AP Chemistry
Summer Work Packet for 2018-2019 School Year
Mrs. Lawson

alawson@k12.wv.us - feel free to email me with questions over the summer

`WELCOME to AP chemistry – "the toughest job you'll ever love"! We will cover all the topics and labs required for the AP exam on **Thursday, May 9th 2019**. All of you will find AP chemistry to be challenging, some of you will find it to be downright hard. There is much that we need to cover and while we can do it, we will all need to work hard. You should expect this class to be <u>more difficult</u> than your first chemistry class. Since there is so much material to learn (2 semesters of college chemistry), we must stay on schedule to get through everything before the test. Many students who take AP classes are also involved in other activities that will take them away from class. You need to make sure that you are staying current with all assignments, and <u>come in for help</u> if you are falling behind.

We need to use our class time effectively during the upcoming year, and the goal of this summer packet is to review material from your first chemistry class. This assignment must be completed and ready to turn in by the **FIRST day of class** on August 21, 2018. We will also have take-home work over all breaks (Thanksgiving, Winter, and Spring) as well as snow day assignments as needed.

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**AP Chemistry will be taught with the assumption that
all students are taking the AP exam in the spring.**

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WHY DO WE HAVE TO DO SUMMER WORK?
- It is a review of basic content covered in 1st year chemistry, which you may not have seen for over a year.
- It provides the necessary fundamentals you will need to be successful in AP chemistry.
- There will not be enough time before the AP exam in May to reteach Chemistry 1 and cover all the material tested on the AP exam

SUMMER WORK ASSIGNMENTS
All work should be done neatly and clearly. All work for every problem (**including units**) needs to be shown. This is an expectation on the AP exam in the spring and we want to make this a habit early. Remember on the AP exam you must show all work including units or you will lose points. *(**Accordingly in this class and this packet, credit will NOT be given for answer-only responses!**)* SO. . . you need to show all work for every problem including
- equation you will be using (if applicable)
- knowns/unknowns (if applicable)
- plugged in equations and any algebraic work

You should spread out the following assignments over several weeks. Many of you will be taking several AP classes so **do not** try to cram these assignments in towards the end of the summer or you will get stressed out before school even starts.

Summer Work Assignments Checklist
_____ *Part 1 – Why are you taking this course?*
- This is due on the 1st day of class. Write a short concise paragraph answering the following questions (1) "Why are you taking this course?" and (2) "What do you hope/expect to get out of the course?".

_____ *Part 2 – Review AP Chemistry Course Online*
-Get a feel for what the course covers. Go to college board website https://apstudent.collegeboard.org/apcourse/ap-chemistry and review the course by clicking on the "AP Course Overview (PDF)" link and the "AP Chemistry Course and Exam Description (PDF)" link

_____ *Part 3 - Memorize Common Ions and Element Names.*
- There will be a *quiz over this the 1st week* of class. If you know me or had me before you know I am not a big memorization person; however, this is a required part of AP chemistry. They **will not** give you an ion chart or element names so it is essential that you have this under your belt prior to school beginning. I suggest notecards, phone app and lots of practice.

_____ *Part 4 – Complete Summer Packet of Chemistry 1 Review*
- This is due on the 1st day of class. *Students are encouraged to work together to complete the packet but THAT DOES NOT MEAN COPY!*

WHAT DO I NEED FOR CLASS?
(If you have issues acquiring any of these things, please let me know)
- Composition Book - college rule (get the larger page number book if possible) for your lab book. You will write up your major labs in this during the year.
- Scientific calculator. It does not *need* to be a graphing calculator, though you are welcome to use a graphing calculator if you already have one. (There will be scientific calculators available in class.)
- a LARGE notebook and binder (2 or 3 inches) to be designated **exclusively** to AP CHEMISTRY
- ENTHUSIASM AND A GREAT WORK ETHIC!!!!

AP Chemistry Class Perception and Reality

Students need to be realistic about the expectations for this course. Many students THINK they are ready for college level work, but really don't know what that means. In order to get a more realistic view of this course, I have included some perceptions entering students have, and the reality of the situation.

