

# Dimensional Analysis and the Metric System

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- Dimensional Analysis is a way to look at one unit compared to another "size" unit.
- To move from one size unit to another we use the Factor Label Method.
  - equality
  - conversion factors
  - Solve Step.

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Example 1 Convert  $14.78 \text{ m} = ? \text{ mm}$ 

Step 1: Determine the equality between your units "m and mm"

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

Step 2: Conversion Factors (these are fractions written from the equality)

$$\frac{1 \text{ m}}{1000 \text{ mm}} \quad (\text{OR}) \quad \frac{1000 \text{ mm}}{1 \text{ m}}$$

$$14.78 \text{ m} \times \frac{1000 \text{ mm}}{1 \text{ m}} = 14,780 \text{ mm}$$

Problem                      Conv. factor

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Convert  $1200 \text{ cm} = ? \text{ nm}$ 

To get your equality here try this:

$$\frac{\text{cm larger unit}}{\text{nm smaller unit}} = \frac{10^{-2}}{10^{-9}} = 10^{-2-(-9)} = 10^{-2+9} = 10^7$$

$$1200 \text{ cm} \times \frac{10^7 \text{ nm}}{1 \text{ cm}} = 1.2 \times 10^{10} \text{ nm}$$

$1 \text{ cm} = 10^7 \text{ nm}$

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 $4,025.5 \text{ kL} = ? \text{ dL}$  (deciliter)

\* You need the equality

$$4.03 \times 10^7 \text{ dL} \quad \frac{\text{kL } 10^3}{\text{dL } 10^{-1}} = 10^{3-(-1)} = 10^{3+1} = 10^4$$

$1 \text{ kL} = 10^4 \text{ dL}$

$$4,025.5 \text{ kL} = ? \text{ dL} \quad 4,025.5 \text{ kL} \times \frac{1 \times 10^4 \text{ dL}}{1 \text{ kL}}$$

$$4,025.5 \text{ kL} \times \frac{1 \times 10^3 \text{ L}}{1 \text{ kL}} \times \frac{1 \text{ dL}}{1 \times 10^{-1} \text{ L}}$$

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Example 2:  $1500 \text{ cg} = ? \text{ hg}$ 

$$1 \text{ hg} = 10,000 \text{ cg}$$

$$\frac{1 \text{ hg}}{10,000 \text{ cg}} \quad \text{OR} \quad \frac{10,000 \text{ cg}}{1 \text{ hg}}$$

$$1500 \text{ cg} \times \frac{1 \text{ hg}}{10,000 \text{ cg}} = 0.15 \text{ hg}$$

equality  
conversion  
factor

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- $25.54 \text{ mL} = \text{L}$
- $76.5 \text{ mg} = \text{g}$
- $1.2 \text{ cm} = \text{nm}$

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