Name:____Period:_________
Ms. Randall
Unit 1: Math & measurement Unit Practice

The **bold, underlined** words are **important vocabulary words** that you should be able to define and use properly in explanations. This is a study guide for what you will be tested on throughout the year. The objectives are divided into categories of "**Knowledge**" (**what you have to *know***) and "**Application**" (**what you have to be able to *do***).

CHECK OFF EACH ITEM WHEN YOU FULLY UNDERSTAND IT

- Identify **independent** and **dependent variables** in an experiment and correctly plot them on an axis

Example **hypothesis**: *Chemistry students who do their homework will have higher test scores than students who do not do their homework.*

- ☐ X-axis (horizontal): the ***independent*** variable is the one that is manipulated by the experimenter. ("The one *I* change." – *do homework/not do homework*)
- ☐ Y-axis (vertical): the ***dependent*** variable is the one that changes based on the independent variable. (The data you collect – *test scores*)

- Express uncertainty in measurement by properly using **significant figures**
- Identify the number of sig. figs. in data
- Round to the correct number of sig. figs. on calculations:
  - ☐ Addition and Subtraction (round to least precise [farthest left] place value)
  - ☐ Multiplication and Division (round to the lowest # of digits in data)
  - ☐ Combined Rules (Add/Subtract first, then Multiply/Divide)

- Identify relationships between variables from data tables and graphs (**direct** or **inverse relationships**)

- Understand what is meant by conditions of **Standard Temperature and Pressure (STP)** (Table A)

- Recognize and convert between units on various scales of measurement (Tables C, D, and T)

  - ☐ Temperature: **Celsius** ↔ **Kelvin**
  - ☐ Mass: **grams** ↔ **kilograms**
  - ☐ Thermal Energy: **joules** ↔ **kilojoules**
  - ☐ Length: **meters** ↔ **centimeters** ↔ **millimeters**
  - ☐ Pressure: **kilopascals** ↔ **atmospheres**
  - ☐ Amount of Substance:
    GFM = 1 mole = 6.02×10^{23} particles
    - **grams** ↔ **moles** ↔ **atoms or molecules**

- Use the density equation on Table T to solve for **density**, mass, or volume, given the other two values

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- Calculate **percent error** (Table T)

Goal setting: Based upon your learning style results and the information above list at least two techniques you plan to use to study during this unit.

1.
2.

What grade would you like to achieve on this unit based on your efforts? _______%

Lesson 1: Chapter Diary 1 **Date:_________**

Objective: To summarize the basic math skills required for chemistry

Directions: After reading the Chapter diary answer the following questions.

1. Below is a data table produced by three groups of students who were measuring the mass of a paper clip which had a known mass of 1.0003 g. The last row is the average of their measurements.

Group 1	Group 2	Group 3	Group 4
1.01 g	2.863287 g	1.013251 g	2.05 g
1.03 g	2.754158	1.013258 g	0.23 g
0.99 g	2.186357 g	1.013255 g	0.75 g
1.01 g	2.601267 g	1.013255 g	1.01 g

1a. Which group(s) are the most accurate?

b. Which group(s) are the most precise?

c. Which group is the most accurate and precise?

2. What is the difference in the measurements 4 vs. 4.00 vs. 4.00000? In terms of taking measurements, explain why we use significant figures.