1. **PERCEPTION**: I can miss class (sports, activities, family vacations, jobs, field trips, etc.) and catch up on my own. I always have before.
> **REALITY**: You can't!!! In AP Chemistry, missing class is the number one reason why students fall behind, get lost, give up, and either drop the class or get a low grade. You cannot be gone for three days and expect to get caught up with a 10-minute session after school. I cannot teach in 10 minutes what it took 4.5 hours to teach earlier. You will need to come in for tutoring and/or make arrangements for assignments to catch up.

2. **PERCEPTION**: Mrs. Lawson is making this class a lot tougher than it really needs to be.
> **REALITY**: Never forget-this is a college level course NOT an advanced high school course. If I am doing my job, students in this course should learn as much as they would if they were taking freshman chemistry at any college or university in the United States. A second goal is to properly prepare students for the AP Exam in May. I cannot make the course easier and still accomplish the above goals.

3. **PERCEPTION**: If the majority of the class falls behind. Mrs. Lawson will just have to slow down so that we can catch up.
> **REALITY**: I can't!!! You will find that time is of the essence in this course. As much as I may like to, our schedule cannot be adjusted. You will need to come in for tutoring if you fall behind. Students will be expected to study the text on their own, and class time will be used more for practice problems, labs and activities than for reviewing old material. There is really no other way to cover the vast amount of material required by the AP exam. If we slow down to make the course easier, we will not cover the required subject matter, and students will have to face exam questions on material not covered in class. As a result, I will make up a schedule that will allow us to complete all required material prior to the exam, and students MUST keep to this schedule. Chemistry topics build upon each other, and students who fall behind have to be responsible and take action to catch back up.

4. **PERCEPTION**: All of this work Mrs. Lawson is talking about must be necessary only if I don't pay attention in class. I've never had to study before!
> **REALITY**: All students who expect to be successful in this course will have to spend time after school—either by getting help with an assignment, completing lab work/ homework, or reviewing for tests. If you are not willing or able to work/study after school to complete chemistry work, you should not take this course! I WILL be available almost every day both before and after school. Students are encouraged to come in for help and to form study groups with peers. Students should expect to spend time outside of class in the study of chemistry most nights. Students who have after-school jobs or who are heavily involved in after-school activities will have to budget their time accordingly.

5. **PERCEPTION**: Mrs. Lawson doesn't really expect us to do a summer assignment, and she isn't really going to test us the first week of class in August.
> **REALITY**: I am serious about this—the summer assignment is mainly a review of the first year of chemistry. This test will encourage you to do most of the memorization for the course before the school year begins. This early work will allow us to spend additional time later in the year on more difficult topics.

6. **PERCEPTION:** I have always been a "straight A" student and always will be.
> **REALITY:** AP Chemistry is challenging. Although there are many "A" grades, there are also "B's " C's "D's and sometimes "F's. If your main purpose in taking this class is to collect one more "A", you are taking the class for the wrong reason. There are easier classes in which to get an "A".

Congratulations on choosing AP Chemistry!!! It is a fun and interesting course, but both of those outcomes depend upon WORK. You should be proud that you are challenging yourself to the limit of your academic ability, and know that if you apply yourself you will reap the rewards of said work.

Mrs. Lawson

AP REQUIRED MEMORIZATION SHEET

- Names of elements
Memorize the names of elements1 to 111.

- Charges of Ions
POSITIVE IONS:

+1   +2 +3 +4 +5
Group 1 Group 2 Group 13 Group 14 Group 15
Alkali (all) Alkaline Earth (all) Boron Carbon Nitrogen
 Al^{+3} Aluminum Si^{+4} Silicon(IV) As^{+5} Arsenic (V)
 Ga^{+3} Gallium Ge^{+4} Germanium(IV) Bi^{+5} Bismuth(V)

NEGATIVE IONS:

-4 - 3 -2 -1
Group 14 Group 15 Group 16 Group 17
Carbon Nitrogen Oxygen Halogens
C^{-4} Carbide N^{-3} Nitride O^{-2} Oxide F^{-1} Fluoride
$\qquad\qquad\qquad$ P^{-3} Phosphide S^{-2} Sulfide Cl^{-1} Chloride
$\qquad\qquad\qquad\qquad$ Se^{-2} Selenide Br^{-1} Bromide
$\qquad\qquad\qquad\qquad\qquad$ I^{-1} Iodide

