SAMPLE PROBLEM A

Metric Prefixes

PROBLEM

A typical bacterium has a mass of about 2.0 fg. Express this measurement in terms of grams and kilograms.

SOLUTION

Given: mass = 2.0 fg

Unknown: mass = ? g mass = ? kg

Build conversion factors from the relationships given in **Table 3.** Two possibilities are shown below.

$$\frac{1 \times 10^{-15}\ \text{g}}{1\ \text{fg}} \text{ and } \frac{1\ \text{fg}}{1 \times 10^{-15}\ \text{g}}$$

Only the first one will cancel the units of femtograms to give units of grams.

$$(2.0\ \text{fg})\left(\frac{1 \times 10^{-15}\ \text{g}}{1\ \text{fg}}\right) = \boxed{2.0 \times 10^{-15}\ \text{g}}$$

Then, take this answer and use a similar process to cancel the units of grams to give units of kilograms.

$$(2.0 \times 10^{-15}\ \text{g})\left(\frac{1\ \text{kg}}{1 \times 10^{3}\ \text{g}}\right) = \boxed{2.0 \times 10^{-18}\ \text{kg}}$$

PRACTICE A

Metric Prefixes

1. A human hair is approximately 50 μm in diameter. Express this diameter in meters.
2. If a radio wave has a period of 1 μs, what is the wave's period in seconds?
3. A hydrogen atom has a diameter of about 10 nm.
   - **a.** Express this diameter in meters.
   - **b.** Express this diameter in millimeters.
   - **c.** Express this diameter in micrometers.
4. The distance between the sun and Earth is about 1.5×10^{11} m. Express this distance with an SI prefix and in kilometers.
5. The average mass of an automobile in the United States is about 1.440×10^{6} g. Express this mass in kilograms.