CHEMISTRY LEE
Name $\qquad$
Date $\qquad$ Block $\qquad$ UnIT ONE

## Problem Set

Score:

Do not cheat by copying the work of another person, or by allowing another person to copy your answers. Cheating results in a 0\% grade for both parties involved.
Signature $\qquad$ Date $\qquad$

In the event any or all of this Problem Set is assessed for a grade, it must be signed and dated in order to receive a grade. The work shall be your own.

Problem Sets are generally not accepted late. Late assignments are 50\% off.

$\qquad$ \# $\qquad$
$\qquad$
$\qquad$ Period:

Laboratory Safety Worksheet
Fill in the table below by describing how and when to use the safety equipment indicated.

| Equipment | How to Use | When to use |
| :--- | :--- | :--- |
| safety <br> goggles |  |  |
| fire <br> extinguisher |  |  |
| fire blanket |  |  |
| eyewash |  |  |
| shower |  |  |
| fume hood |  |  |
| gas shut-off <br> valve |  |  |

Fill in the table below with the safety rule for each topic and provide a rationale (reason) for the rule.

| Topic | Rule or guideline |  |
| :--- | :--- | :--- |
| food, <br>  <br> gum in lab |  | Rationale |
| long hair |  |  |
| loose or <br> bulky <br> clothing |  |  |
| horseplay <br> or running |  |  |
| hot <br> glassware |  |  |
| heating <br> test tubes |  |  |
| washing <br> hands |  |  |
| smelling |  |  |
| chemicals |  |  |
| unused <br> chemicals |  |  |
| broken <br> glassware |  |  |

## Chapter 3 Matter and Change

(You need your Glencoe textbook)

1. Complete the following table for each phase with the terms yes or no

| physical state | definite <br> shape? | definite <br> volume? | Can it be <br> compressed? |
| :--- | :--- | :--- | :--- |
| solid |  |  |  |
| liquid |  |  |  |
| gas |  |  |  |

Look at the data in Table 1 on page 73 and answer the following questions. Note that the state column lists the substance's state at room temperature.
2. Which substance has the highest boiling point? $\qquad$
3. The two solid substances would appear similar in color. What method(s) would you use in an attempt to distinguish them from each other? $\qquad$
4. How many of these substances are in the liquid state at $85^{\circ} \mathrm{C}$ ? $\qquad$
5. Which substance has the broadest temperature range where it remains a liquid? (This is the difference in values between the melting and boiling points) $\qquad$
6. Indicate whether the following are elements (e), compounds (c) or mixtures (m). Only one answer is possible for each.

| table salt, NaCl |  |
| ---: | :--- |
| Iron, Fe |  | sterling silver m

$\qquad$
vinegar $\qquad$
helium $\qquad$
Nitrogen, $\mathrm{N}_{2}$ $\qquad$
salad oil $\qquad$
air $\qquad$
chocolate chip cookie dough $\qquad$
$\qquad$
sea water $\qquad$
caffeine $\qquad$
Fog $\qquad$

Heliox, a mixture of oxygen and helium, is used by deep sea divers to replace compressed air (scuba divers do not breathe pure oxygen. They'd die!) Draw a Heliox mixture at the atomic and molecular level in the scuba tank diagram cross-section. Include a key to identify the gases.


## Name

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## Physical vs. Chemical Properties

A physical property can be determined without destroying chemical makeup of the object. For example, color, shape, mass, and odor are all physical properties.

A chemical property indicates how a substance reacts with something else The original substance is fundamentally changed in observing a chemical property. For example, the ability of iron to react with oxygen to "rust" is a chemical property. The iron, Fe , now exists as iron(III)oxide, $\mathrm{Fe}_{2} \mathrm{O}_{3}-\mathrm{a}$ different substance.

Classify the following properties as either chemical or physical by putting a check in the appropriate column

| Property | Physical <br> property? | Chemical <br> property? |
| :--- | :--- | :--- |
| Red color |  |  |
| Density |  |  |
| flammability |  |  |
| solubility |  |  |
| reacts with acid to form a salt |  |  |
| supports combustion |  |  |
| bitter taste |  |  |
| melts at 25 ${ }^{\circ} \mathrm{C}$ |  |  |
| reacts with water to form a gas |  |  |
| hardness |  |  |
| boiling point |  |  |
| can be easily bent |  |  |
| odor |  |  |
| decomposes to hydrogen and oxygen |  |  |
| reacts with metal to form hydrogen |  |  |

## Chapter 2 Worksheet 2

## Physical vs. Chemical Changes

In physical changes, the original substance still exists. It has only changed form. In a chemical changes, new substances are produced. Energy change always accompanies chemical changes. Energy changes may accompany a physical change (phase changes).

