Exercise 1.61

The density of air at ordinary atmospheric pressure and 25 °C is 1.19 g/L. What is the mass, in kilograms, of the air in a room that measures 14.5 ft × 16.5 ft × 8.0 ft?

Solution

To obtain the mass, multiply the density by the volume of the room.

$$\text{Mass} = \text{Density} \times \text{Volume}$$

$$= \left(1.19\ \frac{\text{g}}{\text{L}}\right)(14.5\ \text{ft} \times 16.5\ \text{ft} \times 8.0\ \text{ft})$$

$$= \left(1.19\ \frac{\cancel{\text{g}}}{\text{L}} \times \frac{1\ \text{kg}}{1000\ \cancel{\text{g}}}\right)\left[14.5 \times 16.5 \times 8.0\ \cancel{\text{ft}^3} \times \left(\frac{12\ \cancel{\text{in}}}{1\ \cancel{\text{ft}}}\right)^3 \times \left(\frac{2.54\ \cancel{\text{cm}}}{1\ \cancel{\text{in}}}\right)^3 \times \frac{1\ \cancel{\text{mL}}}{1\ \cancel{\text{cm}^3}} \times \frac{1\ \text{L}}{1000\ \cancel{\text{mL}}}\right]$$

$$= \left(1.19 \times 10^{-3}\ \frac{\text{kg}}{\cancel{L}}\right)\left(14.5 \times 16.5 \times 8.0 \times 12^3 \times 2.54^3 \times \frac{1}{1000}\ \cancel{L}\right)$$

$$\approx 64\ \text{kg}$$