

METRICS AND MEASUREMENT

Name Gautreau

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
10^6	10^3	10^2	10^1	meter (m)	10^{-1}	10^{-2}	10^{-3}	10^{-6}

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

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

Example 2: 88 km = ____ m

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

Example 3: 7000 cm = ____ hm

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

Example 4: 8 daL = ____ dL

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

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. *Do a separate sheet of paper using factor label method*

1. 35 mL = 0.35 dL

6. 4,500 mg = 4.5 g

2. 950 g = 0.95 kg

7. 25 cm = 250 mm

3. 275 mm = 27.5 cm

8. 0.005 kg = 0.5 dag

4. 1,000 L = 1 kL

9. 0.075 m = 7.5 cm

5. 1,000 mL = 1 L

10. 15 g = 15,000 mg

DIMENSIONAL ANALYSIS CONVERSIONS

Solve all of the following problems with dimensional analysis. **SHOW ALL WORK.** Be sure to label your answer with the proper units.

$$1. 45 \cancel{\text{m}} \times \frac{100 \text{ cm}}{1 \cancel{\text{m}}} = 4500 \text{ cm}$$

$$2. 820 \cancel{\text{mL}} \times \frac{1 \text{ L}}{1000 \cancel{\text{mL}}} = 0.820 \text{ L}$$

$$3. 2.3 \cancel{\text{kg}} \times \frac{1 \text{ g}}{10 \cancel{\text{kg}}} = 0.23 \text{ g}$$

$$4. 12 \cancel{\text{in}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{in}}} = 30.48 \text{ cm}$$

$$5. 3.00 \cancel{\text{km}} \times \frac{1000 \text{ m}}{1 \cancel{\text{km}}} = 3000 \text{ m}$$

$$6. 955 \cancel{\text{dm}} \times \frac{1 \cancel{\text{m}}}{10 \cancel{\text{dm}}} \times \frac{1 \text{ km}}{1000 \cancel{\text{m}}} = 0.0955 \text{ km}$$

$$7. 120 \cancel{\text{cg}} \times \frac{1 \text{ g}}{100 \cancel{\text{cg}}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = 1200 \text{ mg}$$

$$8. 3.0 \cancel{\text{ft}} \times \frac{12 \cancel{\text{in}}}{1 \cancel{\text{ft}}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{in}}} = 91.44 \text{ cm}$$

$$9. 7.5 \text{ L} = ? \text{ mL} \quad \frac{7.5 \cancel{\text{L}} | 1000 \text{ mL}}{1 \cancel{\text{L}}} = 7500 \text{ mL}$$

1 L = 1000 mL

$$10. 6800 \text{ cm} = ? \text{ m}$$

$$\frac{6800 \cancel{\text{cm}}}{100 \cancel{\text{cm}}} | \frac{1 \text{ m}}{100 \cancel{\text{cm}}} = 68 \text{ m}$$

$$1 \text{ m} = 10 \text{ dm}$$

$$1 \text{ m} = 100 \text{ cm}$$

$$1 \text{ km} = 1000 \text{ m}$$

$$1 \text{ L} = 1000 \text{ mL}$$

$$1 \text{ g} = 10 \text{ dg}$$

$$1 \text{ g} = 100 \text{ cg}$$

$$1 \text{ g} = 1000 \text{ mg}$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$1 \text{ ft} = 12 \text{ in}$$

2. $950\text{g} = \underline{\quad? \quad}\text{kg}$ $1\text{kg} = 1000\text{g}$

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

5. $1000\text{mL} = \underline{\quad? \quad}\text{L}$ $1\text{L} = 1000\text{mL}$

$$\frac{1000\text{mL}}{\frac{1\text{L}}{1000\text{mL}}} = \frac{1000\text{L}}{1000} = \underline{1\text{L}}$$

1. $35\text{mL} = \underline{\quad? \quad}\text{dL}$ $1\text{L} = 1000\text{mL}$

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

3. $275\text{mm} = \underline{\quad? \quad}\text{cm}$ $1\text{m} = 1000\text{mm}$

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

4. $1000\text{L} = \underline{\quad? \quad}\text{KL}$ $1\text{KL} = 1000\text{L}$

6. $4500\text{mg} = \underline{\quad? \quad}\text{g}$ $1\text{g} = 1000\text{mg}$

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

Metrics & Measurement Cont...

7. $25 \text{ cm} = ? \text{ mm}$ $1 \text{ m} = 100 \text{ cm}$

$\frac{25 \text{ cm}}{100 \text{ cm}} \times \frac{1 \text{ m}}{1 \text{ m}} \times \frac{1000 \text{ mm}}{1 \text{ m}} = \frac{25 \times 1000 \text{ mm}}{100} = 250 \text{ mm}$

8. $0.005 \text{ kg} = ? \text{ dag}$ $1 \text{ kg} = 1000 \text{ g}$

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

9. $0.075 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = 0.075 \times 100 \text{ cm} = 7.5 \text{ cm}$

$1 \text{ m} = 100 \text{ cm}$

10. $15 \text{ g} = ? \text{ mg}$ $1 \text{ g} = 1000 \text{ mg}$

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