METRICS AND MEASUREMENT

Name _____

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

Factor Label Method

1. Write the given number and unit.
2. Set up a conversion factor (fraction used to convert one unit to another).
   a. Place the given unit as denominator of conversion factor.
   b. Place desired unit as numerator.
3. Cancel units. Solve the problem.

Example 1: 55 mm = _____ m

$$55\ \text{mm} \times \frac{1 \times 10^{-3}\ \text{m}}{1\ \text{mm}} = 0.055\ \text{m}$$

Example 2: 88 km = _____ m

$$88\ \text{km} \times \frac{1 \times 10^{3}\ \text{m}}{1\ \text{km}} = 88{,}000\ \text{m}$$

Example 3: 7000 cm = _____ hm

$$7000\ \text{cm} \times \frac{1 \times 10^{-2}\ \text{m}}{1\ \text{cm}} \times \frac{1\ \text{hm}}{1 \times 10^{2}\ \text{m}} = 0.7\ \text{hm}$$

Example 4: 8 daL = _____ dL

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

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.

1. 35 mL $\bullet \left(\frac{1 \cdot 10^{-3}\ \text{L}}{1\ \text{mL}}\right) \bullet \left(\frac{1\ \text{dL}}{1 \cdot 10^{-1}\ \text{L}}\right) =$ 0.35 dL
2. 950 g $\bullet \left(\frac{1\ \text{kg}}{1 \cdot 10^{3}\ \text{g}}\right) =$ 0.95 kg
3. 275 mm $\bullet \left(\frac{1 \cdot 10^{-3}\ \text{m}}{1\ \text{mm}}\right) \bullet \left(\frac{1\ \text{cm}}{1 \cdot 10^{-2}\ \text{m}}\right) =$ 27.5 cm
4. 1,000 L $\bullet \left(\frac{1\ \text{kL}}{1 \cdot 10^{3}\ \text{L}}\right) =$ 1 kL
5. 1,000 mL $\bullet \left(\frac{1 \cdot 10^{-3}\ \text{L}}{1\ \text{mL}}\right) =$ 1 L
6. 4,500 mg $\bullet \left(\frac{1 \cdot 10^{-3}\ \text{g}}{1\ \text{mg}}\right) =$ 4.5 g
7. 25 cm $\bullet \left(\frac{1 \cdot 10^{-2}\ \text{m}}{1\ \text{cm}}\right) \bullet \left(\frac{1\ \text{mm}}{1 \cdot 10^{-3}\ \text{m}}\right) =$ 250 mm
8. 0.005 kg $\bullet \left(\frac{1 \cdot 10^{3}\ \text{g}}{1\ \text{kg}}\right) \left(\frac{1\ \text{dag}}{1 \cdot 10^{1}\ \text{g}}\right) =$ 0.5 dag
9. 0.075 m $\bullet \left(\frac{1\ \text{cm}}{1 \cdot 10^{-2}\ \text{m}}\right) =$ 7.5 cm
10. 15 g $\bullet \left(\frac{1\ \text{mg}}{1 \cdot 10^{-3}\ \text{g}}\right) =$ $1.5 \cdot 10^{4}$ mg