Classify the following as being chemical or physical changes

| Property | Physical <br> change? | Chemical <br> change? |
| :--- | :--- | :--- |
| Hydrochloric acid reacts with potassium <br> hydroxide to produce salt, water, and <br> heat |  |  |
| A pellet of sodium is sliced in two |  |  |
| Ice is heated and changes to water |  |  |
| Potassium chlorate decomposes to <br> potassium chloride and oxygen |  |  |
| Iron rusts |  |  |
| A sodium pellet catches fire in water <br> and produces hydrogen gas and <br> sodium hydroxide |  |  |
| Ethanol evaporates |  |  |
| Milk sours |  |  |
| Sugar dissolves in water |  |  |
| Wood rots |  |  |
| Cookies cook in the oven |  |  |
| Dry ice vaporizes to a gas |  |  |
| Grass grows on the lawn |  |  |
| Food is digested in the stomach |  |  |
| grapes ferment to produce wine |  |  |
| Glass shatters when dropped | A paper towel absorbs water |  |


| Name | Date | Block |
| :--- | :--- | :--- |

## Chapter 3: Worksheet 1

1. A standard mass of 500.0 grams is massed on Balance $A$ and Balance $B$. Which balance is more accurate? Which balance is more precise?

| Balance A | Balance B |
| :--- | :--- |
| 500.0 g | 498.1 g |
| 500.1 g | 501.9 g |
| 500.2 g | 500.0 g |

2. Ice water is used to calibrate a thermometers. A thermometer should read $0.00^{\circ} \mathrm{C}$ in ice water. Two different thermometers are used to measure the temperature of ice water. Which thermometer was most accurate? Which thermometer was most precise? Which thermometer was probably improperly calibrated?

| Thermometer 1 | Thermometer 2 |
| :--- | :--- |
| $0.0^{\circ} \mathrm{C}$ | $1.0^{\circ} \mathrm{C}$ |
| $0.4^{\circ} \mathrm{C}$ | $0.8^{\circ} \mathrm{C}$ |
| $0.2^{\circ} \mathrm{C}$ | $1.1^{\circ} \mathrm{C}$ |

3. What is the equation to calculate percent error?
4. A student measures the length of a block of wood as 12.5 cm . The true length of the wood block was 13.2 cm . What was the student's percent error?
5. A student uses a balance to determine the mass of a copper cylinder. She records the mass as 29.0 grams. The accepted mass of the copper cylinder is 25.0 grams. What was the percent error?
6. Convert the following to correct scientific notation

251 $\qquad$
12003 $\qquad$
0.21 $\qquad$
4.0 $\qquad$
7. Convert the following scientific notation values to standard notation:

## $4.3 \times 10^{4}$ <br> $\qquad$

$7.28 \times 10^{-2}$ $\qquad$
$9.0 \times 10^{3}$ $\qquad$
$\qquad$
$3.25 \times 10^{1}$
$4.6 \times 10^{-1}$ $\qquad$
$8.403 \times 10^{2}$ $\qquad$

$$
9.84 \times 10^{-4}
$$

Directions: For each item below:
a) draw a model, using a different shape or color for each different element present in the item
b) label each shape/color in your model
c) indicate whether the item is an element, compound or mixture
d) if the item is an element or compound, indicate whether the smallest particle item is an atom or a molecule

| Ca | NaCl | $\mathrm{H}_{2} \mathrm{O}$ | $\mathrm{H}_{2}$ |
| :---: | :---: | :---: | :---: |
| $\mathrm{O}_{2}$ |  |  |  |
| $\mathrm{NH}_{3}$ | $\mathrm{CaBr}_{2}$ | $\mathrm{~N}_{2}$ |  |
|  |  | $\mathrm{Li}_{2} \mathrm{O}$ |  |
|  |  |  |  |

## Part II

Directions:
There are 6 pictures below.
a) Label each picture as one of the following (some might be used more than once): pure element, pure compound, mixture of two elements, mixture of a compound and element, or a mixture of two compounds
b) Next, label each picture with one of these formulas below (each formula is only used once):
$\begin{array}{llllll}\mathrm{KCl} & \mathrm{N}_{2} & \mathrm{Fe} & \mathrm{Al}+\mathrm{Cu} & \mathrm{CO}+\mathrm{Au} & \mathrm{CO}_{2}+\mathrm{CO}\end{array}$


| Name | Date | Block |
| :--- | :--- | :--- |

## Chapter 3: Worksheet 2 NO CALCULATOR

$\left(Y \times 10^{a}\right)\left(X \times 10^{b}\right)=X Y \times 10^{a+b} \quad$ and

$$
\frac{\left(Y \times 10^{a}\right)}{\left(X \times 10^{b}\right)}=Y / X \times 10^{a-b}
$$

