Stone Ridge
School of the Sacred Heart

9101 Rockville Pike · Bethesda, Maryland 20814
301.657.4322 · www.stoneridgeschool.org

Empowering leaders to serve with faith, intellect, and confidence.

Course Number (when applicable)
Course Title
AP Chemistry
Name of Assignment (title of book(s), Author, Edition, and ISBN (when applicable)
AP Chemistry Summer Packet
Expectations/Instructions for Student When Completing Assignment
See next page
One Essential Question for Assignment
How do scientists and engineers use mathematical and chemical language to convey information about the physical world?
One Enduring Understanding for Assignment
Chemical symbols and formulas, as understood in the international science community, are written according to universally accepted standards.
Parent Role and Expectations
Cheerleader and content guide when possible
Estimated Time Requirement
Part 1 Learning ion formulas - 20 minutes per week throughout the summer Part 2 Reviewing significant figures - 45 minutes Part 3 Lab Review - 45 minutes

Dr. Melanie Rock
AP Chemistry Summer Work

Dear AP Chemistry Students,

Congratulations on your decision to take on the challenge of AP Chemistry! This packet contains review materials that are important for your success in this course, and ultimately, on the AP Chemistry exam. Although AP Chemistry is widely regarded as one of the most difficult AP tests available, many students consider this a fun class! It simply requires a substantial amount of effort and persistence to achieve your desired grade. The benefits of working hard and scoring high on the AP exam are worth it. If you pass the AP exam with a 5, many schools in the country will award you 8 to 10 credits of chemistry. This may save you time and money. If your college does not accept these credits, or you decide not to opt out of first year chemistry in college, you will have mastered many fundamentals and you will enjoy freshman chemistry, which is a class in which students often struggle.

The concepts and skills learned in this class are essential to anyone considering a career ranging from engineering to archeology, from medicine to art restoration, or from psychology to culinary arts! If you are a bit nervous, it's okay. The following summer work will ensure that you are where you need to be when we begin in the fall. At the start, chemistry involves a lot of language learning, and these exercises will help you master the language so we can move quickly to more advanced topics.

There are THREE parts to the AP Chemistry Summer Assignment. Part 1 deals with the memorization of common ions used in the course. Part 2 provides information and practice on the use of significant figure rules in calculations. And finally, Part 3 reviews some common lab equipment and allows you to try your hand with a couple of lab calculations. Together, in the fall, we will rapidly review topics like nomenclature, atomic theory and stoichiometry before launching into new material.

PART 1: Learning the ions

This part of the summer assignment for AP Chemistry is quite simple (but not easy). You need to master the formulas, charges, and names of the common ions. On the second time we meet the first week of the school year, you will be given a quiz on these ions. You will be asked to:

- write the names of these ions when given the formula and charge
- write the formula and charge when given the names

I have included several resources in this packet. First, there is a list of the ions that you must know week one. This list also has, on the back, some suggestions for making the process of memorization easier. For instance, many of you will remember that most of the monatomic ions have charges that are directly related to their placement on the periodic table. There are naming patterns that greatly simplify the learning of the polyatomic ions as well.

Also included is a copy of the periodic table used in AP Chemistry. Notice that this is *not* the table used in first year chemistry. The AP table is the same that the College Board allows you to use on the AP Chemistry test. Notice that it has the symbols of the elements but *not* the written names. You need to take that fact into consideration when studying for the afore-mentioned quiz!

I have included a sheet of flashcards for the polyatomic ions that you must learn. I suggest that you cut them out and begin memorizing them immediately. Use the hints on the common ions sheet to help you reduce the amount of rote memorization that you must do.

Don't let the fact that there are no flashcards for monatomic ions suggest to you that the monatomic ions are not important. If you have trouble identifying the charge of monatomic ions (or the naming system) then I suggest that you make yourself some flashcards for those as well.

