



## Problems

1. A bug travels at the rate of 3.0 miles/hour. How fast is this in  $\mu\text{m}/\text{nsec}$ ? *Hint:*

2.54 cm = 1 inch and 1 mile = 5,280 feet

$$\begin{array}{c}
 \frac{3.0 \text{ miles}}{\text{hr}} \times \frac{5280 \text{ ft}}{1 \text{ mile}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{10^2 \text{ cm}} \times \frac{10^6 \mu\text{m}}{1 \text{ m}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec}} \times \frac{1 \text{ sec}}{10^9 \text{ nsec}} = .0013 \frac{\mu\text{m}}{\text{nsec}}
 \end{array}$$

- 2.

Diameter = 25.0 mm

Calculate its density in  $\text{g}/\text{cm}^3$ .

Height = 59.0 cm

Mass = 38.0 g

$$d = \frac{m}{V} = \frac{38.0 \text{ g}}{(\pi)(1.25 \text{ cm})^2 (59.0 \text{ cm})} = 13.1 \text{ g}/\text{cm}^3$$

3. The concentration of CO in a room is  $48 \mu\text{g}/\text{m}^3$ . What mass (g) is present in a room which measures  $8.0 \times 12.0 \times 22$  feet?

$$\begin{array}{c}
 (8.0 \text{ ft} \times 12.0 \text{ ft} \times 22 \text{ ft}) \times \left( \frac{12 \text{ in}}{1 \text{ ft}} \right)^3 \times \left( \frac{2.54 \text{ cm}}{1 \text{ in}} \right)^3 \times \frac{1 \text{ m}^3}{(10^2 \text{ cm})^3} \times \frac{48 \mu\text{g}}{1 \text{ m}^3} \\
 \frac{1 \text{ g}}{10^6 \mu\text{g}} = 2.9 \times 10^{-3} \text{ g}
 \end{array}$$

4. Ben Franklin showed that 1 teaspoon of oil would cover about 0.50 acre of still water. If you know that  $1.0 \times 10^4 \text{ m}^2 = 2.47$  acres, and that there are  $5.0 \text{ cm}^3$  in a teaspoon, what is the thickness (in cm) of a layer of oil?

$$\frac{1 \text{ tsp} \times 5.0 \text{ cm}^3}{1 \text{ tsp}} \times \frac{1 \text{ m}^2}{(10^2 \text{ cm})^2} \times \frac{2.47 \text{ acres}}{1.0 \times 10^4 \text{ m}^2} \times \frac{1}{0.50 \text{ acre}} = 2.47 \times 10^{-2} \text{ cm}$$