Solve these problems without a calculator. Express in correct scientific notation

1) $\left(6 \times 10^{3}\right)\left(8 \times 10^{10}\right)=48 \times 10^{3} \times 10^{10}=48 \times 10^{3+10}=48 \times 10^{13}$
2) $\left(4.0 \times 10^{-11}\right)\left(5.0 \times 10^{9}\right)$
3) $\left(3.0 \times 10^{-4}\right)\left(2.0 \times 10^{2}\right)\left(8.0 \times 10^{-6}\right)$
4) $\frac{\left(8 \times 10^{32}\right)}{\left(4 \times 10^{10}\right)}$
5) $\frac{\left(3 \times 10^{3}\right)}{\left(9 \times 10^{10}\right)}$
6) $\frac{\left(5.0 \times 10^{-4}\right)}{\left(2.5 \times 10^{-6}\right)}$

Express the following values in correct scientific notation.
7) $312 \times 10^{-3}=\left(3.12 \times 10^{2}\right) \times 10^{-3}=3.12 \times 10^{2+(-3)}=3.12 \times 10^{-1}$
8) $57.1 \times 10^{2}$
9) $0.0064 \times 10^{-8}$
10) $0.045 \times 10^{5}$
11) $0.0008 \times 10^{7}$
12) $7800.4 \times 10^{-2}$
13) $0.12 \times 10^{-23}$

## Significant Figure Powerpoint Problems

1. Leading zeros are never significant
2. Trailing zeros are significant if there's a decimal point
3. Exact counts and conversion factors have an infinite number of significant digits:

Significant Figure practice

1. 40,200 has $\qquad$ sig figs
2. 0.0402 has $\qquad$ sig figs
3. 8,000 has $\qquad$ sig figs
4. $3.0 \times 10^{2}$ has $\qquad$ sig figs
5. 0.7090 has $\qquad$ sig figs
6. 0.005 has $\qquad$ sig figs
7. 50. has $\qquad$ sig figs

In multiplication and division, the final answer must match the least number of sig figs in the problem.

1. $(2.00 \mathrm{~cm})(0.50 \mathrm{~cm})=$
2. $(2.0) \mathrm{cm})(0.5 \mathrm{~cm})=$
3. $(3 \mathrm{~m})(1.5 \mathrm{~m})=$
4. $10 . \mathrm{mm} / 2.50 \mathrm{~mm}=$
5. $10 \mathrm{~mm} / 4.05 \mathrm{~mm}=$

In addition and subtraction, the final answer should be rounded to the least number of decimal places.
1.2
$+0.45$
9.6
32
$+9$

- 0.9


## Final Practice

1) $(0.20 \mathrm{~cm})(5.76 \mathrm{~cm})=$ $\qquad$
2) $(35.01 \mathrm{~cm})(0.2 \mathrm{~cm})=$ $\qquad$
3) $(0.0071 \mathrm{~cm})(95,000 \mathrm{~cm})=$ $\qquad$
4) $(7.0 \mathrm{~cm})(4286 \mathrm{~cm})=$ $\qquad$
5) $15 \mathrm{~mm} \div 3.00 \mathrm{~mm}=$ $\qquad$
6) $8.2 \mathrm{~m}+6 \mathrm{~m}=$ $\qquad$
$\qquad$

## Ch 3 WS 3 Significant Figures Worksheet

Part A - Indicate the number of significant digits each number has.

| 1) 0.0453 | 8) 0.0700 | 15) 34,000 . |
| :---: | :---: | :---: |
| 2) 2.300 | 9) 7070 | 16) 0.0006 |
| 3) 1020 | 10) 7.070 | 17) 0.04400 |
| 4) 450.0 | 11) 70700 | 18) 0.0000510 |
| 5) 32 | 12) 0.500 | 19) $32.00 \times 10^{33}$ |
| 6) 0.0020 | 13) $3.42 \times 10^{4}$ | 20) 2020 |
| 7) 1,000 | 14) $1.0 \times 10^{-2}$ | 21) 0.900 |

Part B - Round the following numbers using:

1) 1070

1 sigfig
2 sigfigs
3 sigfigs
2) 350
3) $4.0 \times 10^{2}$
4) 6851.23
5) 98
6) 500
7) 0.002567
8) 0.12
9) 13
10) $4.056 \times 10^{-5}$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

$\qquad$
$\qquad$

Part C
When multiplying or dividing, I round my answer to the $\qquad$ .