Please don't try to do all of this studying just before the start of school. Research on human memory shows us that frequent, short periods of study, spread over long periods of time will produce much greater retention than long periods of study of a short period of time. Last minute studying may allow you to do well on the initial quiz. However, you may not retain the knowledge, quickly forget the ions, and struggle every time that these formulas are used in lecture, homework, quizzes, tests and labs.

Use every modality possible as you try to learn these – speak them, write them, visualize them. I will provide links to some useful online quizzes and exercises that will help you work on the ions. I suggest you play with them. Your efforts to memorize these ions will really pay off for you!

PART 2: Significant figures in calculations

Significant figures will be an ongoing topic for us next year, but a quick review will help prepare you. I have attached a two-sided page with explanations of the rules, and examples of problem solving in addition, subtraction, multiplication and division.

There is also a page of problems for you to complete. This page, and the lab equipment exercises below are due at the beginning of class the second time we meet in the fall.

PART 3: Lab related review

This section reviews some lab equipment and separation techniques, and gives you a chance to do a few fun calculations related to lab data.

Class Textbooks: **AP Chemistry, The Central Science by Brown and LeMay 13th Edition 2015**
AP Test Prep Series for Chemistry, the Central Science 13th Edition, by Ed Waterman

Best wishes for a happy and productive summer!

I very much look forward to seeing you all,

Dr. Rock

Common Ions and Their Charges

A mastery of the common ions, their formulas and their charges, is essential to success in AP Chemistry. You are expected to know all of these ions the first week of class, when I will give you a quiz on them. You will always be allowed a periodic table, which makes identifying the ions on the left "automatic." For tips on learning these ions, see the opposite side of this page.

From the table:	
Cations	**Name**
H^+	Hydrogen
Li^+	Lithium
Na^+	Sodium
K^+	Potassium
Rb^+	Rubidium
Cs^+	Cesium
Be^{2+}	Beryllium
Mg^{2+}	Magnesium
Ca^{2+}	Calcium
Ba^{2+}	Barium
Sr^{2+}	Strontium
Al^{3+}	Aluminum
Anions	**Name**
H^-	Hydride
F^-	Fluoride
Cl^-	Chloride
Br^-	Bromide
I^-	Iodide
O^{2-}	Oxide
S^{2-}	Sulfide
Se^{2-}	Selenide
N^{3-}	Nitride
P^{3-}	Phosphide
As^{3-}	Arsenide
Type II Cations	**Name**
Fe^{3+}	Iron(III)
Fe^{2+}	Iron(II)
Cu^{2+}	Copper(II)
Cu^+	Copper(I)
Co^{3+}	Cobalt(III)
Co^{2+}	Cobalt(II)
Sn^{4+}	Tin(IV)
Sn^{2+}	Tin(II)
Pb^{4+}	Lead(IV)
Pb^{2+}	Lead(II)
Hg^{2+}	Mercury(II)

Ions to Memorize	
Cations	**Name**
Ag^+	Silver
Zn^{2+}	Zinc
Hg_2^{2+}	Mercury(I)
NH_4^+	Ammonium
Anions	**Name**
NO_2^-	Nitrite
NO_3^-	Nitrate
SO_3^{2-}	Sulfite
SO_4^{2-}	Sulfate
HSO_4^-	Hydrogen sulfate (bisulfate)
OH^-	Hydroxide
CN^-	Cyanide
PO_4^{3-}	Phosphate
HPO_4^{2-}	Hydrogen phosphate
$H_2PO_4^-$	Dihydrogen phosphate
NCS^-	Thiocyanate
CO_3^{2-}	Carbonate
HCO_3^-	Hydrogen carbonate (bicarbonate)
ClO^-	Hypochlorite
ClO_2^-	Chlorite
ClO_3^-	Chlorate
ClO_4^-	Perchlorate
BrO^-	Hypobromite
BrO_2^-	Bromite
BrO_3^-	Bromate
BrO_4^-	Perbromate
IO^-	Hypoiodite
IO_2^-	iodite
IO_3^-	iodate
IO_4^-	Periodate
$C_2H_3O_2^-$	Acetate
MnO_4^-	Permanganate
$Cr_2O_7^{2-}$	Dichromate
CrO_4^{2-}	Chromate
O_2^{2-}	Peroxide
$C_2O_4^{2-}$	Oxalate
NH_2^-	Amide
BO_3^{3-}	Borate
$S_2O_3^{2-}$	Thiosulfate

Tips for Learning the Ions

"From the Table"

These are ions can be organized into two groups.