3. Convert the following to Kelvin:

a. 56 °C

b. -22 °C

4. Convert the following to Celsius:

a. 257K

b. 33K

5. A piece of gold has a volume of 35.00 cm^3. What is its mass?

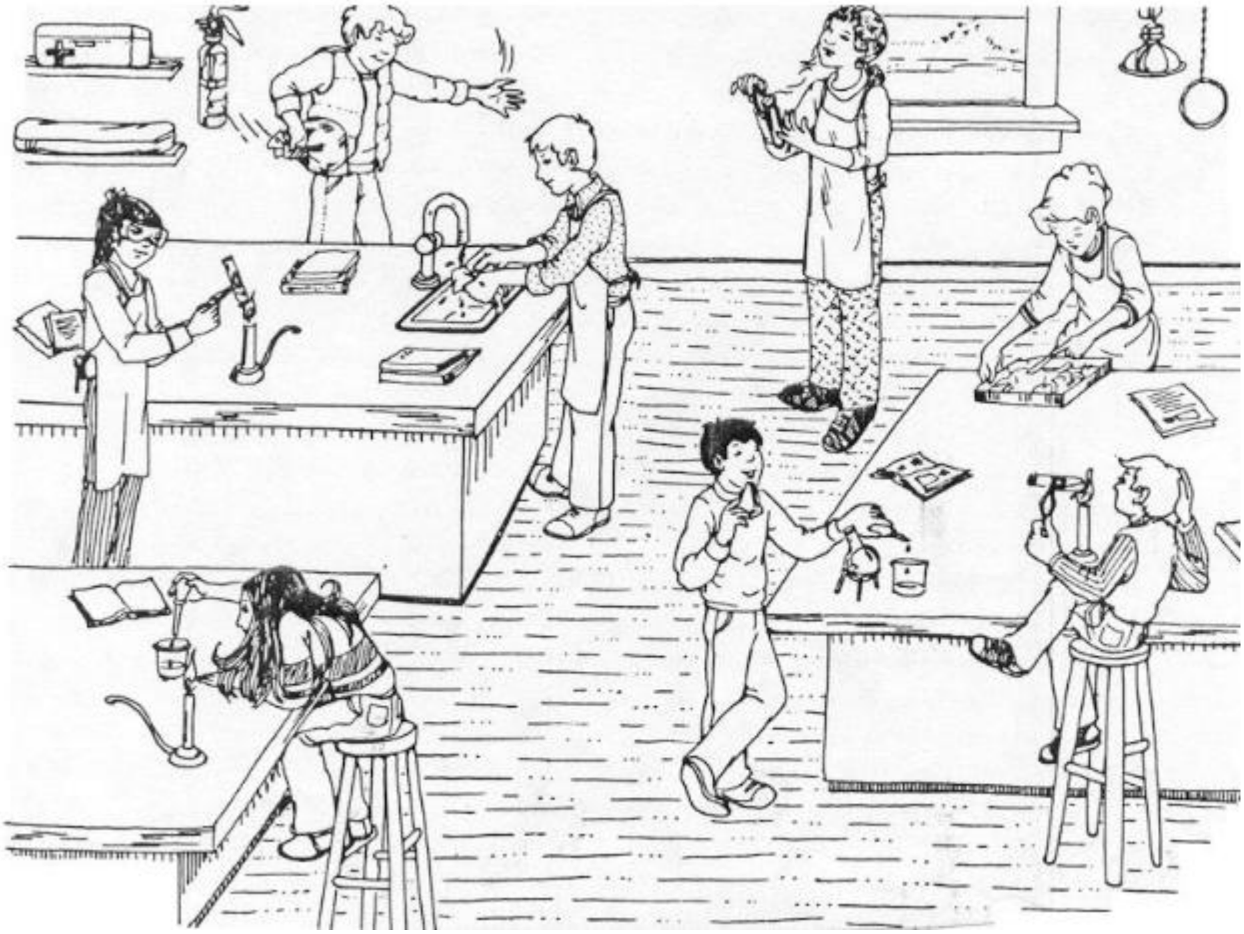
List 10 facts from the reading

List any questions you may have from your reading:

Lesson 2: Safety First! **Date:__________**

<u>Objective:</u> To identify and describe how to avoid safety hazards in the chemistry classroom.

Check your understanding: Circle the safety violations in the picture below



Practice:

Directions: Read the following story and underline/highlight all lab safety violations.

The bell rang, students sat in their seats, and they began to write down their homework. Ryan eagerly asked Mr. Jones, "What are we doing today?" Mr. Jones impatiently said, "As always Ryan it is listed on the board under AGENDA." Ryan responded, "Oh yeah, there it is, we have a Chemistry lab."

Mr. Jones gave the class a brief overview of what they would be doing during the lab and he stressed to the class, "Please be sure to follow appropriate lab safety procedures." Ryan and John sprinted to a lab station, yelling, "We got this station!" Once at the station, Ryan asked John if he read the lab last night for homework to which John replied, "Nope, did you?" Ryan responded to John's question by saying, "Are you serious, I never read anything for this class." They both looked at each other and decided to just start the lab.

"Ryan, you go get the chemicals and I'll light up the Bunsen burner," said John. Even though all of their classmates went to the safety goggle cabinet prior to starting the lab, Ryan and John decided not to go. John said in a smug way, "Forget the goggles; we are too cool to wear those things." Ryan walked up to the front lab bench where the chemicals were, removed the lids, picked up the flasks, and started to smell the different chemicals. "I am just going to bring back the ones that smell the best," said Ryan. Little did Ryan know that one of the chemicals was sulfuric acid, and after taking a deep breath, he thought that his nose hairs were on fire. "Hey Ryan, you didn't even put the lid back on," yelled Mr. Jones. Ryan ignored Mr. Jones and somehow he made it back to his lab station without passing out. Upon making his way back to the lab station, Ryan saw John trying to light the Bunsen burner.
"John, John, your hair!" Ryan yelled in an excited voice.