VARIABLE CHARGES/TRANSITION METALS:
Hydrogen +1 or -1
Iron (II) or (III) +2 or +3
Copper (I) or (II) +1 or +2
Mercury (I) or (II) +1 or +2   NO ROMAN NUMERALS
Tin (II) or (IV) +2 or +4   Silver +1
Lead (II) or (IV) +2 or +4   Zinc +2
Cobalt (II) or (IV) +2 or +4   Cadmium +2
Manganese (II) or (IV) +2 or +4   Nickel +2
Chromium (II) or (III) +2 or +3

POLYATOMICS IONS

+1	Nitrate NO_3^{-1}	Sulfite SO_3^{-2}
ammonium NH_4^{+1}	Nitrite NO_2^{-1}	Thiosulfate $S_2O_3^{-2}$
hydronium H_3O^{+1}	Perchlorate ClO_4^{-1}	Oxalate $C_2O_4^{-2}$
	Chlorate ClO_3^{-1}	Silicate SiO_3^{-2}
-1	Chlorite ClO_2^{-1}	Tetraborate $B_4O_7^{-2}$
Acetate $C_2H_3O_2^{-1}$ or	Hypochlorite ClO^{-1}	Peroxide O_2^{-2}
CH_3COO^{-1}	Iodate IO_3^{-1}	Selenate SeO_4^{-2}
Azide N_3^{-1}	Permanganate MnO_4^{-1}	Tartrate $C_4H_4O_6^{-2}$
Bromate BrO_3^{-1}	Thiocyanate SCN^{-1}	
Cyanide CN^{-1}		**-3**
Dihydrogen phosphate $H_2PO_4^{-1}$	**-2**	Phosphate PO_4^{-3}
Bicarbonate or	Carbonate CO_3^{-2}	Phosphite PO_3^{-3}
Hydrogen carbonate HCO_3^{-1}	Chromate CrO_4^{-2}	Arsenate AsO_4^{-3}
Bisulfate or	Dichromate $Cr_2O_7^{-2}$	Borate BO_3^{-3}
Hydrogen sulfate HSO_4^{-1}	Hydrogen phosphate HPO_4^{-2}	
Hydroxide OH^{-1}	Sulfate SO_4^{-2}	*Reminder NH3 = ammonia*

Prefixes for naming molecular (covalent) compounds – Greek

1 = mono-	3 = tri-	5 = penta-	7 = hepta-	9 = nona-
2 = di-	4 = tetra-	6 = hexa-	8 = octa-	10 = deca-

Elements that exist as diatomic molecules   **Othe**r weirdos P_4 and S_8
HOBr FINCl H_2 O_2 Br_2 F_2 I_2 N_2 Cl_2

Naming Acids
Binary acids – named after anion   **Oxoacids** – named after polyatomic anion, no hydro prefix
Hydro-(element)-ic acid   Ex. HBr **hydro**brom**ic acid**   -ate becomes –ic acid   Ex. H_3PO_4 phosphor**ic acid**
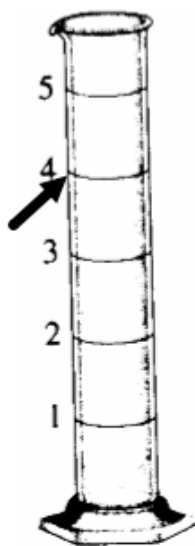   -ite becomes –ous acid   Ex. H_2SO_3 sulfur**ous acid**
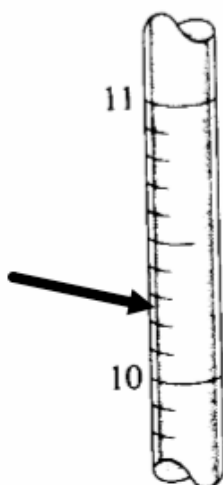
Summer Packet –Chem 1 Review

A. **Matter and Measurement**

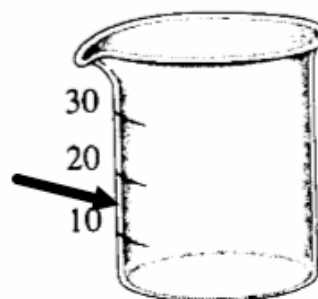– *Know rules for significant figures.*

1. For each of the following pieces of glassware, provide a sample measurement at arrow and discuss the number of significant figures and uncertainty.

a.

b.

c.

