a. What is the volume in cubic kilometer?
b. What is the volume in cubic meters?
c. If 250 000 000 objects averaging 0.060 m^3 each are placed into the landfill each year, how many years will it take to fill the landfill?

75. A dietary calorie (C) is exactly equal to 1000 cal. If your daily intake of food gives you 2400 C, what is your intake in joules per day? (1 cal = 4.184 J)

Four Steps for Solving Quantitative Problems: Chap. 2, Sec. 3

76. Gasoline has a density of 0.73 g/cm^3. How many liters of gasoline would be required to increase the mass of an automobile from 1271 kg to 1305 kg?

77. A swimming pool measures 9.0 m long by 3.5 m wide by 1.75 m deep. What mass of water in metric tons (1 metric ton = 1000 kg) does the pool contain when filled? The density of the water in the pool is 0.997 g/cm^3.

78. A tightly packed box of crackers contains 250 g of crackers and measures 7.0 cm × 17.0 cm × 19.0 cm. What is the average density in kilograms per liter of the crackers in the package? Assume that the unused volume is negligible.

Mixed Review

Solve these problems by using the Four Steps for Solving Quantitative Problems.

79. The aluminum foil on a certain roll has a total area of 18.5 m^2 and a mass of 1275 g. Using a density of 2.7 g per cubic centimeter for aluminum, determine the thickness in millimeters of the aluminum foil.

80. If a liquid has a density of 1.17 g/cm^3, how many liters of the liquid have a mass of 3.75 kg?

81. A stack of 500 sheets of paper measuring 28 cm × 21 cm is 44.5 mm high and has a mass of 2090 g. What is the density of the paper in grams per cubic centimeter?

82. A triangular-shaped piece of a metal has a mass of 6.58 g. The triangle is 0.560 mm thick and measures 36.4 mm on the base and 30.1 mm in height. What is the density of the metal in grams per cubic centimeter?

83. A packing crate measures 0.40 m × 0.40 m × 0.25 m. You must fill the crate with boxes of cookies that each measure 22.0 cm × 12.0 cm × 5.0 cm. How many boxes of cookies can fit into the crate?

84. Calculate the unknown quantities in the following table. Use the following relationships for volumes of the various shapes.

Volume of a cube = $l \times l \times l$
Volume of a rectangle = $l \times w \times h$
Volume of a sphere = $4/3\pi r^3$
Volume of a cylinder = $\pi r^2 \times h$

D	*m*	*V*	*Shape*	*Dimensions*
a. 2.27 g/cm^3	3.93 kg	? L	cube	? m × ? m × ? m
b. 1.85 g/cm^3	? g	? cm^3	rectangle	33 mm × 21 mm × 7.2 mm
c. 3.21 g/L	? kg	? dm^3	sphere	3.30 m diameter
d. ? g/cm^3	497 g	? m^3	cylinder	7.5 cm diameter × 12 cm
e. 0.92 g/cm^3	? kg	? cm^3	rectangle	3.5 m × 1.2 m × 0.65 m

85. When a sample of a metal alloy that has a mass of 9.65 g is placed into a graduated cylinder containing water, the volume reading in the cylinder increases from 16.0 mL to 19.5 mL. What is the density of the alloy sample in grams per cubic centimeter?

86. Pure gold can be made into extremely thin sheets called gold leaf. Suppose that 50. kg of gold is made into gold leaf having an area of 3620 m^2. The density of gold is 19.3 g/cm^3.
a. How thick in micrometers is the gold leaf?
b. A gold atom has a radius of 1.44×10^{-10} m. How many atoms thick is the gold leaf?

87. A chemical plant process requires that a cylindrical reaction tank be filled with a certain liquid in 238 s. The tank is 1.2 m in diameter and 4.6 m high. What flow rate in liters per minute is required to fill the reaction tank in the specified time?

88. The radioactive decay of 2.8 g of plutonium-238 generates 1.0 joule of energy as heat every second. Plutonium has a density of 19.86 g/cm^3. How many calories (1 cal = 4.184 J) of energy as heat will a rectangular piece of plutonium that is 4.5 cm × 3.05 cm × 15 cm generate per hour?

89. The mass of Earth is 5.974×10^{24} kg. Assume that Earth is a sphere of diameter 1.28×10^4 km and calculate the average density of Earth in g/cm^3.

90. What volume of magnesium in cubic centimeters would have the same mass as 1.82 dm^3 of platinum? The density of magnesium is 1.74 g/cm^3, and the density of platinum is 21.45 g/cm^3.

91. A roll of transparent tape has 66 m of tape on it. If an average of 5.0 cm of tape is needed each time the tape is used, how many uses can you get from a case of tape containing 24 rolls?

92. An automobile can travel 38 km on 4.0 L of gasoline. If the automobile is driven 75% of the days in a year and the average distance traveled each day is 86 km, how many liters of gasoline will be consumed in one year (assume the year has 365 days)?

93. A hose delivers water to a swimming pool that measures 9.0 m long by 3.5 m wide by 1.75 m deep. It requires 97 h to fill the pool. At what rate in liters per minute will the hose fill the pool?

94. Automobile batteries are filled with a solution of sulfuric acid, which has a density of 1.285 g/cm^3. The solution used to fill the battery is 38% (by mass)