

# Metrics and Measurement

Name: KEY

In the chemistry classroom and lab, the metric system of measurement is used, so it is important to be able to convert from one unit to another.

mega	kilo	hecto	deca	Basic Unit	deci	centi	milli	micro
(M)	(k)	(h)	(da)	gram (g)	(d)	(c)	(m)	(μ)
1,000,000	1000	100	10	liter (L)	.1	.01	.001	.000001
10 <sup>6</sup>	10 <sup>3</sup>	10 <sup>2</sup>	10 <sup>1</sup>	meter (m)	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>	10 <sup>-6</sup>

## Factor Label Method

- Write the given number and unit.
- Set up a conversion factor (fraction used to convert one unit to another).
  - Place the given unit as denominator of conversion factor.
  - Place desired unit as numerator.
  - Place a "1" in front of the larger unit.
  - Determine the number of smaller units needed to make "1" of the larger unit.
- Cancel units. Solve the problem.

**Example 1:** 55 mm = \_\_\_\_ m

$$\frac{55 \cancel{\text{mm}}}{1000 \cancel{\text{mm}}} \times \frac{1 \text{ m}}{1} = 0.055 \text{ m}$$

**Example 2:** 88 km = \_\_\_\_ m

$$\frac{88 \cancel{\text{km}}}{1 \cancel{\text{km}}} \times \frac{1000 \text{ m}}{1} = 88,000 \text{ m}$$

**Example 3:** 7000 cm = \_\_\_\_ hm

$$\frac{7000 \cancel{\text{cm}}}{100 \cancel{\text{cm}}} \times \frac{1 \cancel{\text{cm}}}{100 \cancel{\text{cm}}} \times \frac{1 \text{ hm}}{1} = 0.7 \text{ hm}$$

**Example 4:** 8 daL = \_\_\_\_ dL

$$\frac{8 \cancel{\text{daL}}}{1 \cancel{\text{daL}}} \times \frac{10 \cancel{\text{L}}}{1 \cancel{\text{L}}} \times \frac{10 \text{ dL}}{1} = 800 \text{ dL}$$

The factor label method can be used to solve virtually any problem including changes in units. It is especially useful in making complex conversions dealing with concentrations and derived units.

Convert the following. Show your work!

1. 35 mL = \_\_\_\_ dL

$$\frac{35 \cancel{\text{mL}}}{1000 \cancel{\text{mL}}} \times \frac{10 \text{ dL}}{1} = 0.35 \text{ dL}$$

6. 4,500 mg = \_\_\_\_ g

$$\frac{4500 \cancel{\text{mg}}}{1000 \cancel{\text{mg}}} \times \frac{1 \text{ g}}{1} = 4.5 \text{ g}$$

2. 950 g = \_\_\_\_ kg

$$\frac{950 \cancel{\text{g}}}{1000 \cancel{\text{g}}} \times \frac{1 \text{ kg}}{1} = 0.95 \text{ kg}$$

7. 25 cm = \_\_\_\_ mm

$$\frac{25 \cancel{\text{cm}}}{100 \cancel{\text{cm}}} \times \frac{10 \text{ mm}}{1} = 250 \text{ mm}$$

3. 275 mm = \_\_\_\_ cm

$$\frac{275 \cancel{\text{mm}}}{1000 \cancel{\text{mm}}} \times \frac{100 \text{ cm}}{1} = 27.5 \text{ cm}$$

8. 0.005 kg = \_\_\_\_ dag

$$\frac{0.005 \cancel{\text{kg}}}{1 \cancel{\text{kg}}} \times \frac{1000 \text{ g}}{1} \times \frac{1 \text{ dag}}{10 \text{ g}} = 0.5 \text{ dag}$$

4. 1,000 L = \_\_\_\_ kL

$$\frac{1000 \cancel{\text{L}}}{1000 \cancel{\text{L}}} \times \frac{1 \text{ kL}}{1} = 1 \text{ kL}$$

9. 0.075 m = \_\_\_\_ cm

$$\frac{0.075 \cancel{\text{m}}}{1 \cancel{\text{m}}} \times \frac{1000 \text{ mm}}{1} \times \frac{1 \text{ cm}}{10 \text{ mm}} = 7.5 \text{ cm}$$

5. 1,000 mL = \_\_\_\_ L

$$\frac{1000 \cancel{\text{mL}}}{1000 \cancel{\text{mL}}} \times \frac{1 \text{ L}}{1} = 1 \text{ L}$$

10. 15 g = \_\_\_\_ mg

$$\frac{15 \cancel{\text{g}}}{1 \cancel{\text{g}}} \times \frac{1000 \text{ mg}}{1} = 15000 \text{ mg}$$

# Metric Conversions

Using the Factor Label Method, make the following conversions. Show your work!

1. 765 mL = \_\_\_\_\_ L  $\frac{765\text{mL} | 1\text{L}}{1000\text{mL}} = 0.765\text{mL}$

2. 150 g = \_\_\_\_\_ mg  $\frac{150\text{g} | 1000\text{mg}}{1\text{g}} = 150000\text{mg}$

3. 4.7 cm<sup>3</sup> = \_\_\_\_\_ ml  $\frac{4.7\text{ cm}^3 | 1\text{mL}}{1\text{cm}^3} = 4.7\text{mL}$

4. 82.7 cm = \_\_\_\_\_ m  $\frac{82.7\text{cm} | 1\text{m}}{100\text{cm}} = 0.827\text{m}$

5. 0.25 L = \_\_\_\_\_ mL  $\frac{0.25\text{L} | 1000\text{mL}}{1\text{L}} = 250\text{mL}$

6. 0.085 cm = \_\_\_\_\_ m  $\frac{0.085\text{cm} | 1\text{m}}{100\text{cm}} = 0.00085\text{m}$

7. 805 μm = \_\_\_\_\_ mm  $\frac{805\mu\text{m} | 1\text{m} | 1000\text{mm}}{1000000\mu\text{m} | 1\text{m}} = 0.805\text{mm}$

8. 150 mL = \_\_\_\_\_ L  $\frac{150\text{mL} | 1\text{L}}{1000\text{mL}} = 0.150\text{L}$

9. 0.055 L = \_\_\_\_\_ mL  $\frac{0.055\text{L} | 1000\text{mL}}{1\text{L}} = 55\text{mL}$

10. 0.004 μm = \_\_\_\_\_ mm  $\frac{0.004\mu\text{m} | 1\text{m} | 1000\text{mm}}{1000000\mu\text{m} | 1\text{m}} = 0.000004\text{mm}$