"That was a close one," said John. "My mother has been telling me to get a haircut. I guess I really need one now that I just lost a big chunk of my hair." The two partners then proceeded with the lab. Ryan reached across the flame in order to get a beaker filled with acetic acid while John grabbed a test tube to put the chemical in. "Oops!" said Ryan, "I just spilled some of the chemicals on the tabletop. I'll just wipe it up with my shirt sleeve."
"Should you tell Mr. Jones?" John asked. "No, it isn't a big deal, I already wiped it up," Ryan nonchalantly said. A few seconds later, Ryan said, "Man, my arm is warm." In an excited voice, John said, "Oh my God, look at your shirt, there is a hole in it. That chemical you wiped up must have eaten through your shirt. How is your arm?"
Ryan said, "It hurts a little, but I will be fine." "Should we tell Mr. Jones?" asked John. "No, I'll be fine," Ryan said confidently.

The lab partners then poured some chemicals into a test tube to begin heating. "Ryan, do you see that crack in the test tube?" questioned John. "Who cares," Ryan whispered. "As long as the test tube is not leaking, it must be fine." The boys proceeded to heat the test tube. Ryan asked, "Is anything happening?" "I don't know, point the test tube in this direction so that I can look into the opening," John replied. "Maybe we should just add some of the other chemicals if nothing is happening yet," said Ryan. "Should we ask Mr. Jones?" wondered John.
"No, he is annoying," Ryan smugly said. Ryan then continued, "He will first ask us if we read all of the procedures and then he will say, 'I put a lot of time and effort into writing these labs for you guys and the least you could do is read them. If you have read it and then have additional questions, I would be more than happy to help you, but you have to do your part first.' I certainly don't want to hear all of that, do you?" "Definitely not, I hate when teachers go ranting," said John.

The lab partners proceeded to add some random chemicals to the test tube. Shortly thereafter, the contents of the test tube began to bubble over. "Wow that was amazing!" Ryan yelled. "Yeah, that was pretty cool, but it is everywhere," John said in a concerned voice. "Good thing we have all of these papers laying around our lab station because most of the chemicals have just spilled onto them. We can just throw all of the papers into the garbage," Ryan said confidently.

“Hey, it got onto my planner,” John said in an annoyed voice. “Who cares, just go to guidance and buy another one for four dollars and fifty cents. Oh, I’m sorry, I mean you can get one for four dollars and Fitty Cent. Get it, Get it!” Ryan said in a joking manner.

The students began to clean up the spilled chemicals when John said, “This stuff smells really good, kind of like lemonade.” “Well, if it smells like lemonade, it must be lemonade, just taste it,” Ryan said in a convincing manner. John proceeded to taste the chemical mixture by sipping what was left in the test tube. “Oh man, the bell is going to ring soon,” Ryan said in a rushed voice. “Just leave it, I really want to go to lunch because it is Taco Day,” John said. “Are you sure?” Ryan questioned. “Yeah let’s just get out of here; the next class is going to be doing the lab again anyway, so they can clean it up,” John said.

Without washing their hands, Ryan and John left the classroom and headed to lunch.

List 3 Safety Rules for the Chemistry lab:

Lesson 3: **Fundamentals of Measurement** **Date:__________**

Objective: To apply the rules of significant figures to represent precise measurements

Check your understanding:

How many SF's in each number below?

1) 5.40 _________
2) 210 ________
3) 801.5 __________
4) 1000 __________
5) 101.0100 _________
6) 1.2×10^{3} ___________
7) 0.00120 __________
8) 0.0102 __________
9) 9.010×10^{-6} ___________
10) 2,370.0 ___________

Practice:

In order to report the most precise and accurate data possible we must learn to count significant figures. When measuring a substances mass, volume, etc. the device requires you to measure "one place beyond." All the numbers you report count as a significant figure (sig fig) except leading zeros and sometimes the trailing zeros. Let's investigate:

Example 1: A piece of aluminum has a mass of 0.0521 grams which had 3 sig figs. This is not 5 sig figs because if we convert that mass to mg the mass becomes 52.1 mg. Again the number has 3 sig figs which show it didn't get any more precise. Proof that leading zeros never count.

Example 2: A beaker of water contains 520 mL which has 2 sig figs. The trailing zero doesn't count *this time* because if we convert to liters the volume is .52 L. The trailing zero was not measured. If we want to show that it was exactly 520 mL we would report it as 520. mL with a decimal point. That way if we convert to liters it is .520L.

