Name: ___________________________________ Date: _____________ Period: ______

Chemistry Vocabulary

Absolute zero
Accepted value
Accuracy
Celsius scale
Density
Error
Experimental value
Gram
Hydrometer
International System of Units (SI)
Kelvin scale
Kilogram
Liter
Meter
Percent error
Precision
Qualitative measurement
Quantitative measurement
Scientific notation
Specific gravity
Temperature
Volume
weight

R.E.V.

Align
Analytical
Bias
Calibration
Coefficients
Denominator
Derived
Digit (not fingers)
Eliminate
Encounter
Exponents
Fundamental
Grouping
Instrument (not musical)
Magnitude
Nonnumerical
Notation
Numerator
Platform
Reproducibility
Significant

Name: ___________________________________ Date: _____________ Period: ______

TEXT REVIEW Section 3.1 The importance of Measurement

1. What is the standard scientific measurement system called? ______
2. What are measurements like “soft”, “orange” called? ______________________________
3. What are measurements like “ 1.34 cm in diameter” called? ____________________________
4. If a measure is very large or very small, what short-hand is used to show the number, rather than writing more than six zeros? ____
5. Fill in the chart with the missing information:

Long-hand	Short-hand _______________________________
30,000,000,000,000,000	
404,000,000,000	
	4.06×10^5
0.000 000 000 000 000 000 000 123	
	1.040×10^{-3}

6. List the rules for adding exponents:

7. List the rules for multiplying or dividing exponents:

8. Do the following problems:

a) $(4.44 \times 10^3) + (1.22 \times 10^2) =$

(on your calculator: 4.44 $_{EE}$ 3 + 1.22 $_{EE}$ 2 =)

b) $(5.45 \times 10^8) - (1.2 \times 10^7) =$

(on your calculator: 5.45 $_{EE}$ 8 - 1.2 $_{EE}$ 7 =)

c) $(8.4 \times 10^3) \times (1.2 \times 10^{10}) =$

(on your calculator: 8.4 $_{EE}$ 3 x 1.2 $_{EE}$ 10 =)

d)

$$\frac{2.4 \times 10^{-3}}{1.2 \times 10^{-10}} =$$

(on your calculator: 2.4 $_{EE}$ -3 ÷ 1.2 $_{EE}$ -10 =)

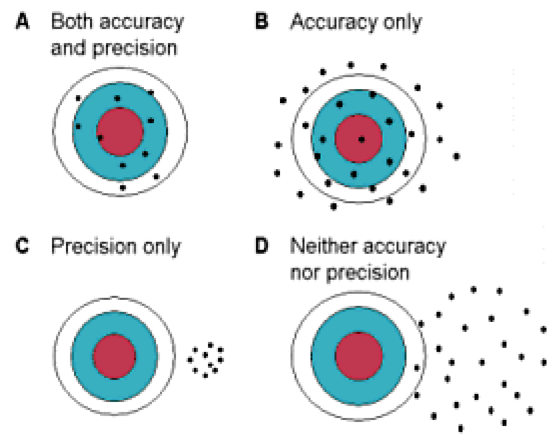
9. Classify each of the following as qualitative or quantitative. Write all quantitative information in scientific notation.

“measurement”		Qualitative/Quantitative	Scientific notation
Length of football field, 91.4 meters			
The ball is brown			
Diameter of a carbon atom = 0.000 000 000 154 m			
Radius of Earth 6 378 000 m			
Diameter of human hair 0.000 008 m			

Name: ______________________________ Date: ___________ Period: ______

TEXT REVIEW Section 3.2 Uncertainty in Measurement

Use the picture on the right to answer the following questions:



1. As you try your bathroom scale on different parts of the floor of your basement, you get the following measurements of weight. Explain if the measurements are accurate, precise, neither or both.

#1	33.4 kg
#2	32.8 kg
#3	33.0 kg
Average	

Your actual weight is 33.0 kg.

2. Using a different scale, you get the following results:

#1	105.0 kg
#2	55.6 kg
#3	75.9 kg
Average	

Explain if the measurements are accurate, precise, neither or both.

3. Using a third scale you get the following data:

#1	105.0 kg
#2	105.1 kg
#3	104.9 kg
Average	

Explain if the measurements are accurate, precise, neither or both.