1) $2.3 \div 1.31=$ $\qquad$ $\approx$ $\qquad$ 7) $3.14 \times 14=$ $\qquad$ $\approx$ $\qquad$
2) $6.65 \times 1.2=$ $\qquad$ $\approx$ $\qquad$ 8) $230 \div 0.0004=$ $\qquad$ $\approx$
3) $2400 \div 12.3=$ $\qquad$ $\approx$ $\qquad$ 9) $230 . \div 0.0004=$ $\qquad$ $\approx$ $\qquad$
4) $2.780 \times 131=$ $\qquad$ $\approx$ $\qquad$ 10) $2 \times 250 . \times 34.5=$ $\qquad$ $\approx$ $\qquad$
5) $1000 \times 456.23=$ $\qquad$ $\approx$ $\qquad$
6) $9.0 \times 10^{2} \div 2.5 \times 10^{3}=$
$\qquad$ $\approx$ $\qquad$
7) $1000 . \mathrm{x} 456.23=$ $\qquad$ $\approx$ $\qquad$ 12) $45.55 \times 220=$ $\qquad$ $\approx$ $\qquad$
Part D
When adding or subtracting, I round my answer to the
8) $3.4-1.23=\square \approx$ $\qquad$ 6) $100 \mathrm{~mL}-17.5 \mathrm{~mL}=$ $\qquad$ $\approx$ $\qquad$
9) $3.4+4=$ $\qquad$ $\approx$ -
10) $5.00-2.300=$ $\qquad$ $\approx$ $\qquad$
11) $77.5-0.0032-0.0098=$ $\qquad$ $\approx$
$\qquad$ $\approx$
$\qquad$
12) $900 \mathrm{~cm}+12.5 \mathrm{~cm}+50.5 \mathrm{~cm}=$ $\qquad$
$\qquad$ 10) $2000-0.09999=$
13) $19.056+1.4567=$ $\qquad$ $\approx$ $\qquad$
14) $25.0-21.0=$ $\approx$
15) $54.22+2.980+10=$ $\qquad$ $\approx$
$\qquad$ $\approx$ $\qquad$

| Name | Date | Block |
| :--- | :--- | :--- |

## Chapter 3: Worksheet 3a Significant Figure Practice

1. All leading zeros are insignificant
2. Trailing zeros are significant IF there's a decimal point
3. Exact counts and conversion factors are treated as having an unlimited number of significant digits.

How many significant figures does each of the following numbers have?
$\qquad$
103
0.103

1030 $\qquad$
$0.073 \times 10^{8}$ $\qquad$

0.450000 $\qquad$
$6.500 \times 10^{-2}$ $\qquad$
12.203 $\qquad$

Write the answer for each problem rounding to the correct number of significant figures. Use correct scientific notation and units when appropriate. Hint-when all else fails use scientific notation.

## Multiply

1. $5 \mathrm{~cm} \times 5 \mathrm{~cm}=$
2. $5.0 \mathrm{~cm} \times 5 \mathrm{~cm}=$
3. $5.0 \mathrm{~cm} \times 5.0 \mathrm{~cm}=$
4. $2.89 \mathrm{~cm} \times 4.01 \mathrm{~cm}=$
5. $17.3 \mathrm{~cm} \times 6.2 \mathrm{~cm}=$
6. $\quad 3.08 \mathrm{~m} \times 1.2=$
7. $\quad 5.00 \mathrm{~mm} \times 7.3216 \mathrm{~mm}=$
8. $\left(4.8 \times 10^{2} \mathrm{~m}\right)\left(2.301 \times 10^{3} \mathrm{~m}\right)=$
9. $\left(9.13 \times 10^{-4} \mathrm{~cm}\right)\left(1.2 \times 10^{-3} \mathrm{~cm}\right)=$
10. $42 \mathrm{~cm} \times 119=$
11. $150.0 \mathrm{~m} \times 4.00 \mathrm{~m}=$
12. $282.2 \mathrm{~km} \times 3.0 \mathrm{~km}=$
13. $100 \mathrm{~mm} \times 1.2 \mathrm{~mm}=$
14. $0.400 \mathrm{~cm} \times 42 \mathrm{~cm}=$

## Divide

1. $109.37 \mathrm{~cm}^{2} \div 5.81 \mathrm{~cm}=$
2. $93,602 \div 31=$
3. $100,000 \mathrm{~cm}^{3} \div 3.1 \mathrm{~cm}=$
4. $231 \mathrm{~m} \div 0.03=$
5. $0.40 \mathrm{~m}^{2} \div 241 \mathrm{~m}=$
6. $\left(6.8 \times 10^{-3}\right) \div\left(2 \times 10^{-5}\right)=$
7. $200 . \mathrm{km}^{2} \div 5.5 \mathrm{~km}=$
8. $\left(4.1 \times 10^{3}\right) \div\left(6.00 \times 10^{-1}\right)=$

| Name | Date | Block |
| :--- | :--- | :--- |

## Chapter 3: Worksheet 4 (Scientific Notation and Significant Figure Review)

Convert each of these to scientific notation.