Example 3: A reaction takes 0.0025050 s which has 5 sig figs. Remember the first three zeros are "place holders and don't count. If we convert to ms we get 2.5050 ms, also with 5 sig figs. The trailing zero was measured or else the student wouldn't have reported it. The rule is: **Leading zeros never count, trapped zeros always count they are measured) and trailing zeros count if there is a decimal.**

Using the rules above, count the number of significant figures in the following measurements:

1) 56.040 L ________

2) 7.00mm________

3) 0.0005 M________

4) 120.020 g________

5) 78.000 kg________

6) 708.03mL________

7) 0.0120 J________

8) 1800.2 mg________

9) 0.03100 L________

10) 1230 mL ________

11) 0.0040 mm________

12) 6500.0 m ________

13) 1.090 mg ________

14) 0.007 L ______

Lesson 4: Calculations using Sig Figs **Date:___________________________**

Objective: **To apply sig figs rules to mathematical calculations**

Check your understanding:

1. Calculate the following. Report your answer in the correct number of sig figs

a. 9.2 - 5 =

b. 5.800 + 0.4289 =

c. 5.3 – 2.104 =

d. 123.45 + 0.82 =

e. 37.0 / 4 =

f. 0.63 x 9.754 =

g. 40.0 / 8.74 =

Practice: Perform the following calculations and round off the answer to the correct number of sig figs.

If a piece of glassware is very precise it may have a lot of sig figs, as many as 4. A less accurate piece of glassware such as a beaker will only have 1 sig fig. If both pieces of glassware are used to measure quantities in a lab we have to round our results to the least precise measurement. When working with measurements the quantity with the least decimal places is the least precise. For example, if the beaker measures 10mL and a cylinder measures 10.1mL the cylinder is more precise. If the two quantities are added together the new volume is 20mL. The decimal must be rounded to make our answer to one sig fig. Therefore the rule is: **When adding or subtracting measurements, round your answer to the lowest number of decimal places given.**

Complete the following operations and report to the correct number of significant figures.

1. 10.2 + 21	________	5. 0.023 - 0.0004	_______
2. 31.3 + 54.45	________	6. 5.068 - 0.1	_______
3. 22.59 + 21	________	7. 45.6 - 22.12 + 11	_______
4. 0.023 + 20.1	________	8. 0.0123 +5.689 – 0.014	_______

When performing calculations with our data sometimes we have to multiply and divide our data. In these case, the most precise answer is the one with the most sig figs. Since we need to round to our least precise measurement, we should round to the least number of sig figs given. For example, if the mass of a substance is 10.0 grams 3 sig figs) and the volume is 2 mL 1 sig fig) the density is 5 g/mL also 1 sig fig). The rule is: **When multiplying or dividing measurements, round your answer to the lowest number of significant figures given.**

Complete the following operations and report to the correct number of significant figures.

9. 5.87 x 2.1	________	13. 589 / 12	_______
10. 4 x 78	________	14. 78.632 / 52.3	_______
11. 0.0235 x 9	________	15. 1569 / 24 x 2	_______
12. 0.014 x 0.01	________	16. 596 x 32) / 22	_______

If both types of operations are used, always follow the multiplication rules least sig figs). Finally, in scientific notation, only the base number counts not the exponent or the 10). Use **PEMDAS!**

17. 22.1-10.0) / 2	________	19. $6.23x10^{-3}/2.15x10^{-4}$	_________
18. 12.35 / 4.56-2.14)	________	20. $2.1x10^{2} – 1.4x10^{1}$) x 2	_________

More Practice:

Identify the number of significant figures:

1. 3.0800 ______
2. 0.00418 ______
3. $7.19x10^{-5}$ ______
4. 91,600 ______
5. 0.0003003 ______
6. $3.200x10^{9}$ ______
7. 250 ______
8. 780,000,000 ______
9. 0.0101010 ______
10. 0.00800 ______

Round to 3 significant figures:

1. 7.8975 ______
2. 7976.896 ______
3. 80.000 ______
4. 848001 ______
5. $7.89765x10^{-8}$ ______
6. 78765.085 ______
7. 8999.99 ______
8. 1.0000 ______
9. 0.008978 ______
10. 0.000076097078 ______

Solve using the proper number of significant figures:

1. 4.86097 + 90.9048 ________
2. 3578.9 – 423.84 ________
3. 89038.9357 + 345.98 – 89.847 ________

Challenge yourself!!!!

