CHM 4, PAL – Conversion factors Student name:

Part A: Background information on units and conversion factors

1) For each measurement in Table 1, choose the unit 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 and some may not be used at all.]

Table 1

Measurement	Unit abbrev.	Measurement	Unit abbrev.
Your age		Length of a football field	
Length of a pencil		Mass of an atom	
Mass of a large truck		Temperature of this room	
Amount of flour in a recipe		Volume of a milk container	
Your mass		Mass of a pencil	
Length of this room		Amount of salt in a recipe	
Time spent working on chemistry each week		Distance from Sacramento to San Francisco	

Table 2

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

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	Infinite sig figs?
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 → nm			YES NO
in. → cm			YES NO

3) Put the lengths from Table 3 into Table 4 by ordering their corresponding abbreviations from shortest to longest distance. Also fill in how many meters each length is equal to. The first 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	

Table 4

Shortest												Longest
1 fm	<		<		<		<		<		<		<		<		<	
10^{-15} m																		

Part B: Step-by-step practice using conversion factors

4) Work step-by-step to determine the number of ps in 2.5 Ms.
   a. Which of the following is a longer duration of time? (circle your answer) 1 ps 1 Ms

   b. Given your response to question 4a, do you expect there to be a large or a small number of ps in 2.5 Ms? Explain.

   c. Write out a flow chart that you can use to solve this problem.

   d. Write out the conversion factors that go with each step in your flow chart.

   e. Show all your work for determining the number of ps in 2.5 Ms.

   f. Does your answer agree with your prediction from question 4b?

Although this next problem hasn't been broken down for you in steps, you should still follow the process outlined in question 4 above.

5) Determine the number of kg in 1.8×10^4 µg.

6) A bottle of orange juice (see partial label to the right) states that it contains a total volume of 89 fluid ounces (fl oz). Let's check to see how many liters there are in 89 fl oz and if it matches what they report on the label (2.6 L).

a. Which is a larger volume, 1 fluid ounce or 1 L?

b. Given your response to question 6a, do you expect your answer (for the number of L in 89 fl oz.) to be greater than or less than 89 L? Explain.

c. Write out a flow chart and any conversion factors that you will need to solve this problem.

d. Show all your work for determining the number of liters in 89 fluid ounces. Does your answer agree with your prediction from question 6b? Does it agree with the number of liters given on the orange juice label?

e. Strangely enough, the label also indicates that the total volume is equal to 2.0 qt + 1.0 pt + 9 fl oz. Verify that the total volume of 2.0 qt + 1.0 pt + 9 fl oz is also equal to 89 fl oz. Remember to watch your significant figures!

Part C: Extra practice if you have time

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. Which sample did your team select? Justify your answer in the spaces provided.

Sample A: 2.0×10^{-6} tons of gold	**Sample C:** 2.0×10^{22} gold atoms
Sample B: 0.020 lb of gold	**Sample D:** 2.0×10^{6} µg of gold

b. If you evenly divide the prize among everyone on your team, how much is your individual prize worth? [Note: Gold is currently selling at $1785.39/troy ounce; 1 troy ounce = 31.103 grams]