1) $0.005=$ $\qquad$ 4) $1,000,000=$ $\qquad$
2) $5,050=$ $\qquad$ 5) $0.25=$ $\qquad$
3) $0.0008=$ $\qquad$
4) $25,000=$ $\qquad$

Convert each of these to decimal notation.
7) $1.5 \times 10^{3}=$ $\qquad$ 10) $2.20 \times 10^{2}=$ $\qquad$
8) $1.5 \times 10^{-3}=$ $\qquad$ 11) $4 \times 10^{0}=$ $\qquad$
9) $3.75 \times 10^{-5}=$ $\qquad$
12) $1 \times 10^{4}=$ $\qquad$

Correct the scientific notation.
13) $60.3 \times 10^{-4}=$ $\qquad$
15) $1500 \times 10^{2}=$ $\qquad$
14) $0.036 \times 10^{8}=$ $\qquad$ 16) $0.047 \times 10^{-3}=$ $\qquad$

Solve these problems. Express your answer in scientific notation with the correct number of significant figures.
17) $\left(8.07 \times 10^{-16}\right)\left(4.5 \times 10^{10}\right)=$ $\qquad$ rounds to $\qquad$
Calculator answer
sig fig answer
18) $\left(7.0 \times 10^{32}\right)=$ $\qquad$ rounds to $\qquad$ $\left(9.06 \times 10^{10}\right) \quad$ calculator answer
sig fig answer
19) $\left(5.006 \times 10^{8}\right)\left(4.53 \times 10^{-6}\right)=$ $\qquad$ rounds to $\qquad$

## Ch 4 WS 1: Basic Unit Cancelation Method

## Directions:

Use the method taught in class. The relationships below can be made into conversion factors. You must show your work including units. When you're done, correct for significant figures and box the final answer. The answers in parentheses are NOT corrected for sig figs.

Relationships:
1 dozen bagels $=12$ bagels $\quad 1$ liter $=1000 \mathrm{~mL} \quad 1$ meter $=100$ centimeters
1 kilometer $=1000$ meters $\quad 1$ centimeter $=10$ millimeters
example: How many bagels are in 0.75 dozen? Given: 0.75 dozen bagels Find: \# bagels
0.75 dozen $\times 12$ bagels $=9$ bagels $\approx 9.0$ bagels with sig fig 1 dozen

1) How many bagels are there in 12 dozen bagels? $($ Ans $=144$ bagel $) \approx$ $\qquad$ w/ sig fig
2) How many bagels are there in 7.25 dozen bagels? (Ans=87 dozen bagel) $\approx$ $\qquad$ w/ sig fig
3) How many meters are in 62 centimeters, cm ? $($ Ans $=0.62 \mathrm{~m}) \approx$ $\qquad$ w/ sig fig
4) How many centimeters are in 1.5 meters?(Ans= 150 cm$) \approx$ $\qquad$ w/ sig fig
5) How many kilometers are in 750 meters? $($ Ans $=0.75 \mathrm{~km}) \approx$ $\qquad$ w/ sig fig
6) How many meters are in 2.30 kilometers? $($ Ans $=2300 \mathrm{~m}) \approx$ $\qquad$ w/ sig fig
7) How many liters are in 5270. mL ? $(\mathrm{Ans}=5.27 \mathrm{~L}) \approx$ $\qquad$ w/ sig fig
8) How many mL are in 0.070 liters? $(\mathrm{Ans}=70 \mathrm{~mL}) \approx$ $\qquad$ w/ sig fig

Use the following conversion factors to solve the following unit cancelation problems. Remember units and significant figures!

```
Length conversions: 1 inch = 2.54 cm and 1 mile = 5280 feet, 1 kilometer = 0.62 mile, 1 yard = 3 feet, 12 in=1 ft.
Volume conversions: 1 quart = 0.9463L, 1 quart = 4 cups, 4 quarts = 1 gallon, 1 cup = 16 Tablespoons, 1
Tablespoon = 3 teaspoons
Mass conversions: 1 lb = 453.6 g, 1 carat = 0.20 grams, 1 lb = 16 ounces
```