1. 8975.8947 x 56.8 ________
2. $(5.78x10^{-9})$ $7.789x10^{4})$ ________
3. $9.856x10^{8})$/ $(5.8x10^{-6})$ ________
4. (76.9478 + 7865.9) x 6.780 – 5.76) ________

Lesson 5: Scientific Notation **Date:____________**

Objective: **To convert large and small numbers into scientific notation**

Check your understanding:

***a*. Express each of the following in standard form.**

1. 5.2×10^3
2. 9.65×10^{-4}
3. 3.6×10^1
4. 6.452×10^2

b. Express each of the following in scientific notation.

1. 78,000
2. 0.00053
3. 16
4. 0.0043

Practice:

***Part A**: Express each of the following in standard form.*

1. 8.5×10^{-2}
2. 2.71×10^{4}
3. 8.77×10^{-1}
4. 6.4×10^{-3}

***Part B**: Express each of the following in scientific notation.*

1. 250
2. 2,687
3. 0.875
4. 0.012654

Part C: Use the exponent function on your calculator (EE or EXP) to compute the following.

1. $(6.02 \times 10^{23})\ (8.65 \times 10^{4}) =$
2. $(6.02 \times 10^{23})\ (9.63 \times 10^{-2}) =$
3. $\dfrac{(5.4 \times 10^{4})\ (2.2 \times 10^{7}) =}{4.5 \times 10^{5}}$

4 $\dfrac{(6.02 \times 10^{23})\ (-1.42 \times 10^{-15}) =}{6.54 \times 10^{-6}}$

More Practice:

Scientific notation is used to express numbers that are very large or small. An example is $6.02x10^{23}$ which is a large number called a "mole" in chemistry. It means 6.02 times 10 twenty three times; or 602000000000000000000000! The number 6.02 is the "base number", which must be between 1 and 10. The number 23 is the "exponent" which represents the number of place the decimal moved to get the base number between 1 and 10.

Another number, $5.12x10^{-5}$ is a small number. The exponent is negative which really means the 5.12 is divided by 10 five times. So the rule is if the exponent is positive the real number is large and if the exponent is negative the real number is small.

Convert the following numbers into scientific notation:

1) 3,400 ________________________________

2) 0.000023 ________________________________

3) 101,000 ________________________________

4) 0.010 ________________________________

5) 45.01 ________________________________

6) 1,000,000 ________________________________

7) 0.00671 ________________________________

8) 4.50 ________________________________

Convert the following numbers into standard notation:

9) 2.30×10^4 ________________________________

10) 1.76×10^{-3} ________________________________

11) 1.901×10^{-7} ________________________________

12) 8.65×10^{-1} ________________________________

13) 9.11×10^3 ________________________________

14) 5.40×10^1 ________________________________

15) 1.76×10^0 ________________________________

Lesson 6: Temperature Conversions **Date:____________**

Objective: To differentiate between temperature scales. To convert between temperature in Kelvin and Celcius.

Check your understanding:

Fill in the chart using the formula for converting temperature.

(°C)	(K)
	273
16	
	105
8	
	117
2760	
77	
	373
	678
34	
	1089
26	
150	
	45
20	

Practice:

1) **Convert the following to Kelvin**

0^o C ________

-50^o C ________

90^o C ________

-20^o C ________

2) Convert the following to Celsius

100^o K ________

200^o K ________

273^o K ________

350^o K ________

3) How many Celsius degrees separate the freezing and boiling points of water? _______
What are these two temperatures? ________ & _________

4) What is the lowest possible temperature in °C? _________

5) How many Kelvin separate the freezing and boiling points of water? ______

6) What are these two temperatures? ________ & ________

7) What is the lowest possible temperature in Kelvin? __________

8) Using the temperature conversion formula on Table T in your Reference Tables, convert the following temperatures to either Celsius or Kelvin.

383 K	
	80 °C
323K	
	10° C
10K	

9) Using Table S in your reference table what temperature does Sulfur melt at?

10) Using table S, what is the freezing point of Silver (Ag)?

11) Using table S, what is the boiling point of Mercury (Hg)?

Lesson 7 Metric conversions **Date:_______**

Objective: To convert between units of measurement within the metric system using the reference table

Check your understanding

Use Reference Tables C and D to help you answer the following questions about the metric system.

1. Give the unit used to describe the following:

    a. Mass _______ d. Time: ______

    b. Volume _______ e. Temperature: ______

    c. Energy _______ f. Pressure: ______

2. Complete the following number line by adding the prefixes found on your reference table that pertain to the marked values:

10^{-15} 10^{-12} 10^{-9} 10^{-6} 10^{-3} 10^{0} 10^{3} 10^{6} 10^{9} 10^{12} 10^{15}

3. If a substance weighs 2.00 grams and you need the mass in kilograms, will the number appear to become smaller or larger? Explain your answer.