4. Using the average from all three trials; figure out the % error.

Trial # 1.

Percent error = $\frac{33.0 - \text{average}}{33.0}$ X 100% = $\frac{\boxed{}}{33.0}$ X 100% = $\boxed{}$

Trial #2

Percent error = $\frac{33.0 - \text{average}}{33.0}$ X 100% = $\frac{\boxed{}}{33.0}$ X 100% = $\boxed{}$

Trial #3

Percent error = $\frac{33.0 - \text{average}}{33.0}$ X 100% = $\frac{\boxed{}}{33.0}$ X 100% = $\boxed{}$

Name: ________________________________ Date: ____________ Period: ______

Significant Figures:

EXAMPLES	# OF SIG. DIG.	COMMENT
453 kg	3	All non-zero digits are always significant.
5057 L	4	Zeros between 2 sig. dig. are significant.
5.00	3	Additional zeros to the right of decimal and a sig. dig. are significant.
0.007	1	Placeholders are not sig.

1. Underline the significant digits and write how many significant digits in each of the following numbers.

Underline the significant digits	How many significant figures?
1.340×10^{-18}	
0.000 000 000 000 000 001340	
900 000 000 000	
9×10^{11}	
9.00×10^{9}	
9 000 900 000 000 000	
0.000 000 000 001 000	
0.000 000 000 001 010	

2. Round the following numbers to three significant digits.

a. 1.099		f. 9.99999	
b. 2.4549		g. 56.749	
c. 0.00034444		h. 0.000 340 000	
d. 4.569×10^{8}		i. 10.09	
e. 45.5555		j. 0.999	

3. Solve the following expressions and express the answers in scientific notation:

a) $(5.3 \times 10^{4}) + (1.3 \times 10^{4}) =$

b) $(7.2 \times 10^{-4}) \div (1.8 \times 10^{3}) =$

c) $(9.12 \times 10^{-1}) - (4.7 \times 10^{-2}) =$

d) $(5.4 \times 10^{4}) \times (3.5 \times 10^{9}) =$

4. Explain why there is no point to adding $(5.4 \times 10^{4}) + (3.5 \times 10^{9}) =$ because of significant figures. What would your answer be if you DID add these two numbers (to two significant figures).

Name: ___________________________________ Date: _____________ Period: ______

TEXT REVIEW: Section 3.3 International System of Units

1. Metric units are based on the number _____.

2. The same prefixes are used over and over again for all of the units. The most common units are listed below. Write the number (in scientific notation which equals each (below the prefix)

pico	nano	micro	milli	centi	deci	__	Kilo	Mega
	10^{-9}					1		

3. Fill in the chart below which shows the SI units for each unit of measurement:

symbol for unit= unit	Quantity measured	Symbol
m = meter		
m^3 = cubic meter		
kg =		
g/cm^3 =		
g/ mL		
K		
s		
Pa		
J		
mol		
cd		
A		

4. Give an example of a "derived unit".

Use metric units to describe the following (use table 3.3 to help you)

5. How big is the length of five city blocks?

6. How thick is a dime?

7. How high is a mountain?

8. How thick is a quarter?

9. How do mL compare to cm^3?

Use metric units to describe the mass of the following:

10. the mass of a dollar bill? the mass of a small paperclip?

11. Your mass? the mass of the moon?

12. Find the % error if a student weighed a sample of copper (II) chloride and found its mass to be 0.21grams when the actual mass was 0.33 grams.

Name: ___________________________________ Date: _____________ Period: ______

Measurement Lab #3-1 – Finding the Volume of Cylinders.

Purpose: To develop your skill at measurement and calculations. To demonstrate error in measurement. To familiarize you with metric measurements. To familiarize you with lab equipment.

Materials:

Metric Ruler
Graduated cylinder
Baggie of cylinders.
Water.

Procedure: Before beginning, fill in data table 1 and two with **qualitative** descriptions of the cylinders ranging from smallest (gold colored) to the largest plastic cylinder.

1. Measure the diameter of each cylinder, record the value in the data table.
2. Measure the height of each cylinder, record the value in the data table.
3. Fill the graduated cylinder about half way using water from the tap.
4. Measure the initial volume of the water.
5. Add one cylinder to the water in the graduated cylinder.
6. Measure the final volume of the water. Discard the water and dry off the cylinder.
7. Repeat steps 3 – 6 for each cylinder. Then clean up your area.