1. Their place on the table suggests the charge on the ion, since the neutral atom gains or loses a predictable number of electrons in order to obtain a noble gas configuration.

    a. All Group 1 Elements (alkali metals) lose one electron to form an ion with a 1+ charge
    b. All Group 2 Elements (alkaline earth metals) lose two electrons to form an ion with a 2+ charge
    c. Group 13 metals (like aluminum) lose three electrons to form an ion with a 3+ charge
    d. All Group 17 Elements (halogens) gain one electron to form an ion with a 1- charge
    e. All Group 16 nonmetals gain two electrons to form an ion with a 2- charge
    f. All Group 15 nonmetals gain three electrons to form an ion with a 3- charge

    Notice that cations keep their name (sodium ion, calcium ion) while anions get an "-ide" ending (chloride ion, oxide ion).

2. Metals that can form more than one ion will have their positive charge denoted by a roman numeral in parenthesis immediately after the name of the metal.

Polyatomic Anions

Most of the work on memorization occurs with these ions, but there are a number of patterns that can greatly reduce the amount of memorizing that one must do.

1. "ate" anions have one more oxygen then the "ite" ion, but the same charge. If you memorize the "ate" ions, then you should be able to derive the formula for the "ite" ion and vice-versa.
    a. sulfate is SO_4^{2-}, so sulfite has the same charge but one less oxygen (SO_3^{2-})
    b. nitrate is NO_3^-, so nitrite has the same charge but one less oxygen (NO_2^-)

2. If you know that a sufate ion is SO_4^{2-} to get the formula for hydrogen sulfate ion, you add a hydrogen ion to the front of the formula. Since a hydrogen ion has a 1+ charge, the net charge on the new ion is less negative by one.
    a. Example:

PO_4^{3-}	→	HPO_4^{2-}	→	$H_2PO_4^-$
phosphate		hydrogen phosphate		dihydrogen phosphate

3. Learn the hypochlorite < chlorite < chlorate < perchlorate series, and you also know the series containing iodite/iodate as well as bromite/bromate.

    a. The relationship between the "ite" and "ate" ion is predictable, as always. Learn one and you know the other.
    b. The prefix "hypo" means "under" or "too little" (think "hypodermic", "hypothermic" or "hypoglycemia")
        i. Hypochlorite is "under" chlorite, meaning it has one less oxygen
    c. The prefix "hyper" means "above" or "too much" (think "hyperkinetic")
        i. the prefix "per" is derived from "hyper" so perchlorate (hyperchlorate) has one more oxygen than chlorate.
    d. Notice how this sequence increases in oxygen while retaining the same charge:

ClO^-	ClO_2^-	ClO_3^-	ClO_4^-
hypochlorite	chlorite	chlorate	perchlorate

Sulfite	**Sulfate**	**Hydrogen sulfate**
Phosphate	**Dihydrogen Phosphate**	**Hydrogen Phosphate**
Nitrite	**Nitrate**	**Ammonium**
Thiocyanate	**Carbonate**	**Hydrogen carbonate**
Borate	**Chromate**	**Dichromate**
Permanganate	**Oxalate**	**Amide**
Hydroxide	**Cyanide**	**Acetate**
Peroxide	**Hypochlorite**	**Chlorite**
Chlorate	**Perchlorate**	**Thiosulfate**