4. If a liquid has a volume of 5800 mL and you need the mass in Liters, will the number appear to become smaller or larger? Explain your answer.

5. If a substance has a mass of 0.00235 grams and you need the mass in milligrams, will the number appear to become smaller or larger? Explain your answer.

<u>Practice:</u> Match the terms in Column II with the descriptions in Column I. Write the letters of the correct term in the blank on the left.

Column I	**Column II**
_____ 1. Distance between two points	a. time
_____ 2. SI unit of length	b. volume
_____ 3. Tool used to measure length	c. mass
_____ 4. Units obtained by combining other units	d. density
_____ 5. Amount of space occupied by an object	e. meter
_____ 6. Unit used to express volume	f. kilogram
_____ 7. SI unit of mass	g. derived
_____ 8. Amount of matter in an object	h. liter
_____ 9. Mass per unit of volume	i. second
_____ 10. Temperature scale of most laboratory thermometers	j. Kelvin
_____ 11. Instrument used to measure mass	k. length
_____ 12. Interval between two events	1. balance
_____ 13. SI unit of temperature	m. meterstick
_____ 14. SI unit of time	n. thermometer
_____ 15. Instrument used to measure temperature	o. Celsius

<u>Show all work and report with the *proper units*.</u>

1. Convert a measurement of 100 cm to its equivalent in m.

2. Convert a measurement of 0.001 m to its equivalent in mm.

3. Convert a measurement of 10. L to its equivalent in mL.

4. Convert a measurement of 1000 g to its equivalent in kg.

5. Convert a measurement of 50 cm to its equivalent in mm.

6. Convert 24 mg to g.

7. Convert a measurement of 36 mL to its equivalent in L.

8. Convert a measurement of 0.00883 km to its equivalent in cm.

9. Convert a measurement of 350.0 mg to its equivalent in kg.

10. How many mL are in 0.0895 L?

11. Convert 1258 cm to meters.

12. Convert 2500 mL to liters.

13. Convert 0.0290m to millimeters.

Lesson 8: **Dimensional Analysis** **Date:___________**

Objective: **To apply dimensional analysis to conversion problems**

Check your understanding: Use the chart and dimensional analysis to solve the following:

How many meters are there in 7.2 km?

Steps	
1. Write the term to be converted (include both the number and the unit)	
2. Write the conversion formula (see Ref Tables)	
3. Make a fraction of the conversion formula such that the denominator units are the same as the units from step 1 and the numerator contains the units you want to convert to.	
4. Multiply the term in step 1 by the fraction in step 3.	
5. Cancel out “like” units	
6. Solve (everything on top of fraction is multiplied and divided by everything on bottom)	

<u>Practice:</u> Convert the following using **dimensional analysis!!!! Show your work.**

1. Convert 26 g to kg

2. Convert 9,474 mm to cm

3. Convert 0.73 L to mL

4. Convert 26.4 m to km

5. Convert 0.0489 g to mg

6. Convert 1067 cm to km

Bonus:

This exercise is to reinforce the concept that problems are set up based on UNITS.

Nonsense words taken from the poem *Jabberwocky* (from Lewis Carroll's *Through the Looking Glass*)

There are 20 tumtum trees in the tulgey wood.
In each tulgey wood is one frumious Bandersnatch.
There are 5 slithy toves in 2 borogoves.
There are 2 mome raths per Jabberwock.
There are 2 Jubjub birds in 200 tumtum trees.
There are 200 mome raths in each borogove.
There are 5 Jubjub birds per slithy tove.

The question is: If there are 5 frumious Bandersnatches, how many Jabberwocks are there?

Use a dimensional analysis setup to show your work!

<u>Lesson 9: Scientific Method:</u> **<u>Date:_____</u>**

<u>Objective:</u> To apply the steps of the scientific method to problem solving

<u>Check your understanding:</u>

1. Using the flow chart shown earlier, list the steps of the scientific method in order.

2. What is the difference between a law and a theory?

Practice:

1. Suppose you work for a Blabbit Labs, the developer of many different pharmaceutical products. Your research division has stumbled across a new drug that you believe cures male pattern baldness. Before you can start selling the drug, you must demonstrate to the U.S. Food and Drug Administration that the drug is effective.

a. What is the question being asked?

b. What is the hypothesis?

2. You design an experiment with 500 men who have been diagnosed with male pattern baldness. They are divided up into two groups, group A men receiving the drug while group B men receive a placebo, a drug that is known not to effect baldness. The drug is referred to as the ***experimental variable***, since this is what is being tested. As a hint, the hypothesis will usually identify the experimental variable of a study.