1. You are scaling up your grandmother's recipe for cookies. How many quarts of vinegar are in 240 tablespoons of vinegar?(Ans - 3.8 quarts)
2. You completed a 5.0 kilometer run. How many feet did you run?(Ans $=16,000 \mathrm{ft})$
3. How many grams are in an 8.0 ounce steak?(Ans = 230 g )
4. Europeans buy gasoline in liters. How many liters of gas would fit in a 15 gallon tank?(Ans $=57 \mathrm{~L}$ )
5. How many centimeters are in 0.52 miles?(Ans $=84,000 \mathrm{~cm})$
6. The Cullinan diamond was the largest gem-quality diamond ever found, at 3100 carat on 26 January 1905 in South Africa. What was the mass in pounds of the diamond?(Ans = 1.4 lb )
7. A European cookbook calls for using 750 mL of flour to make a cake. How many cups of flour should you use? (Ans = 3.2 cups)

Convert the following. You are not required to use the unit cancelation method
$34 \mathrm{~cm}=$ $\qquad$ meters

78 m = $\qquad$ km
$12 \mathrm{dm}=$ $\qquad$ mm
$1200 \mathrm{~mL}=$ $\qquad$ Liters
$0.542 \mathrm{~kg}=$ $\qquad$ grams

320 mg = $\qquad$ kg
$32 \mathrm{~cm}=$ $\qquad$ mm
2.3 liters = $\qquad$ mL
$4.5 \times 10^{-5} \mathrm{~kg}=$ $\qquad$ grams
$5.0 \mathrm{mg}=$ $\qquad$ grams
$7800 \mathrm{~g}=$ kg

## Chapter 4 WS 2b Unit Cancelation Method

Use the following conversion factors, and your knowledge of the English system and Metric system to solve the factor label problems. Remember units and significant figures!


1. 68 inches $=? \mathrm{~cm}($ Ans $=172.72 \mathrm{~cm}) \mathrm{w} /$ sig fig $\approx$ $\qquad$
2. $0.45 \mathrm{~m}=$ ? in(Ans $=17.716--\mathrm{in}) \mathrm{w} / \mathrm{sig}$ fig $\approx$ $\qquad$
3. 520 inches $=$ ? $\mathrm{mm}($ Ans $=13208 \mathrm{~mm}) \mathrm{w} / \mathrm{sig}$ fig $\approx$ $\qquad$
4. 1.00 meter $=$ ? in $($ ans $=39.37008---$ in $) \mathrm{w} /$ sig fig $\approx$ $\qquad$
5. $3.2 \mathrm{ft}=? \mathrm{~mm}($ Ans $=975.36 \mathrm{~mm}) \mathrm{w} / \mathrm{sig} \mathrm{fig} \approx$ $\qquad$
6. $9.18 \mathrm{~km}=$ ? $\mathrm{yd}($ Ans $=10039.3---\mathrm{yd}) \mathrm{w} / \mathrm{sig}$ fig $\approx$ $\qquad$
7. If you run a 5 kilometer race, you've run $\qquad$ miles(Ans $=3.1068$--- miles) $\mathrm{w} / \mathrm{sig}$ fig $\approx$ $\qquad$

Use the following conversion factors, and your knowledge of the English system and Metric system to solve the factor label problems. Remember units and significant figures!

Length conversions: 1 inch = 2.54 cm and 1 mile $=5280$ feet, 1 kilometer $=0.62$ mile
Volume conversions: 1 quart $=0.9463 \mathrm{~L}, 1$ quart $=4$ cups, 4 quarts $=1$ gallon, 1 cup = 16 Tablespoons
Mass conversions: $1 \mathrm{lb}=453.6 \mathrm{~g}, 1$ carat $=0.20$ grams, $1 \mathrm{lb}=16$ ounces

1. An average woman is 64 inches tall. How tall is this in meters? (Ans $=1.6 \mathrm{~m}$ )
2. The average man is 1.78 meters tall. How tall is this in inches? (Ans $=70.1 \mathrm{in}$ )
3. A pudding recipe calls for 3.5 cups of milk, but all you have are metric measuring cups. How many milliliters of milk do you need?(Ans $=830 \mathrm{~mL}$ )
4. A blacksmith has to put new shoes on 25 horses. Each shoe requires 3 nails. How many nails does the blacksmith need?(Ans = 300. Shoes) Note all the counts are exact.
5. A dressmaker needs 5.25 yards of French silk ribbon. The European boutique only sells by the meter. How much ribbon should the dressmaker buy? $($ Ans $=4.80 \mathrm{~m})$
6. Your European sports car has a 61 liter gas tank. How many gallons of gas will the car's tank hold?(Ans = 16 gal)
```
Length conversions: 1 inch = 2.54 cm and 1 mile = 5280 feet, 1 kilometer = 0.62 mile
Volume conversions: 1 quart = 0.9463L, 1 quart = 4 cups, 4 quarts = 1 gallon, 1 cup = 16 Tablespoons
Mass conversions: 1 lb = 453.6 g,1 carat = 0.20 grams, 1 lb=16 ounces
```

