72. A simple model (Fig. 10–56) considers a continent as a block (density ≈ 2800 kg/m^3) floating in the mantle rock around it (density ≈ 3300 kg/m^3). Assuming the continent is 35 km thick (the average thickness of the Earth's continental crust), estimate the height of the continent above the surrounding rock.

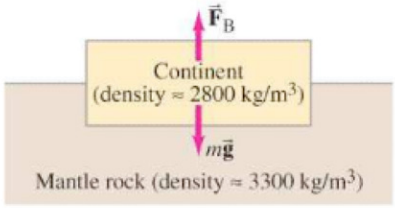

FIGURE 10–56 Problem 72.

73. The contraction of the left ventricle (chamber) of the heart pumps blood to the body. Assuming that the inner surface of the left ventricle has an area of 82 cm^2 and the maximum pressure in the blood is 120 mm-Hg, estimate the force exerted by that ventricle at maximum pressure.
74. Estimate the total mass of the Earth's atmosphere, using the known value of atmospheric pressure at sea level.
75. Suppose a person can reduce the pressure in his lungs to −80 mm-Hg gauge pressure. How high can water then be sucked up a straw?
76. A ship, carrying fresh water to a desert island in the Caribbean, has a horizontal cross-sectional area of 2650 m^2 at the waterline. When unloaded, the ship rises 8.50 m higher in the sea. How much water was delivered?
77. A copper (Cu) weight is placed on top of a 0.50-kg block of wood (density = 0.60 × 10^3 kg/m^3) floating in water, as shown in Fig. 10–57. What is the mass of the copper if the top of the wood block is exactly at the water's surface?

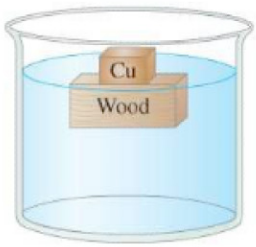

FIGURE 10–57 Problem 77.

78. A raft is made of 10 logs lashed together. Each is 56 cm in diameter and has a length of 6.1 m. How many people can the raft hold before they start getting their feet wet, assuming the average person has a mass of 68 kg? Do *not* neglect the weight of the logs. Assume the specific gravity of wood is 0.60.
79. During each heartbeat, approximately 70 cm^3 of blood is pushed from the heart at an average pressure of 105 mm-Hg. Calculate the power output of the heart, in watts, assuming 70 beats per minute.
80. A bucket of water is accelerated upward at 2.4g. What is the buoyant force on a 3.0-kg granite rock (SG = 2.7) submerged in the water? Will the rock float? Why or why not?
81. How high should the pressure head be if water is to come from a faucet at a speed of 9.5 m/s? Ignore viscosity.
82. The stream of water from a faucet decreases in diameter as it falls (Fig. 10–47). Derive an equation for the diameter of the stream as a function of the distance y below the faucet, given that the water has speed v_0 when it leaves the faucet, whose diameter is d.
83. Four lawn sprinkler heads are fed by a 1.9-cm-diameter pipe. The water comes out of the heads at an angle of 35° to the horizontal and covers a radius of 8.0 m. (*a*) What is the velocity of the water coming out of each sprinkler head? (Assume zero air resistance.) (*b*) If the output diameter of each head is 3.0 mm, how many liters of water do the four heads deliver per second? (*c*) How fast is the water flowing inside the 1.9-cm-diameter pipe?
84. You need to siphon water from a clogged sink. The sink has an area of 0.48 m^2 and is filled to a height of 4.0 cm. Your siphon tube rises 50 cm above the bottom of the sink and then descends 100 cm to a pail as shown in Fig. 10–58. The siphon tube has a diameter of 2.0 cm. (*a*) Assuming that the water enters the siphon tube with almost zero velocity, calculate its velocity when it enters the pail. (*b*) Estimate how long it will take to empty the sink.

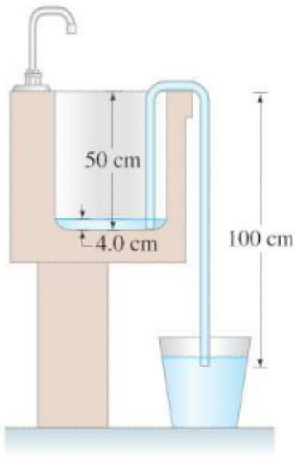

FIGURE 10–58 Problems 84 and 85.

85. Consider a siphon which transfers water from one vessel to a second (lower) one, as in Fig. 10–58. Determine the rate of flow if the tube has a diameter of 1.2 cm and the difference in water levels of the two containers is 64 cm.
86. An airplane has a mass of 2.0 × 10^6 kg, and the air flows past the lower surface of the wings at 95 m/s. If the wings have a surface area of 1200 m^2, how fast must the air flow over the upper surface of the wing if the plane is to stay in the air? Consider only the Bernoulli effect.
* 87. Blood from an animal is placed in a bottle 1.70 m above a 3.8-cm-long needle, of inside diameter 0.40 mm, from which it flows at a rate of 4.1 cm^3/min. What is the viscosity of this blood?
* 88. If cholesterol build-up reduces the diameter of an artery by 15%, what will be the effect on blood flow?

Answers to Exercises

A: The same. Pressure depends on depth, not on length.
B: Lower.
C: Increases.