Unit Analysis

1. Convert 318 µs to seconds.

\[ 318 \, \mu s \times \frac{1 \times 10^{-6} \, s}{1 \, \mu s} = 3.18 \times 10^{-4} \, s \]

2. Nitrogen gas is the major component of air. A sample of nitrogen gas in a glass bulb weighs 243 mg. What is this mass in the SI base unit of mass (kilograms)?

\[ 243 \, mg \times \frac{1 \times 10^{-3} \, g}{1 \, mg} \times \frac{1 \, kg}{1000 \, g} = 2.43 \times 10^{-4} \, kg \]

3. How many centimeters are there in 6.51 miles? Use the exact definitions, 1 mi = 5280 ft, 1 ft = 12 in, and 1 in = 2.54 cm.

\[ 6.51 \, miles \times \frac{5280 \, ft}{1 \, mile} \times \frac{12 \, in}{1 \, ft} \times \frac{2.54 \, cm}{1 \, in} = 1.05 \times 10^6 \, cm \]

4. The estimated amount of recoverable oil from the field at Prudhoe Bay in Alaska is \(9.6 \times 10^9\) barrels. What is this amount of oil in cubic meters? One barrel = 42 gal (exact), 1 gal = 4 qt, and 1 qt = 9.46 \times 10^{-4} \, m^3.

\[ 9.6 \times 10^9 \, barrels \times \frac{42 \, gal}{1 \, barrel} \times \frac{4 \, qts}{1 \, gal} \times \frac{9.46 \times 10^{-4} \, m^3}{1 \, qt} = 1.5 \times 10^{10} \, m^3 \]

5. The world's oceans contain approximately \(1.35 \times 10^9\) km³ of water. What is this volume in liters?

\[ 1.35 \times 10^9 \, km^3 \times \left( \frac{1000 \, m}{1 \, km} \right)^3 \times \left( \frac{1 \, cm}{0.01 \, m} \right)^3 \times \frac{1 \, L}{1000 \, cm^3} = 1.35 \times 10^{21} \, L \]