Problem 1.5

The density of Au is 19.3 g/cm^3 at room temperature and 1 atm. (a) Express this density in kg/m^3. (b) If gold is selling for \$800 per troy ounce, what would a cubic meter of it sell for? One troy ounce = 480 grains, 1 grain = $\frac{1}{7000}$ pound, 1 pound = 453.59 g.

Solution

Part (a)

Use known conversion factors to change the density to the desired units.

$$19.3\ \frac{\text{g}}{\text{cm}^3} = 19.3\ \frac{\cancel{\text{g}}}{\cancel{\text{cm}^3}} \times \frac{1\ \text{kg}}{1000\ \cancel{\text{g}}} \times \left(\frac{100\ \cancel{\text{cm}}}{1\ \text{m}}\right)^3 = 1.93 \times 10^4\ \frac{\text{kg}}{\text{m}^3}$$

Part (b)

Start with the given quantity, a cubic meter, and multiply it by the appropriate conversion factors to end up with dollars in the numerator.

$$1\ \cancel{\text{m}^3} \times 1.93 \times 10^4\ \frac{\cancel{\text{kg}}}{\cancel{\text{m}^3}} \times \frac{1000\ \cancel{\text{g}}}{1\ \cancel{\text{kg}}} \times \frac{1\ \cancel{\text{lb}}}{453.59\ \cancel{\text{g}}} \times \frac{1\ \cancel{\text{grain}}}{\frac{1}{7000}\ \cancel{\text{lb}}} \times \frac{1\ \cancel{\text{troy oz}}}{480\ \cancel{\text{grains}}} \times \frac{\$800}{1\ \cancel{\text{troy oz}}} \approx 496 \text{ million dollars}$$