EXPERIMENT & REPORT 2 DIMENSIONAL ANALYSIS

Chem 110 Lab

Name _____
(last) (first)

Instructor's Initials _____

PURPOSE: The purpose of this laboratory exercise it to develop and practice the skill of dimensional analysis which is used in most chemistry calculations.

A. Metric-Metric Conversions

Solve each of the following Metric-Metric conversions using dimensional analysis and going through the basic unit. Give complete setups, including all UNITS. Be sure your answers are rounded to the correct number of significant figures. (Assume all numbers given are measured numbers)

1. Convert 4.2 microliters to liters 1. _____

2. Convert 2.2 centimeters to millimeters 2. _____

3. Convert 5.99 kilograms to decigrams 3. _____

4. Convert 111 cubic centimeters to liters 4. _____

5. Convert 8 square meters to square kilometers 5. _____

6. Convert 33 square centimeters to square nanometers. 6. _____

7. Convert 8.5×10^3 square millimeters to square decimeters. 7. _____

B. Solve each of the following problems, giving complete setups, including all UNITS. Be sure your answer is rounded to the correct number of significant figures. (Assume all numbers given are measured numbers)

1. $\frac{32.00 \text{ miles}}{0.0035 \text{ hr}}$ 1. _____

2. 40.0 ft. x 3.0 lb. 2. _____

3. 76.94 in. + 75.4 ft. (give the answer in feet)

3. _____

4. $(3.6 \times 10^6 \text{ m}^2)^{½}$ 4. _____

5. $4.6 \times 10^1 \mu L + 2.975 \times 10^1 \mu L + 9.34 \times 10^{-1} \mu L$ 5. _____

6. $\frac{5.9 \times 10^4 + 9.7 \times 10^4}{0.00976 \text{ sec} - 0.00971 \text{ sec}}$

6. _____

7. $\frac{6.40 \times 10^{-350} \text{ sec}}{(4 \times 10^8 \text{ sec})^3}$

7. _____

8. Convert 35.0 m/s into cm/min

8._____

9. Convert 65 mph into m/s

9._____

C. Solve each of the following problems using dimensional analysis, giving complete setups, including all UNITS and LABELS. Be sure your answer is rounded to the correct number of significant figures. (Assume all numbers given are measured numbers.)

1. What is the density, in g/mL, of copper if a 23.6 cm^3 sample has a mass of 210.4 g?

1. _____

2. Gold has a density of 17.0 g/cc. A gold nugget weighing 0.678 kg was found. What was the volume ,in cubic centimeters, of this nugget?

2. _____

3. If 437.5 pounds of water has a volume of 7.0 cubic feet, what is the density of water in g/cm^3?

3. _____

4. A solution of nitric acid, HNO_3, has a density of 1.4337g/mL. What is the mass, in grams, of 500.0 μL of this solution?

4. _____

5. A sprinter runs the one hundred yard dash in 9.95 seconds. What was the runner's speed in kilometers per hour?

5. _____

6. A certain very large diamond is 38 carats in mass. What is the weight, in pounds, of the diamond? (1.000 carat = 2.000×10^2 mg)

6. _____

D. **AT HOME** solve each of the following problems using dimensional analysis, giving complete setups, including all UNITS and LABELS. Be sure your answer is rounded to the correct number of significant figures. (Assume all numbers given are measured numbers.)

1. A car is traveling at 80.25 miles per hour on the freeway. What is the speed of the car in meters per second?

1. _____

2. Water has a density of 0.989 g/ml. What is the volume, in gallons, of 11.1 tons of water?

2. _____

3. What is the volume, in ml, of a 1.42565 kg brick of lead if its density is 11.34 g/cm^3?

3. _____

4. What is the mass, in grams, of a brick whose length is 0.25 in., width is 0.0031 m, and height is 0.051 cm; if its density is 2.67 g/cm^3?

4. _____

CONVERSION FACTORS

Metric-Metric Conversions

Metric-Metric Conversions are made *through the basic unit.*
Basic Metric Units: liter (L), **meter** (m), and **gram** (g).
Metric Prefixes: The one or two letter abbreviation for a metric prefix is written to the left of the abbreviation for one of the basic units . These prefixes have the following meanings. (The prefixes you are to memorize are given in **boldface** type.)

mega- (M)	*means*	1,000,000	*or*	10^6	*times the basic unit*
kilo- (k)		**1,000**		**10^3**	
hecto- (h)		100		10^2	
deka- (da)		10		10^1	
deci- (d)		**0.1**		**10^{-1}**	
centi- (c)		**0.01**		**10^{-2}**	
milli- (m)		**0.001**		**10^{-3}**	
micro- (µ)		**0.000001**		**10^{-6}**	
nano- (n)		**0.000000001**		**10^{-9}**	
pico- (p)				10^{-12}	
femto- (f)				10^{-15}	

Metric-English (American) Conversions

English-Metric Conversion Factors
NOTE: Assume that those numbers with no decimal written are exact numbers.

MASS (weight)	VOLUME	LENGTH
2.205 pounds = 1 kilogram	1.06 quart = 1 liter	1 inch = 2.54 centimeter
1 ounce = 28.34 grams	1 fluid ounce = 29.57 milliliter	1 mile = 1.61 kilometer

ENGLISH-ENGLISH CONVERSIONS

English-English Conversions Factors
Note: All relationships are exact

MASS (weight)	VOLUME	LENGTH
1 ton = 2000 pounds	4 quart = 1 gallon	3 feet = 1 yard
16 ounces = 1 pound	1 quart = 2 pints	1 foot = 12 inches
	16 fluid ounces = 1 pint	1 mile = 5280 feet
	2 cups = 1 pint	

ABBREVIATIONS:

gallon = gal	quart = qt.	pound = lb.
pint = pt.	ounce = oz.	Inch = in.