HSO_4^-	SO_4^{2-}	SO^{32-}
HPO_4^{2-}	$H_2PO_4^-$	PO^{43-}
NH_4^+	NO_3^-	NO_2^-
HCO_3^-	CO_3^{2-}	NCS^- SCN^-
$Cr_2O_7^{2-}$	CrO^{42-}	BO^{33-}
NH_2^-	$C_2O_4^{2-}$	MnO_4^-
$C_2H_3O_2^-$ CH_3COO^-	CN^-	OH^-
ClO_2^-	ClO^-	O^{22-}
$S_2O_3^{2-}$	ClO_4^-	ClO_3^-

Resources for help with memorizing ions

- Monatomic and Polyatomic Ions http://www.sciencegeek.net/APchemistry/Quizzes/Ions/ **(HTML5 and Mobile Compliant)** This review gives the formula of an ion, and you write the name. There are 70 ions total, but the quiz will only serve up 15 each time the quiz loads.
- More Ions Practice http://www.sciencegeek.net/APchemistry/Quizzes/Ions2/ **HTML5 and Mobile Compliant)** Multiple Choice and Matching questions to review the ions.
- Monatomic Ions Concentration Game http://www.sciencegeek.net/Concentration/Monatomics/monatomic.html
- Polyatomic Ions Concentration Game http://www.sciencegeek.net/Concentration/Anions/anions.html

Resources for help with significant figures

- Introduction to Significant Figures from Khan Academy via YouTube.
- https://www.youtube.com/watch?v=eCJ76hz7jPM
- More on Significant Figures from Khan Academy via YouTube.
- https://www.youtube.com/watch?v=eMl2z3ezlrQ
- Multiplication and Division with Significant Figures from Khan Academy via YouTube. https://www.youtube.com/watch?v=iorZdz4dsBU
- Addition and Subtraction with Significant Figures from Khan Academy via YouTube. https://www.youtube.com/watch?v=xHgPtFUbAeU
- Significant Figures in Measurement and Calculations **(HTML5 and Mobile Compliant)** http://www.sciencegeek.net/APchemistry/Quizzes/SigFigs/

This includes simulations of reading measurements to the appropriate number of significant figures.

PERIODIC TABLE OF THE ELEMENTS

1 H 1.0079																	2 He 4.0026
3 Li 6.941	4 Be 9.012											5 B 10.811	6 C 12.011	7 N 14.007	8 O 16.00	9 F 19.00	10 Ne 20.179
11 Na 22.99	12 Mg 24.30											13 Al 26.98	14 Si 28.09	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.938	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.91	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	*57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.02	†89 Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Rg (272)							

* Lanthanides	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
† Actinides	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Significant Figures in Measurement and Calculations

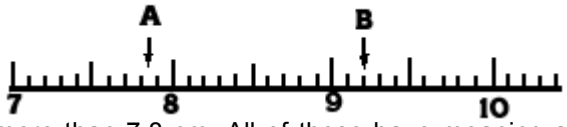
A successful chemistry student habitually labels all numbers, because the unit is important. Also of great importance is the number itself. Any number used in a calculation should contain only figures that are considered reliable; otherwise, time and effort are wasted. Figures that are considered reliable are called *significant figures*. Chemical calculations involve numbers representing actual measurements. In a measurement, significant figures in a number consist of:

Figures (digits) definitely known + One estimated figure (digit)

In class you will hear this expressed as "all of the digits known for certain plus one that is a guess."

Recording Measurements

When one reads an instrument (ruler, thermometer, graduate, buret, barometer, balance), he expresses the reading as one which is reasonably reliable. For example, in the accompanying illustration, note the reading marked *A*. This reading is definitely beyond the 7 cm mark and also beyond the 0.8 cm mark. We read the 7.8 with certainty. We further *estimate* that the reading is five-tenths the distance from the 7.8 mark to the 7.9 mark. So, we estimate the length as 0.05 cm more than 7.8 cm. All of these have meaning and are therefore significant. We express the reading as 7.85 cm, accurate to three significant figures. All of these figures, *7.85*, can be used in calculations. In reading B we see that 9.2 cm is definitely known. We can include one estimated digit in our reading, and we estimate the next digit to be zero. Our reading is reported as 9.20 cm. It is accurate to three significant figures.