In this study, the men receive the drug or a placebo once a day. All of the men will have the number of hairs per square inch of scalp measured in a clinic once per week. The number of hairs per square inch will be the ***dependent variable*** since this variable depends on the effectiveness of the experimental variable. The dependent variable is also what we use to determine if the experimental variable is actually acting according to the hypothesis and the data collected will usually tell what the dependent variable is.

Men in group A belong to the ***experimental group***, since they received the experimental variable. Men in group B belong to the ***control group***. The control group is important since it gives the researchers something to compare the experimental group to. For instance, if the men in the experimental group were shown to have hair growth, then that would indicate that the hypothesis was supported and the drug grows more hair. However, if the control group also grew hair, then something in the environment besides the drug was responsible for hair growth.

a. Define dependent and experimental variables.

b. Compare and contrast the experimental and control group.

3. You are conducting an experiment to determine if increased ultraviolet radiation from the decrease in the ozone layer is killing off frog tadpoles. After examining all of the data available in the library, you decide to go with a hypothesis that increased ultraviolet radiation from the sun is killing off the tadpoles.

You design an experiment with a control and an experimental group. Group 1 involves 100 tadpoles in a five gallon container of water, which is covered by glass (knowing that the glass will filter out the ultraviolet radiation). Group 2 will be set up exactly like group 1, except that instead of being covered with glass, it is covered with an acrylic plexiglass, which will not filter out the U.V. radiation. You then place the groups outside for a period of a month, and observe the results.

Results

	Group 1	**Group 2**
Number of tadpoles started with	100	100
Number finished	96	96

Using the information given, answer the following questions.

a. What is the experimental variable and what is the dependent variable?

b. Does the information from this experiment support the hypothesis?

c. If no, then what might be causing the decrease in frog populations?

<u>**Lesson 10: Graphing**</u> **Date:____________**

<u>**Objective:**</u> **To create a visual representation of data through a graph**

<u>**Check your understanding:**</u>

A student masses a crucible empty. Its mass is 20.50 g. She adds some pieces of magnesium and remasses it. Its new mass is 25.50 g. She heats the crucible and its contents and remasses it every five minutes. She obtains the following data:

Time(minutes)	Mass of Crucible and Its Contents(grams)
5	**25.80**
10	**26.20**
15	**26.65**
20	**27.00**
25	**27.45**
30	**27.85**
35	**28.20**
40	**28.60**

Plot the mass of the crucible's contents. Label all parts properly

Lesson 11 : Measuring Matter **Date:____________**

Objective: To calculate density as a property of matter

Check your understanding:

1. What is the difference between mass and weight?

2. When reading any volume in the laboratory, we always read where the bottom of the water curve falls. This is called the ________________.

3 . Reference table S gives the densities of many elements. Which of the first 10 elements is the least dense?

4. Which of the first ten elements has the greatest density?

5. Generally, what phase are all elements in that have low densities? What phase has high densities?

6. Bubbles in soda rise to the surface. Explain this in terms of density.

7. A pure elemental gas has a mass of 0.018 g and a volume of 20.0 mL. What gas could it be?

8. A pure metallic liquid has a mass of 162.6 g and a volume of 12mL. What element could it be?

Practice:

1. A 2.75 kg sample of a substance occupies a volume of 250.0 cm^3. Find its density in g/cm^3.

2. Under certain conditions, oxygen gas (O_2)has a density of 0.00134 g/mL. Find the volume occupied by 250.0 g of O2 under the same conditions.

3. Find the volume that 35.2 g of carbon tetrachloride (CCl4) will occupy if it has a density of 1.60 g/mL.

4. The density of ethanol is 0.789 g/mL at 20oC. Find the mass of a sample of ethanol that has a volume of 150.0 mL at this temperature.

5. 30.0 g of each of the following acids are needed. Find the volume of each that must be measured out in a graduated cylinder.

A. hydrochloric acid (HCl), density = 1.164 g/mL

B. sulfuric acid (H_2SO_4), density = 1.834 g/mL

C. nitric acid (HNO_3), density = 1.251 g/mL

6. A rectangular block of lead (Pb) measures 20.0 mm X 30.0 mm X 45.0 mm. If the density of Pb is 11.34 g/cm^3, calculate the mass of the block.

7. A cube of gold Au) has a side length of 1.55 cm. If the sample is found to have a mass of 71.9 g, find the density of Au.

Lesson 12: Percent Error **Date:____ __________**

Objective: To apply a formula to determine experimental error

Check your understanding:

A. Fill in the blanks

______________= Values obtained from the lab.

____________= Values obtained from some authority -> book, table, list, official, etc.

(+) A positive percent error indicates your experimental values are ______________ than the accepted values.