Results:

Data Table 1: Measurements to calculate the volume of a cylinder using geometry/algebra.

Cylinder	smallest (gold color)					largest
Diameter (cm)						
Length (cm)						

Data Table 2: Measurements to calculate the volume of a cylinder using "volume by difference".

Cylinder	smallest (gold color)					largest
Initial Volume (mL)						
Final Volume (mL)						

Calculations:

1. For each cylinder, use the equation for area to find the area of the circle at the top of the cylinder. $A = \pi r^2$. First you will have to convert the diameter to a radius by dividing the diameter by 2.

Name: ___________________________________ Date: _____________ Period: ______

After you have calculated the area, you will calculate the volume using the formula below:
$V = A \times length$.
Show each step in the appropriate boxes.

Cylinder	smallest (gold color)					largest
$r = D/2$						
$A = \pi r^2$						
$V = A \cdot length$						

Next, you will find the volume by difference in the appropriate boxes. To do this, use the following formula:
$\Delta V = V_{final} - V_{initial}$

Cylinder	smallest (gold color)					largest
$\Delta V = V_{final} - V_{initial}$						

Find the average volume for each cylinder. Add the volume you got from the first method and the volume you got from the second method. Divide by 2.

Cylinder	smallest (gold color)					largest
$\frac{V_1 + V_2}{2}$						

Find the % error. Since the accepted value is the average of the two numbers, you will get the same % error for method one and method two. We will take the difference between the two as our error. We will then divide our error from our accepted value (the average).

Cylinder	smallest (gold color)					largest
$\frac{V_{avg} - V_1}{V_{avg}}$						

Name: ___________________________________ Date: _____________ Period: ______

Conclusions:

1. Which method to find the volume was easier?
2. Which numbers were you more confident were accurate?
3. If your experimental technique was perfect, you would have obtained the same exact volume from both methods. Did you?
4. Hypothesize why you did not get the exact same volume for the exact same object.
5. Were your values more similar for the smallest object, or for the biggest object?
6. The larger your sample size, the more confidence you can have in the accuracy of your data. Did you find that to be true in this experiment? Explain using the %error values in the final calculation.
7. If your numbers were not at all similar, you will have to come after school and repeat the experiment until your numbers make sense.

Name: ___________________________________ Date: _____________ Period: ______

Practice with volume:

1. List these units in order from smallest to largest if any are the same, write = between them:

1 dm^3	1μL	1 mL	1L	1 cL	1 dL

2. What is the volume of a block 21 cm tall, 12 cm wide and 3.5 cm thick? (SHOW WORK)

Formula:

Math:

3. What is the volume of a can 33 cm in diameter, 50 cm in length.

Formula:

Math:

4. List these in order from smallest to largest. Give the measurement in Liters (use scientific notation):

1 cm^3=	1μL=	1 KL=	1mL=	1 nL=	1 pL=

5. What is the volume of a glass cylinder with an inside diameter of 6.0 cm and a height of 28 cm?

6. What is the volume of an object in the following experiment: A graduated cylinder is filled to exactly 5.0 mL. When the object was placed into the water, the new volume was 6.1 mL.

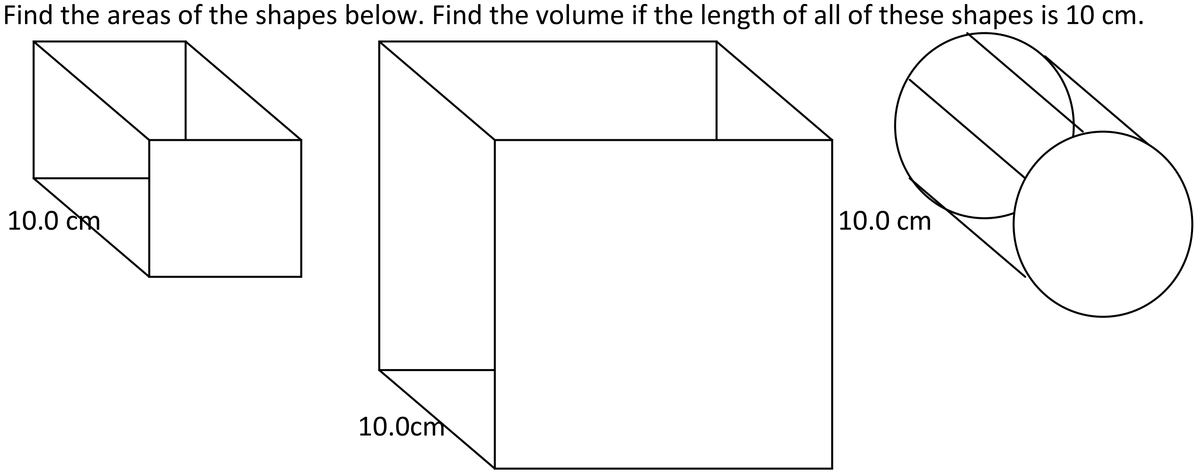
Formula:

Math:

7. List these in order from smallest to largest. Give the measurement in Liters (use scientific notation):

1 cm^3=	1mL=	1 KL=	1cL=	1 dL=	1 L=

8. Find the areas of the shapes below. Find the volume if the length of all of these shapes is 10 cm.



Name: ___________________________________ Date: _____________ Period: ______

TEXT REVIEW: Section 3.4 Density

1. What is the formula for density?

2. If an object is more dense than water, will it sink or float?

3. Which is more dense, according to figure 3.15, glycerol or corn oil?

4. If you go to “cash for gold” with a bracelet with a density of 8.7 g/cm^3, will they find that it is gold? How can you use table 3.7 to tell?

5. If your bracelet has a density of 19.3 g/cm^3, what is the bracelet made with?

6. The police find a packet of white powder in the trunk of your car, suspicious, they measure the density of the white powder. They find that the density is 1.59 g/cm^3. You are set free, and the police apologize. WHY? What was the white powder?

7. A balloon with a density of 2.95 is given to your little sister. She begins to cry because it won’t float. Explain.

8. Once you determine the contents of the balloon, you get very angry because it contains a toxic substance. What toxic substance was in the balloon?

9. According to table 3.7, which substances would float in air? Two of those substances have the chemical property that they are explosive. List one or both of the explosive substances.

10. When temperature is increased on the gases, which changes, mass or volume?

11. What happens to the density of a gas when temperature is increased?

12. How is specific gravity related to density?

13. What instrument is used to measure specific gravity?

14. What disease can be diagnosed using a hydrometer?

15. Why would an auto mechanic use a hydrometer?

16. Find the density of a weather balloon with a volume of 2.2×10^3L and a mass of 37.4 grams of helium.

Name: ___________________________________ Date: _____________ Period: ______

Lab #3-2 Finding the density of cylinders.

Purpose: To compare the density of a variety of objects.

Hypothesis: Since each object looks different, the density of each object will be ________________.

Materials:

Bag of cylinders.
Electronic Balance
25 ml graduated cylinder
Water
Paper Towel
Strainer

Procedure:

1. Make sure your cylinder is dry. Make sure the balance is zeroed. If not, press "Tare" or "Zero" and wait. Fill in the qualitative data in your data table.
2. Gently place your cylinder on the balance pan. Record the mass.
3. Fill the graduated cylinder to 11.0 mL
4. Add the cylinder, measure the new volume.
5. Repeat for each cylinder, then clean up your area.

Results:

Data Table #1: Raw data

	smallest				largest
mass					
V_1					
V_2					

Calculations:

Find the density of each cylinder:

	smallest				largest
$V_2 - V_1 = \Delta V$					
$D = \frac{\text{mass}}{\Delta V}$					

Conclusions: use the following words to summarize your findings: **mass, volume by difference, volume, density, experimental error, uncertainty in measurement.**

____

____

____

____

____

Name: ___________________________________ Date: _____________ Period: ______

Lab 3-3 Uncertainty in Measurement

Purpose: To learn about significant figures and Uncertainty in Measurement.
Hypothesis: The more markings on a ruler, the easier it is to figure out the measurement, and thus the **more/less** (choose one) uncertainty in measurement.
Materials: Three "rulers" A, B, and C. Your desk.
Procedure: In your data table, write observations of rulers "A", "B", and "C". Measure the length and width of your desk using ruler A first, then ruler B, then Ruler C.
Results:
Data