7. You have a bad cough and need to take 2 tablespoons of cough medicine. You only have a graduated cylinder marked off in milliliters. How many mLs of cough medicine do you need?(Ans $=30 \mathrm{~mL}$ )
8. You order a McDonald's quarter pounder hamburger. How many kilograms of beef will you be eating assuming the hamburger patty weighs 0.25 lb .(Ans $=0.11 \mathrm{~kg}$ )
9. The Hope diamond weighs 45.52 carats. How many ounces is this?(Ans $=0.3211 \mathrm{oz}$ )
10. Harry Potter won 1000. galleons for winning the tri-wizard tournament. How much money did he win in U.S. dollars? ( 100 knuts $=\$ 0.98,29$ knuts $=1$ sickle, 17 sickles $=1$ galleon)(Ans $=4,831$ dollars)
11. Lethal dose (LD50) is the amount of an ingested substance that kills 50 percent of a test sample. The $\mathrm{LD}_{50}$ for caffeine is $140 \mathrm{mg} / 1 \mathrm{Kg}$ for dogs. How many grams of caffeine would have a $50 / 50$ chance of killing a $50 \mathrm{lb} \operatorname{dog}$ ? (Ans $=3.2$ grams) Hint: use 140 mg caffeine $=1 \mathrm{Kg}$ dog.

## Chapter 7 WS 1: Unit Cancellation and the Mole

## Use Significant Figures. <br> You must use the Unit Canceling Method and show your work. Answers must include units.

1. How many moles are in $6.3 \times 10^{13}$ atoms of silver, Ag ?
2. How many atoms are in $4.8 \times 10^{-6}$ moles of copper, Cu?
3. How many moles are in $1 \times 10^{27}$ molecules of oxygen, $\mathrm{O}_{2}$ ?
4. How many moles are in 300,000 molecules of fluorine, $F_{2}$ ?
5. How many atoms are in 92.3 moles of tin, Sn ?
6. How many molecules are 0.012 moles of carbon dioxide, $\mathrm{CO}_{2}$ ?
7. Challenger: How many atoms are in 12 moles of ammonia, $\mathrm{NH}_{3}$ ? (Hint: each ammonia molecule contains 4 atoms). Add a final step to the unit cancellation.

## Ch 4 WS 4 More Unit Cancelation Word Problems

Use the following conversion factors, and your knowledge of the English system and Metric system to solve the factor label problems. Remember units and significant figures!

```
1 mole = 6.02 < 10 23 things
Length conversions: 1 inch = 2.54 cm and 1 mile = 5280 feet, 1 kilometer = 0.62 mile, 3 feet = 1 yard
Volume conversions: 1 quart = 0.9463L,1 quart = 4 cups, 4 quarts = 1 gallon, 1 cup = 16 Tablespoons
Mass conversions: 1 lb = 453.6 g, 1 lb = 16 ounces
```

1. A gold coin contains $8.1 \times 10^{-2}$ moles of gold. How many atoms of gold are in the coin?(Ans $=4.9 \times 10^{22}$ atom Au$)$
2. A big balloon contains $2.2 \times 10^{26}$ atoms of argon. How many moles of argon are in the balloon? $\left(\mathrm{ans}=3.7 \times 10^{2} \mathrm{~mol} \mathrm{Ar}\right)$
3. A basket ball player is 2.1 meters tall. How tall is this in inches? (Ans $=83 \mathrm{in}$ )
4. You buy 12 ounce package of jelly beans. How many grams of jelly beans did you buy? (Ans = 340 g )
5. How many milliliters are in 3.00 gallons of milk? (Ans $=11,400 \mathrm{~mL})$
6. Given the following equivalents, convert 3.0 Icks to Eeks.(Ans = 0.39 Eeks)

2 Icks = 3 Aughs, 5 Aughs = 4 Oops, 7 Oop = 1 Ugh, 4 Ughs $=3$ Eeks.
7. A 8.0 ounce glass of water contains 13 moles of water. How many molecules of water are in an 8.0 ounce glass of water?(Ans $=7.8 \times 1024$ molec. $\mathrm{H}_{2} \mathrm{O}$ )

