

77. A fish-tank heater is rated at 95 W when connected to 120 V. The heating element is a coil of Nichrome wire. When uncoiled, the wire has a total length of 3.8 m. What is the diameter of the wire?
78. In an automobile, the system voltage varies from about 12 V when the car is off to about 13.8 V when the car is on and the charging system is in operation, a difference of 15%. By what percentage does the power delivered to the headlights vary as the voltage changes from 12 V to 13.8 V? Assume the headlight resistance remains constant.
79. Lightbulb A is rated at 120 V and 40 W for household applications. Lightbulb B is rated at 12 V and 40 W for automotive applications. (a) What is the current through each bulb? (b) What is the resistance of each bulb? (c) In one hour, how much charge passes through each bulb? (d) In one hour, how much energy does each bulb use? (e) Which bulb requires larger diameter wires to connect its power source and the bulb?
80. Copper wire of diameter 0.259 cm is used to connect a set of appliances at 120 V, which draw 2250 W of power total. (a) What power is wasted in 25.0 m of this wire? (b) What is your answer if wire of diameter 0.412 cm is used?
81. A copper pipe has an inside diameter of 3.00 cm and an outside diameter of 5.00 cm (Fig. 18–37). What is the resistance of 10.0 m of this pipe?

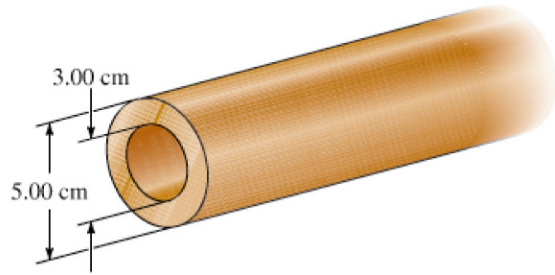


FIGURE 18–37 Problem 81.

82. If a wire of resistance  $R$  is stretched uniformly so that its length doubles, by what factor does the power dissipated in the wire change, assuming it remains hooked up to the same voltage source?
- \* 83. A tungsten filament used in a flashlight bulb operates at 0.20 A and 3.2 V. If its resistance at 20°C is 1.5  $\Omega$ , what is the temperature of the filament when the flashlight is on?

## Answers to Exercises

- A:**  $1.6 \times 10^{-13}$  A.  
**B:** 240  $\Omega$ .  
**C:** 110 m.  
**D:** 370,000 kg, or about 5000 people.  
**E:** 1800 W at 120 V draws a 15-A current. The wires in the extension cord rated at 11 A could become hot enough to melt the insulation and cause a fire.  
**F:** 20 V, 5.0 A.