2. A student performed an analysis of a sample for its calcium content and got the following results: 14.92%, 14.91%, 14.88%, and 14.91%. The actual amount of calcium in the sample is 15.70%. What conclusion can you draw about the accuracy and precision of these results?

3. Calculate the percent error for the following measurements.

   a. The density of an aluminum block determined in an experiment was 2.64 g/cm3. (Accepted value = 2.70 g/cm3)

   b. The experimental determination of iron in ore was 16.48%. (Accepted value was 16.12%)

4. How many significant figures are in each of the following?

   a. 12

   b. 1098

   c. 2001

   d. 2.001×10^3

   e. 100

   f. 0.0000101

   g. 1000.

   h. 22.04030

   i. 1.00×10^3

5. Round of each of the following numbers to two significant figures, and write the answers in scientific notation.

   a. 0.00031254

   b. 31,254,000

   c. 35,900

   d. 0.00000399

6. Use scientific notation to express the number 480 to

   a. One significant figure

   b. Two significant figures

   c. Three significant figures

7. Perform the following mathematical operations, and express each result to the correct number of significant figures.

   a. 97.381 + 4.2502 + 0.99195

   b. 171.5 + 72.915 – 8.23

   c. 0.102 x 0.0821 x 273.5

   d. (9.04 – 8.23 + 21.954 + 81.0) / 3.1416

8. Precious metals and gems are measured in troy weights in the English system:

    24 grains = 1 pennyweight   1 grain = 0.0648 gram
    20 pennyweights = 1 troy ounce   1 carat = 0.200 gram
    12 troy ounces = 1 troy pound

    a. Diamonds are measured in carats. If a lucky girl receives a 5 carat diamond how many pennyweights is it?

    b. What is the mass of 2.3 troy ounces of gold in grams?

    c. The density of gold is 19.3 g/cm3. What is the volume of a troy pound of gold?

9. Apothecaries (druggists) use the following set of measures:

    20 grains ap = 1 scruple   8 dram ap = 1 oz. ap
    3 scruples = 1 dram ap   1 dram ap = 3.888 g

    a. An aspirin table contains 5.00 x 102 mg of active ingredient. How many grains ap of active ingredient does it contain?

    b. From (a) how many scruples?

    c. What is the mass of 1.00 scruple in grams?

10. The world record for the hundred meter dash is 9.79 s.

    a. What is the corresponding speed in units of m/s, km/hr, ft/s, and mi/hr?

    b. At this speed how long would it take to run a mile (5,820 ft)?

11. You're planning to buy a new car. One model that you're considering gets 32 miles per gallon of gasoline in highway travel. The one that your spouse likes gets 14 kilometers to the liter. Which car has the better gas mileage? (1 gal = 4 qt., 1.057 qt = 1 L)

12. You pass a road sign saying "New York – 112 km".

    a. If you drive at a constant speed of 65 mi/hr., how long should it take you to reach New York?

    b. If your car gets 28 miles to the gallon, how many liters of gasoline are necessary to travel 112 km?

13. You have a 1.0 cm3 sample of lead and a 1.0 cm^3 sample of glass. You drop each in separate beakers of water. How do the volumes of water displaced by each sample compare? Explain. (Density of lead = 11.35 g/cm^3 : Density of glass = 3.00 g/cm^3)

14. A person has a temperature of 102.5 °F. What is this temperature on the Celsius scale? On the Kelvin scale?

15. Convert the following Celsius temperatures to Kelvin and to Fahrenheit degrees.
    a. The boiling-point temperature of ethyl alcohol, 78.1°C

    b. A cold winter day, -25°C

    c. The lowest possible temperature, -273°C

    d. The melting-point temperature of sodium chloride, 801°C

16. The density of diamond is 3.51 g/cm^3. What is the volume of a 4.5 carat diamond? (1 carat = 0.200 g)

17. The volume of a diamond is found to be 2.8 mL. What is the mass of the diamond in carats? (See question #16)

18. A sample containing 33.42 g of metal pellets is poured into a graduated cylinder initially containing 12.7 mL of water, causing the water level in the cylinder to rise to 21.6 mL. Calculate the density of the metal.

19. Two spherical objects have the same mass. One floats on water; the other sinks. Which object has the greater diameter? Explain your answer.