## Ch 3 WS 6 Density Calculations

Density is an intrinsic physical property of a substance. For example, a sample of gold will always have a density of $19.3 \mathrm{~g} / \mathrm{cm}^{3}$ regardless of how massive the sample of gold.
D = mass/volume

1. What is the density of polystyrene plastic if $100 . \mathrm{cm}^{3}$ of it has a mass of 101 grams? (Ans = 1.01 g )
2. Iron, $\qquad$ has a density of $7.87 \mathrm{~g} / \mathrm{cm}^{3}$. How many grams of iron are in an iron sample that is $392 \mathrm{~cm}^{3}$ ?(Ans $=3090 \mathrm{~g})$
3. Bromine, $\mathrm{Br}_{2}$, is a liquid with a density of $3.12 \mathrm{~g} / \mathrm{mL}$. How many milliliters of bromine are in a 100. gram sample? $(A n s=32.1 \mathrm{~mL})$
4. A graduated cylinder is filled to 8.0 mL with water. A stone is dropped in that weighs 10. grams. The new volume reading is 10.5 mL . What is the density of the stone? (Ans $=4.0 \mathrm{~g} / \mathrm{mL}$ )
5. A graduated cylinder contains 22 mL of mercury, $\qquad$ How many grams of mercury does the cylinder contain if mercury has a density of $13.55 \mathrm{~g} / \mathrm{cm}^{3}$ ? (Ans $\left.=3.0 \times 10^{2} \mathrm{~g}\right)$
6. What will be the volume of a balloon containing 0.60 grams of Helium, which has a density of $1.9 \times 10^{-4}$ $\mathrm{g} / \mathrm{cm}^{3}$ ? $\left(\right.$ Ans $\left.=3.2 \times 10^{3} \mathrm{~cm}^{3}\right)$
7. Challenger: A pine board that is $120 \mathrm{~cm} \times 2.0 \mathrm{~cm} \times 10 . \mathrm{cm}$ has a mass of 2.1 lbs . If one pound equals 454 grams, what is the density of the pine in $\mathrm{g} / \mathrm{cm}^{3}$ ? $\left(\right.$ Ans $\left.=0.40 \mathrm{~g} / \mathrm{cm}^{3}\right)$

## Chapter 3 WS 5: Metric System Prefixes and Conversion

| Kilometer | Hectometer | Dekameter | Meter | Decimeter | Centimeter | Millimeter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| km | hm | dam | m | dm | cm | mm |
| 1000 | 100 | 10 | 1 | 0.1 | 0.01 | 0.001 |

This list shows the units of length in the SI system. They range from the smallest to the largest (from right to left). The whole system is based on powers of 10.

Example: Millimeter and centimeter are next to each other. Since mm is to the right of cm , it is the smaller unit. It takes 10 mm to equal 1 cm .

Since cm is to the left of $\mathrm{mm}, \mathrm{cm}$ is the larger unit. It takes $0.1 \mathrm{~cm}=1 \mathrm{~mm}$.
Conversions using decimal point jump method

1. Identify the starting and ending unit.
2. Begin at the starting unit and count "jumps" to the ending unit. Note your direction/
3. Move the decimal that number of spaces and in the SAME direction as you moved on the chart.

Examples:
$256 \mathrm{~mm}=$ $\qquad$ dm $\quad 0.023 \mathrm{~kg}=$ $\qquad$ mg

1. Start at mm and count jumps to dm
2. I moved 2 spaces to the left
3. I move the decimal in 256 two places to the left
4. The answer is $256 \mathrm{~mm}=2.56 \mathrm{dm}$

## Practice

$34 \mathrm{~cm}=$ $\qquad$ dm
$78 \mathrm{~m}=$ $\qquad$ km 901 mm = $\qquad$ m

768 km = $\qquad$ m
$761 \mathrm{~cm}=$ $\qquad$ m

134 hm = $\qquad$ dkm
$445 \mathrm{~cm}=$ $\qquad$ dm

809 mm = $\qquad$ dm
$1.34 \mathrm{~cm}=$ $\qquad$ mm
$6.98 \mathrm{~m}=$ $\qquad$ cm
$0.876 \mathrm{~km}=$ $\qquad$ m

999 m = $\qquad$ mm
$0.000002 \mathrm{~km}=$ $\qquad$ mm
$1.456 \mathrm{~km}=$ $\qquad$ hm
0.714 dm = $\qquad$ km
$0.442 \mathrm{~km}=$ $\qquad$ m