(-) A negative percent error indicates your experimental values are ______________ than the accepted values.

b. Determine the percentage error in the following problems. Show all your work!

1. Measured Value: 1.24 g
   Accepted Value: 1.30 g

2. A standard 20.OOg mass is used to check the accuracy of a laboratory balance. The balance indicates a mass of 19.81 g when a standard mass is measured. What is the percent error of this measurement?

Practice:

1. There are 35 mg of sodium in a can of Coke. You determine it to be 15 mg. What is your percent error?

2. There is 3.5 grams of fat in a granola bar. You determine the fat content to be 4.0 g in the lab. What is the percent error?

3. Working in the laboratory, a student finds the density of a piece of pure aluminum to be 2.85 g/cm^3. The accepted value for the density of aluminum is 2.699 g/cm^3.

4. A student experimentally determines the specific heat of water to be 4.29 J/g x C^o. He then looks up the specific heat of water on a reference table and finds that it is 4.18 J/g• C^o. What is his percent error?

5. A student takes an object with an accepted mass of 200.00 grams and masses it on his own balance. He records the mass of the object as 196.5 g. What is his percent error?

Unit Study Guide

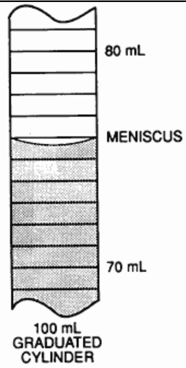
Law, Theories, BIG ideas	**Equations, Calculations, Reference Tables**
Laws:	Equation: (When to use & units)
Theories:	Calculations (When to use)
BIG ideas:	Reference Table (Hints & tricks)

Helpful tips, sayings, shortcuts

Things I always forget…

Unit 1 Review
If you can do all the things listed below, you are ready for the Unit 1 test.
Place a checkmark next to each item that you can do! If a sample problem is given, complete it as evidence.

_____1. I can list five important lab safety rules.	5 important lab safety rules are: 1. 2. 3. 4. 5.
_____2. I can identify the most common laboratory tools such as: beaker, graduated cylinder, Erlenmeyer flask, scoop, beaker tongs, test tube, test tube rack, test tube holder, crucible tongs, Bunsen burner, striker, stirring rod, funnel, dropper pipette (aka eye dropper)	Draw and label as many of the common laboratory tools as you can!
_____3. I can determine the independent and dependent variable in a lab experiment.	A farmer wants to know what the effect the amount of fertilizer has on the amount of fruit an apple tree produces. What is the independent variable? What is the dependent variable?
_____4. I can determine the number of significant figures in a measurement.	How many significant figures are there in 30.50 cm? How many significant figures are there in 400.0 sec?
_____5. I can determine the answer to a math problem to the correct number of significant figures.	To the correct number of significant figures, what is the answer to 5.93 mL + 4.6 mL? To the correct number of significant figures, what is the answer to 5.93 cm * 4.6 cm?

_____6. I can read the meniscus on a graduated cylinder to the correct number of significant figures.	 The volume is______________________ mL.
_____7. I can use dimensional analysis to solve math problems.	To the correct number of significant figures, determine how many meters there are in 15.4 ft. To the correct number of significant figures, determine how many minutes there are in 2.7 years.
_____8. I can convert numbers into scientific notation from standard notation.	Convert 87,394,000,000,000 to scientific notation. Convert 0.0000040934 to scientific notation.
_____9. I can convert numbers into standard notation from scientific notation.	Convert 5.8 x 10^{9} to standard notation. Convert 4.3 x 10^{-5} to standard notation.
_____10. I can use my calculator to input numbers in scientific notation using the "2^{nd} function & EE keys.	Enter the number 5.67 x 10^{52} on your calculator and show Mrs. S. She'll initial this box, if you've done it correctly!
_____11. I can convert between different metric units by using Reference Table C and dimensional analysis.	1.5 x 10^{-3} km = ? µm 4.67 x 10^{13} pm = ?dm

_____12. I can solve for "x" when it's in the denominator of a fraction.	What is the volume, in cm^3, of 54.6 g of beryllium (density = 1.85 g/cm^3)
_____13. I can convert ^oC to degrees kelvin and degrees kelvin to ^oC.	What kelvin temperature is equal to 200^oC? What Celsius temperature is equal to 200K?
_____14. I can determine the percent error of experimental data	The density of water at 4^oC is known to be 1.00 g/mL. Kayla experimentally found the density of water to be 1.075 g/mL. What is her percent error?