Rules for Zeros

If a zero represents a measured quantity, it is a significant figure. If it merely locates the decimal point, it is not a significant figure.

Zero Within a Number. In reading the measurement 9.04 cm, the zero represents a measured quantity, just as 9 and 4, and is, therefore, a significant number. A zero between any of the other digits in a number is a significant figure.

Zero at the Front of a Number. In reading the measurement 0.46 cm, the zero does not represent a measured quantity, but merely locates the decimal point. It is not a significant figure. Also, in the measurement 0.07 kg, the zeros are used merely to locate the decimal point and are, therefore, not significant. Zeros at the first (left) of a number are not significant figures.

Zero at the End of a Number. In reading the measurement 11.30 cm, the zero is an estimate and represents a measured quantity. It is therefore significant. Another way to look at this: The zero is not needed as a placeholder, and yet it was included by the person recording the measurement. It must have been recorded as a part of the measurement, making it significant. Zeros to the right of the decimal point, and at the end of the number, are significant figures.

Zeros at the End of a Whole Number. Zeros at the end of a whole number may or may not be significant. If a distance is reported as 1600 feet, one assumes two sig figs. Reporting measurements in scientific notation removes all doubt, since all numbers written in scientific notation are considered significant.

1 600 feet	1.6×10^3 feet	Two significant figures
1 600 feet	1.60×10^3 feet	Three significant figures
1 600 feet	1.600×10^3 feet	Four significant figures

Sample Problem #1: Underline the significant figures in the following numbers.

(a) 0.0420 cm	answer = 0.0420 cm	(e) 2 403 ft.	answer = 2 403 ft.
(b) 5.320 in.	answer = 5.320 in.	(f) 80.5300 m	answer = 80.5300 m
(c) 10 lb.	answer = 10 lb.	(g) 200. g	answer = 200 g
(d) 0.020 ml	answer = 0.020 ml	(h) 2.4×10^3 kg	answer = 2.4×10^3 kg

Rounding Off Numbers

In reporting a numerical answer, one needs to know how to "round off" a number to include the correct number of significant figures. Even in a series of operations leading to the final answer, one must "round off" numbers. The rules are well accepted rules:

1. If the figure to be dropped is less than 5, simply eliminate it.
2. If the figure to be dropped is greater than 5, eliminate it and raise the preceding figure by 1.
3. If the figure is 5, followed by nonzero digits, raise the preceding figure by 1
4. If the figure is 5, not followed by nonzero digit(s), and preceded by an odd digit, raise the preceding digit by one
5. If the figure is 5, not followed by nonzero digit(s), and the preceding significant digit is even, the preceding digit remains unchanged

Sample Problem #2: Round off the following to three significant figures.

(a) 3.478 m	answer = 3.48 m	(c) 5.333 g	answer = 5.33 g
(b) 4.8055 cm	answer = 4.81 cm	(d) 7.999 in.	answer = 8.00 in.

Multiplication

In multiplying two numbers, when you wish to determine the number of significant figures you should have in your answer (the product), you should inspect the numbers multiplied and find which has the least number of significant figures. This is the number of significant figures you should have in your answer (the product). Thus the answer to 0.024 x 1244 would be rounded off to contain two significant figures since the factor with the lesser number of significant figures (0.024) has only *two* such figures.

Sample Problem #3: Find the area of a rectangle 2.1 cm by 3.24 cm.

