

## 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  $\mu\text{m}$  in diameter. Express this diameter in meters.
2. If a radio wave has a period of 1  $\mu\text{s}$ , 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  $1.5 \times 10^{11} \text{ m}$ . Express this distance with an SI prefix and in kilometers.
5. The average mass of an automobile in the United States is about  $1.440 \times 10^6 \text{ g}$ . Express this mass in kilograms.