1.25 There are 5280 feet in one mile. Each foot is 12 inches, and each inch is 2.54 centimeters. Hence, the number of centimeters in one mile is

\[
\left(\frac{5280 \text{ ft}}{\text{mile}}\right) \left(\frac{12 \text{ in}}{\text{ft}}\right) \left(\frac{2.54 \text{ cm}}{\text{in}}\right) = 1.61 \times 10^5 \frac{\text{cm}}{\text{mile}} = 1.61 \times 10^3 \frac{\text{m}}{\text{mile}}
\]

Let \( v \) be the numerical value of the speed in miles per hour. To convert this to \( \text{m/s} \):

\[
v \text{ in } \text{m/s} = \left(\frac{v \text{ mile}}{\text{h}}\right) \left(1.61 \times 10^3 \frac{\text{m}}{\text{mile}}\right) \left(\frac{h}{3.600 \times 10^3 \text{ s}}\right) = v \times 0.447 \text{ m/s}.
\]

Therefore, to convert the numerical value of \( v \) in miles per hour to a numerical value in meters per second, multiply the numerical value of \( v \) in miles per hour by the factor 0.447.

1.26 There are \( 1.61 \times 10^3 \text{ m/mile} \), as shown in the previous problem, and therefore \( 1.61 \text{ km/mile} \). Hence, the conversion of 65 mile/hour to kilometers per hour is

\[
65 \text{ mile/hour} = (65 \text{ mile/hour})(1.61 \text{ km/mile}) = 105 \text{ km/h}.
\]

We keep an extra significant figure so you can avoid a speeding ticket!

1.27 One micro century is \( 10^{-6} \) of a century. The conversion of this to minutes is

\[
1.00 \times 10^{-6} \text{ century} = 1.00 \times 10^{-6} \text{ century} \left(\frac{100 \text{ y}}{\text{century}}\right) \left(\frac{365.25 \text{ d}}{\text{y}}\right) \left(\frac{24 \text{ h}}{\text{d}}\right) \left(\frac{60 \text{ min}}{\text{h}}\right) = 52.6 \text{ min}.
\]

1.28 From problem 1.25 there are \( 1.61 \text{ km/mile} \). Therefore,

\[
20000 \text{ league} = 20000 \text{ league} \left(\frac{3 \text{ mile}}{\text{league}}\right) \left(\frac{1.61 \text{ km}}{\text{mile}}\right) = 9.66 \times 10^4 \text{ km}.
\]

1.29 The density of water is

\[
1.0 \times 10^3 \frac{\text{kg}}{\text{m}^3} = 1.0 \frac{\text{g}}{\text{cm}^3}.
\]

Hence, the number of moles in one cubic centimeter of water, i.e., 1.0 g of water, is

\[
\frac{1.0 \text{ g}}{18 \text{ g/mol}} = 0.056 \text{ mol}.
\]

Each mole has Avogadro’s number of particles. Therefore, the number of molecules in the cubic centimeter of water is

\[
0.056 \text{ mol} = 0.056 \text{ mol} \left(6.02 \times 10^{23} \frac{\text{particle}}{\text{mol}}\right) = 3.4 \times 10^{22} \text{ particle}.
\]

1.30 The surface roughness is

\[
8.85 \times 10^3 \text{ m} + 11.5 \times 10^3 \text{ m} = 8.9 \times 10^3 \text{ m} + 11.5 \times 10^3 \text{ m} = 20.4 \times 10^3 \text{ m}.
\]

The surface roughness is the following percentage of the radius of the Earth:

\[
\frac{20.4 \times 10^3 \text{ m}}{6.37 \times 10^6 \text{ m}} \times 100\% = 0.320\%.
\]