Solution: Area = 2.1 cm x 3.24 cm = 6.804 cm^2

We note that 2.1 contains two significant figures, while 3.24 contains three significant figures. Our product should contain no more than *two* significant figures. Therefore, our answer would be recorded as 6.8 cm^2

Sample Problem #4: Find the volume of a rectangular solid 10.2 cm x 8.24 cm x 1.8 cm

Solution: Volume = 10.2 cm x 8.24 cm x 1.8 cm = 151.2864 cm^3

We observe that the factor having the least number of significant figures is 1.8 cm. It contains two significant figures. Therefore, the answer is rounded off to 150 cm^3.

Division

In dividing two numbers, the answer (quotient) should contain the same number of significant figures as are contained in the number (divisor or dividend) with the least number of significant figures. Thus the answer to 528 ÷ 0.14 would be rounded off to contain *two* significant figures. The answer to 0.340 ÷ 3242 would be rounded off to contain three significant figures.

Sample Problem #5: Calculate 20.45 ÷ 2.4

Solution: 20.45 ÷ 2.4 = 8.52083

We note that the 2.4 has fewer significant figures than the 20.45. It has only *two* significant figures. Therefore, our answer should have no more than two significant figures and should be reported as 8.5.

Addition and Subtraction

In adding (or subtracting), set down the numbers, being sure to keep like decimal places under each other, and add (or subtract). Next, note which column contains the first estimated figure. This column determines the last decimal place of the answer. After the answer is obtained, it should be rounded off in this column. In other words, round to the least number of decimal places in you data.

Sample Problem #6: Add 42.56 g + 39.460 g + 4.1g

Solution:

42.56 g
39.460 g
4.1 g
Sum = 86.120 g

Since the number 4.1 only extends to the first decimal place, the answer must be rounded to the first decimal place, yielding the answer 86.1 g.

Average Readings

The average of a number of successive readings will have the same number of decimal places that are in their sum.

Sample Problem #7: A graduated cylinder was weighed three times and the recorded weighings were 12.523 g, 12.497 g, 12.515 g. Calculate the average weight.

Solution:

12.523 g
12.497 g
12.515 g
37.535 g

In order to find the average, the sum is divided by 3 to give an answer of 12.51167. Since each number extends to three decimal places, the final answer is rounded to three decimal places, yielding a final answer of 12.512 g. Notice that the divisor of 3 does not effect the rounding of the final answer. This is because 3 is an exact number - known to an infinite number of decimal places.

Name _____

Give the number of significant figures in each of the following:

_____ 402 m	_____ 34.20 lbs	_____ 0.03 sec
_____ 0.00420 g	_____ 3 200 liters	_____ 0.0300 ft.
_____ 5.1×10^4 kg	_____ 0.48 m	_____ 1 400.0 m
_____ 78 323.01 g	_____ 1.10 torr	_____ 760 mm Hg

Multiply each of the following, observing significant figure rules:

17 m x 324 m = _____ 1.7 mm x 4 294 mm = _____

0.005 in x 8 888 in = _____ 0.050 m x 102 m = _____

0.424 in x .090 in = _____ 324 000 cm x 12.00 cm = _____

Divide each of the following, observing significant figure rules:

23.4 m ÷ 0.50 sec = _____ 12 miles ÷ 3.20 hours = _____

0.960 g ÷ 1.51 moles = _____ 1 200 m ÷ 12.12 sec = _____

Add each of the following, observing significant figure rules:

3.40 m	102.45 g	102. cm
0.022 m	2.44 g	3.14 cm
0.5 m	1.9999 g	5.9 cm

Subtract each of the following, observing significant figure rules:

42.306 m	14.33 g	234.1 cm
1.22 m	3.468 g	62.04 cm

Work each of the following problems, observing significant figure rules:

A rectangular solid measures 13.4 cm x 11.0 cm x 2.2 cm. Calculate the volume of the solid.

If the density of mercury is 13.6 g/ml, what is the mass in grams of 3426.0 ml of the liquid?

