

**Part I: Background information on units and conversion factors**

- For each measurement in **Table 1**, choose both the imperial and metric units (when possible) from **Table 2** that would be most appropriate for making that measurement and fill it's abbreviation in **Table 1**. [Note: Some measurements in **Table 1** may have more than one reasonable unit. Units in **Table 2** may be used more than once while others may not be used at all.]

**Table 1**

<b>Measurement</b>	<b>Unit Abbreviation (Imperial)</b>	<b>Unit Abbreviation (Metric)</b>
Your age		<del>                    </del>
Length of a Pencil		
Mass of a large truck		
Your mass		
Length of this room		
Time spent studying each week		<del>                    </del>
Length of a football field		
Temperature of this room		
Volume of a milk container		
Mass of a pencil		
Amount of salt in a recipe		
Distance from Sacramento to San Francisco		

**Table 2**

grams	pounds	meters	kilometers	years
tons	hours	centimeters	cups	teaspoons
gallons	feet	kilograms	minutes	inches
miles	degrees (Celsius)	liters	ounces	atomic mass units

## CHEM 4 PAL—Conversion Factors

2. For each conversion below, write the appropriate equality, the conversion factor and determine whether the conversion factor has an infinite number of sig. figs. The first one is done for you.

Conversion	Equality	Conversion Factor	Exact Value?
oz → lb.	1 lb. = 16 oz	$\frac{1 \text{ lb.}}{16 \text{ oz}}$ or $\frac{16 \text{ oz}}{1 \text{ lb.}}$	Yes No
L → qt			Yes No
m → mm			Yes No
in. → cm			Yes No

3. Take the lengths from **Table 3** by ordering their corresponding abbreviations from the shortest to longest distance. Also fill in how many meters each length is equal to. The first one is done for you.

**Table 3**

1 megameter	1 picometer	1 kilometer	1 gigameter
1 millimeter	1 decimeter	1 femtometer	1 micrometer
1 terameter	1 centimeter	1 nanometer	

**Shortest**

**Longest**

$\frac{1 \text{ fm}}{10^{-15} \text{ m}}$  < ——— < ——— < ——— < ——— < ——— < ——— < ——— < ——— < ———

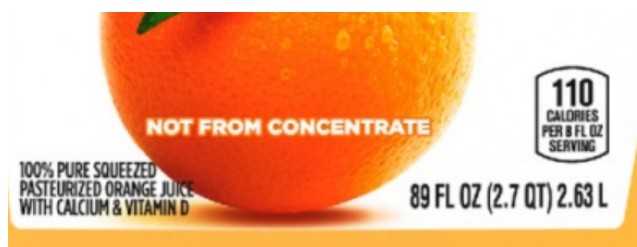
**Part II: Step-by-Step Practice Using Conversion Factors**

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4. Work step-by-step to determine the number of ps (picoseconds) in 2.5 Ms (megaseconds).
- Which of the following is a longer duration of time? (Circle your answer)  

1 ps    or    1 Ms
  - Given your response to question 4a, do you expect there to be a large or small number of ps in 2.5 Ms? Explain your reasoning.
  - Write out a flow chart similar to that from question 3 that you can use to solve this problem.
  - Write out the conversion factors that go with each step in your flow chart.
  - Use your flow chart and conversion factors to determine the number of ps in 2.5 Ms.
  - Does your answer agree with your prediction from question 4b?
5. Follow the steps from question 4 to determine how many kg is equivalent to  $1.8 \times 10^4 \mu\text{g}$ .

6. Most food packaging lists the amount of product in the container in at least 2 different units of measurement. If a bottle of orange juice states it has a total volume of 89 fluid ounces (fl oz) does this agree with the other portion of the label which states it contains 2.63 L?



- a. Which is a larger volume, 1 fluid ounce or 1 L?
- b. Write out a flow chart to go from fluid ounces to L. Be sure to include any conversion factors you will need to go between different units of measurement.
- c. Show all of your work to convert 89 fl oz to L. Show all of your work.
- d. This label also states that it contains 2.7 quarts. Is this correct based on the amount it states it contains in fl oz?
7. You and your PAL team have just won the “No-Bull” prize for being the best PAL team ever! Now you have to decide which of the following samples of gold to accept as your prize! a.
- a. Which sample did your team select? Justify your answer in the spaces provided.

**Sample A:**  $2.0 \times 10^{-6}$  tons of gold

**Sample B:** 0.020 lb of gold

**Sample C:**  $2.0 \times 10^{22}$  gold atoms

**Sample D:**  $2.0 \times 10^6$   $\mu\text{g}$  of gold

- b. If the prize is evenly divided among 4 people, how much is your individual prize worth if gold sells for 1785.39/troy ounce? 1 troy ounce = 31.103 grams

8. Methylmercury is a toxin commonly found in the tuna that we eat. Different species of tuna have different levels of this toxin. It is suggested that a person should limit the amount of methylmercury they ingest to less than 315 ng (nano grams) per 1 lb. of body weight per week.

The table below shows the amount of methyl mercury found in various types of tuna commonly available. Would it exceed the suggested limit of methylmercury if someone weighing 200 lbs. eats 266 grams of light tuna (the amount in 2 cans of tuna) in one week? How about if they eat the same amount of yellow tuna in one week? Albacore?

Species	Methylmercury per 3.00 ounces
Light tuna (canned)	$1.071 \times 10^{-2}$ mg
Yellowfin tuna	$3.009 \times 10^{-2}$ mg
Albacore tuna	$3.043 \times 10^{-2}$ mg