. MW of power. If the power company charges its customers \$0.10 per kWh, what is the revenue brought in by the power plant each day?

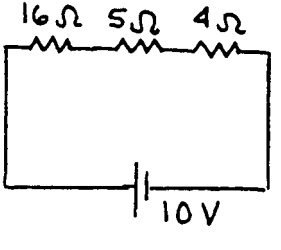
A-10: Horace has invented a unique pair of reading glasses that have two small light bulbs at the bottom wired in series, so that he can see the newspaper when he is reading at night. Each of the bulbs has a resistance of 2.00 Ω, and the system runs off a 3.20-V battery. How much current is drawn by Horace's reading glasses?

A-11: Jay has two 8-Ω stereo speakers wired in series in the front of his car connected to the 4.0-V output of the stereo. a) What is the current through each of the speakers? b) In his garage, Jay finds two more old speakers with resistances of 4 Ω and 16 Ω. He wires each in parallel with the 8-Ω combination. What is the new current through the 8-Ω speakers? c) If the loudness of each speaker is proportional to the amount of power used, how has the loudness of the two 8-Ω speakers changed?

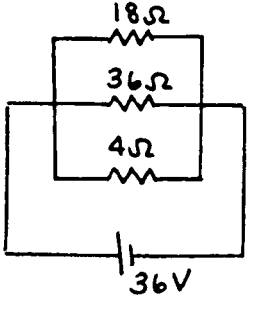
A-12: Find a) the total resistance in circuit A below. b) Find the total current through the circuit.

A-13: Find a) the total resistance in circuit B below. b) Find the total current through the circuit.

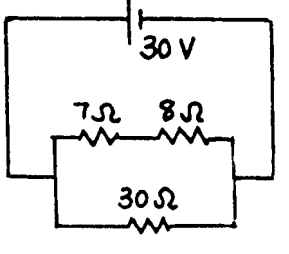
A-14: Find a) the total resistance in circuit C below. b) Find the total current through the circuit.



Circuit A



Circuit B



Circuit C

A3. Silver: 10 500 kg/m^3
Earth: 5540 kg/m^3
A5. 1.5×10^{-3} m
A7. b) 21 m
A9. a) 9.0×10^3 N
b) 10. N
A11. a) 3.03 times bigger

Chapter 10

1. 122°F
3. a) −148°C
b) −234°F
5. 437°C
7. b) 3.96×10^{-4} m^3
9. 347 000 J
11. 31.8°C
13. 9630 J
15. 3.9×10^6 J
A1. Hottest: 462°C
Coldest: −218°C
A3. 2.0×10^{-3} m
A5. 3.1×10^{-4} m^2
A7. 1990 cm^3
A9. 79.7°C
A11. 0.019 kg
A13. 1300 J

Chapter 11

1. 0.67 s
3. a) 200 N/m
5. a) 0.63 s
7. 2 s
9. a) 3.1 s
11. 0.65 m
A1. 0.0023 s
A3. 20 N/m
A5. a) 0.5441 s
A7. 6.28 s
A9. b) 0.0400 m

Chapter 12

1. 0.013 m
3. 0.4 m/s
5. 188 Hz
7. b) −5.26 m/s
9. 813 Hz
11. 0.300 m
13. 394.0 Hz
A1. 0.0085 m
A3. a) 0.688 m
A5. 40 m
A7. a) Toward: 501.5 Hz
Away: 498.5 Hz
b) 3.0 Hz
A9. 15.0 m/s
A11. 20.4 m/s
A15. 628 m/s

Chapter 13

1. 19 700 s
3. 3.80×10^{-7} m
5. 40°
7. a) −36 cm
9. 28.9°
11. 1.39
A1. 260 s
A3. 20°
A5. c) −12.0 cm
A7. a) ∞
A9. b) alcohol: 2.21×10^8 m/s
water: 2.26×10^8 m/s
A11. 20.7°
A13. a) 42.5°

Chapter 14

1. 11.1 cm
3. a) 0.0508 m
5. a) 20 times
b) 30 cm
7. 8 times
9. b) 2.7 diopters
11. 0.40 m
13. a) 8.8×10^{-4} m
15. 2.4×10^{-6} m
A1. 12.0 cm
A3. 2.4 cm
A5. 24 cm
A7. 0.17 m
A9. a) −4.0 diopters
b) 0.29 m
A11. −0.17 diopters
A13. 7130 m

Chapter 15

1. 1.3×10^{-3} N
3. 7.0×10^{-13} C
5. 10. m
7. 1.9×10^{13} N/C
9. 18×10^5 N/C to the right
11. 8800 V
13. 4.0×10^{-3} m
A1. 1.5×10^{-11} N
A3. 4.2×10^{-13} C
A5. a) 0.043 m
A7. 1.3×10^7 N/C
A9. a) 0.14 m
A11. 450 000 J
A13. 600 000 V

Chapter 16

1. 10 800 s
3. 27.5 Ω
5. 1.52 V
7. 2.0×10^4 V
9. 0.8 A
11. a) 240 V
c) 18 A
13. a) 1.5 A
b) 80 Ω
15. $8.10
17. a) 3 Ω
b) 4 A
19. Series: 10. V
Parallel: 120 V
21. a) 5 Ω
b) 85 Ω
A1. a) 15 600 s
A3. 100. Ω
A5. 5×10^{-9} A
A7. 14.17 A
A9. 1.2×10^6
A11. 0.25 A
A13. a) 3.0 Ω
b) 12 A

Chapter 17

1. 4.2×10^{-14} N
3. a) 6.0×10^{-3} T
5. a) Zero
b) 1.4×10^{-5} Wb
7. 8.4×10^{-8} V
9. a) 12 V
A1. 1.1×10^{-10} N
A3. 8.6×10^{-14} N
A5. a) 1.3×10^{-3} N
b) zero
A7. a) 1.1×10^{-5} V
A9. a) 4800 V

Chapter 18

1. 2.15 eV
3. 1040 nm
5. 150 000 m/s
7. a) 1.96 eV
b) 5.22×10^{-7} m
9. 823 nm
11. a) 657 nm Red
b) 488 nm Greenish Blue
c) 445 nm Violet
13. 1.85×10^{16} atoms
15. 1.13×10^{14} atoms
A1. 2.9×10^{20} Hz
A3. 2.42 eV
A5. 1.7×10^{-19} m
A7. Sodium: 1.68 eV Yes
Iron: 0.244 eV Yes
Gold: −0.676 eV No
A9. 7.72 eV
A11. 2.18×10^4 atoms
A13. 8.18×10^{24} atoms