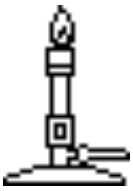
A copper cylinder, 12.0 cm in radius, is 44 cm long. If the density of copper is 8.90 g/cm^3, calculate the mass in grams of the cylinder. (assume pi = 3.14)

Chemistry Equipment

Identify each of the following pieces of equipment. Place the correct name of each in the blank on the left.

beaker	crucible	test tube	mortar and pestle	test tube rack
test tube clamp	crucible tongs	burette	ring stand	clay triangle
funnel	evaporating dish	Bunsen burner	Erlenmeyer flask	

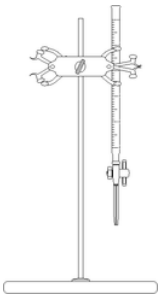
1. _____ 

2. _____ 

3. _____ 

4. _____ 

5. _____ 

6. _____ 

7. _____ 

8. _____ 

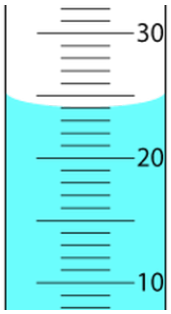
9. _____ 

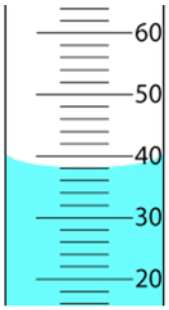
10. _____ 

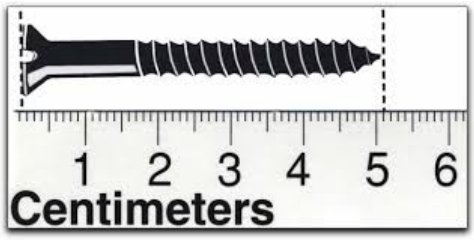
Making Measurements in the Lab:

- The generally accepted rule for recording a measurement is to estimate one more digit beyond the digit associated with the closest spaced markings.

11. Write the correct measurement in the blank below each. Include a unit with your answer.







_____ _____ _____

How many significant figures are in each of the measurements above?

_____ _____ _____

12. Which of the following pieces of lab equipment can be used to measure an amount of liquid? Circle those that can be used to measure and cross out those that should be used as a container or transfer vessel only.

Erlenmeyer flask beaker graduated cylinder volumetric pipet burette disposable pipet

13. Define/explain the following separation techniques and indicate what types of mixtures can be successfully separated using each technique.

Filtration:

Evaporation:

Distillation:

Decanting:

Chromatography:

14. A student obtained the following data in an experiment to determine the density of an unknown solid. Complete the secondary data section and answer the questions related to the laboratory activity.

a.

Primary Data:		Secondary Data:
Mass of solid:	12.00 g	Volume of Solid: _____
Volume of water in graduated cylinder:	26.00 mL	
Volume of water in graduated cylinder after solid was added:	30.52 mL	Density of Solid: _____

b. The solid is determined to be aluminum. The accepted value for the density of aluminum is 2.71 g/cm^3. What is the percent error for this lab activity? (Be sure to consider significant figures for this calculation!)

c. The following errors may have been made during the experiment. Determine how each would affect the calculated value for the density of the solid. Write the words TOO HIGH, TOO LOW, or NO EFFECT in the box after each statement.

The volume of the solid was determined first and the solid was not dried before massing.	
The solid was massed first. On the way back from the balance the student dropped the solid a piece chipped off and was lost.	
As the solid was added to the graduated cylinder, some water splashed out.	

15. A student performed an experiment where she heated tin shavings to a high temperature to produce a tin oxide, combining tin metal with oxygen from the air.

Use the following data to answer the following questions and complete the data chart below:

Data Table:	
1. Mass of dish and cover	74.14 g
2. Mass of dish, cover and tin	76.20 g
3. Mass of tin	_____ g
4. Moles of tin	_____ mol
5. Mass of dish, cover, tin-oxide product	76.76 g
6. Mass of oxygen	_____ g
7. Moles of oxygen	_____ mol

a. Determine the mole ratio between tin and oxygen:

b. Write the empirical formula and name for this compound.

c. Write the complete balanced equation for this reaction.