20. What are some of the differences between a solid, a liquid, and a gas?

21. What is the difference between homogeneous and heterogeneous matter?

22. Classify each of the following as homogeneous or heterogeneous.
    a. soil
    b. the atmosphere
    c. a carbonated soft drink
    d. gasoline
    e. gold
    f. a solution of ethanol and water

23. Classify each of the following as a mixture or a pure substance. Of the pure substances, which are elements and which are compounds?
    a. Water
    b. Blood
    c. The oceans
    d. Iron
    e. Brass
    f. Uranium
    g. Wine
    h. Leather
    i. Table salt (NaCl)

24. Distinguish between physical and chemical changes.

25. List four indications that a chemical change (reaction) has occurred.

26. If you place a glass rod over a burning candle, the glass appears to turn black. What is happening to each of the following (physical change, chemical change, both, or neither) as the candle burns? Explain each answer
    a. the wax

    b. the wick

    c. the glass rod

27. The properties of a mixture are typically averages of the properties of its components. The properties of a compound may differ dramatically from the properties of the elements that combine to produce the compound. For each process described below, state whether the material being discussed is most likely a mixture or a compound, and state whether the process is a chemical change or a physical change.
    a. An orange liquid is distilled, resulting in the collection of a yellow liquid and a red solid. _____ _____
    b. A colorless, crystalline solid is decomposed, yielding a pale yellow-green gas and a soft, shiny metal. _____ _____
    c. A cup of tea becomes sweeter as sugar is added to it. _____ _____

B. **- Atoms, Molecules, and Ions**
    28. Describe Dalton's atomic theory.

    29. What discoveries were made by J.J. Thomson and Lord Rutherford? How did Dalton's model of the atom have to be modified to account for these discoveries?

    30. What is the distinction between atomic number and mass number?

    31. What is the difference between atomic mass and average atomic mass?

    32. What is an isotope?

    33. How many protons and neutrons are contained in the nucleus of each of the following atoms?
        a. $^{42}_{22}Ti$
        b. $^{64}_{30}Zn$
        c. $^{76}_{32}Ge$
        d. $^{86}_{36}Kr$
        e. $^{75}_{33}As$
        f. $^{41}_{19}K$

    34. Write the isotopic symbol for each of the isotopes below.
        a. Atomic number = 8, number of neutrons = 9
        b. The isotope of chlorine in which mass = 37
        c. Atomic number = 27, mass = 60
        d. Protons=26, neutrons =31
        e. The isotope of I with a mass number of 131
        f. Atomic number = 3, number of neutrons = 4

    35. The element copper has naturally occurring isotopes with mass number of 63 and 65. The relative abundance of the isotopes are 69.2% for mass = 62.93 amu, and 30.8% for mass = 64.93 amu. Calculate the average atomic mass of copper.

    36. An element consists of 1.40% of an isotope with mass 203.973 amu, 24.10% of an isotope with mass 205.9745 amu, 22.10% of an isotope with mass 206.9759 amu, and 52.40% of an isotope with mass 207.9766 amu. Calculate the average atomic mass and identify the element.

    37. Distinguish between the terms *family* and *period* in connection to the periodic table. For which of these terms is the term *group* also used?

    38. In the periodic table, what is the name of the following groups
        a. Group (2) b. Group (18)

    39. An ion contains 50 protons, 68 neutrons, and 48 electrons. What is its symbol and charge?

    40. Which of the following sets of elements are all in the same group in the periodic table?
        a. N, P, O
        b. C, Si, Ge
        c. Rb, Sn
        d. Mg, Ca

41. Identify each of the following elements:
   a. A member of the same family as oxygen whose most stable ion contains 54 electrons
   b. A member of the alkali metal family whose most stable ion contains 36 electrons
   c. A noble gas with 18 protons in the nucleus
   d. A halogen with 85 protons and 85 electrons

42. Would you expect each of the following atoms to gain or lose electrons when forming ions? What ion is the most likely in each case?
   a. Na
   b. Sr
   c. P
   d. Ba
   e. I
   f. O
   g. Al
   h. S

43. For each of the following ions, indicate the total number of protons and electrons in the ion. For the positive ions, predict the formula of the simplest compound formed between itself and oxide. For the negative ions predict the simplest compound formed between itself and aluminum.
   a. Fe^{+2}
   b. Fe^{+3}
   c. Ba^{+2}
   d. Cs^{+1}
   e. S^{-2}
   f. P^{-3}
   g. Br^{-1}
   h. N^{-3}

44. An element's most stable ion forms an ionic compound with bromine, having the formula XBr_2. If the ion of element X has a mass number of 230 and 86 electrons, what is the identity of the element, and how many neutrons does it have?