Observation	Length	Width
"A"		
"B"		
"C"		

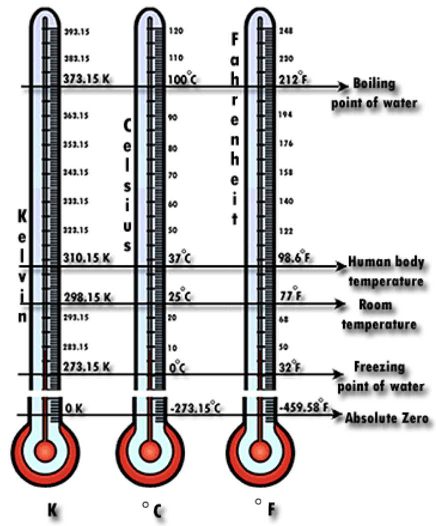
Calculations: Find the area of your desk:

Ruler	Length x Width	Area
"A"		
"B"		
"C"		

Conclusions:
Use the following words in your conclusion: **accuracy, precision, experimental area, measurement, significant figures, length, width, area, uncertainty.**

Name: ____________________________________ Date: _____________ Period: ______

TEXT REVIEW: Section 3.5 Temperature



1. What determines the direction of heat transfer?

2. Does heat move from hot to cold, or cold to hot?

3. Do substances expand or contract when heated?

4. How does mercury allow you to tell the temperature using a thermometer?

5. Which scale, Celsius, Kelvin, or Fahrenheit has the value of 0^{o} for freezing water and 100^{o} for boiling water?

6. Which temperature scale has a value of 0 at the coldest temperature it is possible for matter to obtain?

7. What is it called at the coldest temperature matter can obtain?

8. How many degrees different is the freezing point of water and boiling point of water when measured in the Kelvin scale?

9. At absolute zero, what is the Celsius temperature?___________ What is the Fahrenheit temperature?______

10. What is the relationship between Celsius and Kelvin degrees?
11. Chocolate cookies are baked at 190°C, at what temperature Kelvin are they baked? _______
12. Surgical instruments are sterilized by heating at 170°C for 1.5 hours. At what temperature Kelvin are they heated? _______
13. The boiling point of argon is 87 K, at what temperature Celsius is that?
14. Fill in the chart

°C	math	K
37		
		333
-40		
		10
10		
		0.14
1000		

Name: ___________________________________ Date: _____________ Period: ______

Chapter Review:

1. Rank these numbers from smallest to largest:

$5.3x10^4$	$57x10^3$	$4.9x10^{-2}$	0.0057	5.1×10^{-3}	0.0072×10^2	0.0072	1.0

2. Convert the following:

a. 23°C = ___________K

b. 1000 K = ________°C

c. -50 °C = __________K

d. 1 K = _________°C

3. Explain why there is no such thing as -1 K.

4. Convert the following:

a. 3.45 cm = ________ mm

b. 2.45×10^8µL = ___________ mL

c. 0.00 kg = _________ g

d. 300 L = __________mL

5. List the SI Base Unit for each of the following: time, temperature, length,, mass

6. How many significant figures are in each of the following? Underline the digits which ARE significant. Remember counting numbers are infinite ∞

a) 60 seconds ___ b) 9 innings in a baseball game: ____ c) 1000 m ____

d) 25 computers _____ e) 0.00010 grams f) 10100.0 mg _____

7. Calculate the answers and round to the appropriate number of significant figures, underline the numbers which will be significant in the final answer:

ex: <u>8</u>.7 g + <u>15</u>.43 g + <u>19</u> g = *<u>43</u>.14* = **<u>43 g</u>**

a) 4.32 cm x 1.7 cm =

b) 853.2 L – 627.443 L =

c) 38.742 kg ÷ 0.421 kg =

d) 5.40 m x 3.21 m x 1.871 m =

e) 5.74 m^3 + 11 m^3 + 87.300 m^3 =

8. List two possible reasons for precise, but inaccurate measurements.

9. Match the measurement to the item:

___1. orange	a. 30 m^3	___5. peanut	a. 400 cg
___2. basketball	b. 20 L	___6. pear	b. 50 mg
___3. van	c. 200 cm^3	___7. stamp	c. 60 kg
___4. aspirin tablet	d. 200 mm^3	___8. person	d. 150 g