C. **Writing Formulas and Naming Compounds** – Do WITHOUT an ion chart! You need to have these memorized.
   45. Name each of the following compounds:
       a. $NaCl$
       b. Rb_2O
       c. $FeBr_3$
       d. Cr_2O_3
       e. $CaBr_2$
       f. CsF
       g. CaS
       h. AlI_3
       i. Al_2O_3
       j. $ZnCl_2$
       k. Li_3N
       l. Ag_2S
       m. $KClO_4$
       n. $Al_2(SO_4)_3$
       o. $BaSO_3$
       p. $KMnO_4$
       q. Sr_3P_2
       r. $Ca_3(PO_4)_2$
       s. $Pb(NO_3)_2$
       t. $NaNO_2$
       u. $K_2Cr_2O_7$

   46. Name each of the following compounds:
       a. NI_3
       b. PCl_3
       c. SO_2
       d. ICl_3
       e. SF_2
       f. N_2F_4
       g. P_2S_5
       h. N_2O_4

   47. Name each of the following compounds:
       a. HCl
       b. H_3PO_4
       c. HIO_3
       d. HNO_2
       e. HI
       f. H_2SO_3

   48. Name each of the following compounds:
       a. HgO
       b. CuI
       c. CuI_2
       d. CoI_2
       e. Na_2CO_3
       f. $NaHCO_3$
       g. $HC_2H_3O_2$
       h. NH_4NO_2
       i. Co_2S_3
       j. ICl
       k. $Pb_3(PO_4)_2$
       l. KIO_3
       m. $Ca(OH)_2$
       n. CoS
       o. S_3N_4
       p. $SF6$
       q. $NaClO$
       r. $BaCrO_4$
       s. NH_4NO_3
       t. H_2SO_4
       u. Sr_3N_2
       v. $Al_2(SO_3)_3$
       w. SnO_2
       x. Na_2CrO_4
       y. $HClO$
       z. NO

   49. Write the formula for each of the following compounds:
       a. Cesium bromide
       b. Barium sulfate
       c. Chlorine trifluoride
       d. Ammonium chloride
       e. Beryllium oxide
       f. Chlorine monoxide
       g. Magnesium fluoride
       h. Sulfur difluoride
       i. Sulfur hexafluoride
       j. Sodium dihydrogen phosphate
       k. Silicon tetrachloride
       l. Lithium nitride
       m. Chromium (III) carbonate
       n. Tin (II) fluoride
       o. Ammonium acetate
       p. Ammonium hydrogen sulfate
       q. Cobalt (III) nitrate
       r. Copper (I) sulfide
       s. Potassium chlorate
       t. Lithium tartrate

50. Write the formula for each of the following compounds:
   a. sodium oxide
   b. Sodium peroxide
   c. Potassium cyanide
   d. Copper (II) nitrate
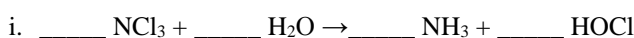   e. Silicon tetrafluoride
   f. Lead (II) sulfide

   g. Lead (IV) sulfide
   h. Copper (I) chloride
   i. Cadmium selenide
   j. Zinc sulfide
   k. Ammonium hydrogen
       phosphate

   l. Hydrobromic acid
   m. Bromous acid
   n. Perchloric acid
   o. Silicon dioxide
   p. Sodium sulfate
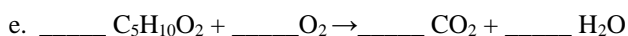   q. Aluminum hydrogen sulfate

D. **- Stoichiometry: Calculations with Chemical Formulas**
−   *Be sure to know general types of reactions and how to balance.*
−   *Be comfortable with basic dimensional analysis (conversions between mass/ moles/ particles/ units), balancing and stoichiometry.*
−   *Review how to calculate percent composition, empirical, molecular formulas, limiting reagents and percent yield.*

51. Balance the following equations:
   a. _____ CO + _____ $O_2 \rightarrow$ _____ CO_2

   b. _____ N_2O_5 + _____ $H_2O \rightarrow$ _____ HNO_3

   c. _____ PCl_5 + _____ $H_2O \rightarrow$ _____ H_3PO_4 + _____ HCl

   d. _____ CH_4 + _____ $Br_2 \rightarrow$ _____ CBr_4 + _____ HBr

   e. _____ $C_5H_{10}O_2$ + _____ $O_2 \rightarrow$ _____ CO_2 + _____ H_2O

   f. _____ $Cr(OH)_3$ + _____ $HClO_4 \rightarrow$ _____ $Cr(ClO_4)_3$ + _____ H_2O

   g. _____ $KNO_3 \rightarrow$ _____ KNO_2 + _____ O_2

   h. _____ La_2O_3 + _____ $H_2O \rightarrow$ _____ $La(OH)_3$

   i. _____ NCl_3 + _____ $H_2O \rightarrow$ _____ NH_3 + _____ $HOCl$

   j. _____ Mg_3N_2 + _____ $HCl \rightarrow$ _____ $MgCl2$ + _____ $NH4Cl$

   k. _____ $AgNO3$ + _____ $K_2SO_4 \rightarrow$ _____ Ag_2SO_4 + _____ KNO_3

   l. _____ $Al(OH)_3$ + _____ $H_2SO_4 \rightarrow$ _____ $Al_2(SO_4)_3$ + _____ H_2O

   m. _____ CH_3NH_2 + _____ $O_2 \rightarrow$ _____ CO_2 + _____ H_2O + _____ N_2

   n. _____ $(NH_4)_2Cr_2O_7 \rightarrow$ _____ Cr_2O_3 + _____ N_2 + _____ H_2O
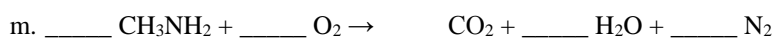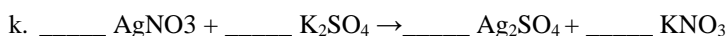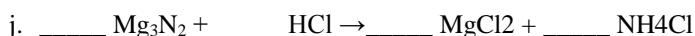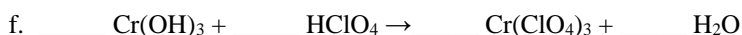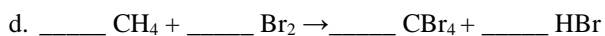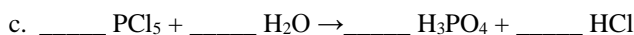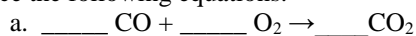
52. Write balanced chemical equations to correspond to each of the following descriptions.
   a. When solid potassium chlorate is heated it decomposes to form solid potassium chloride and oxygen.

   b. Solid zinc metal reacts with sulfuric acid to form hydrogen gas and an aqueous solution of zinc sulfate.

   c. When liquid phosphorous trichloride is added to water, it reacts to form aqueous phosphorous acid, and hydrochloric acid.

d. When hydrogen sulfide gas is passed over solid hot iron (III) hydroxide, the resultant reaction produces solid iron (III) sulfide and water vapor.

53. Indicate what type of reaction is represented in the following equations.
A. Synthesis B. Decomposition C. Single replacement D. Double replacement E. Combustion

   a. _____ $H_2 + I_2 \rightarrow 2\ HI$

   b. _____ Aluminum + iron (III) oxide $\rightarrow$ aluminum oxide + iron

   c. _____ $2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$

   d. _____ $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

   e. _____ Hydrochloric acid + ammonia $\rightarrow$ ammonium chloride

   f. _____ $2\ NaClO_3 \rightarrow 2\ NaCl + 3\ O_2$

   g. _____ $2\ Na + 2\ H_2O \rightarrow 2\ NaOH + H_2$

   h. _____ Methane + oxygen $\rightarrow$ carbon dioxide + water

54. The molecular formula of aspartame, the artificial sweetener marketed as NutraSweet, is $C_{14}H_{18}N_2O_5$.
   a. What is the molar mass of aspartame?

   b. How many moles of aspartame are present in 3769.4 grams of aspartame?

   c. How many molecules of aspartame are present in 345.9 grams of aspartame?

   d. How many oxygen atoms are present in 23.6 grams of aspartame?

55. How many moles of ammonium ions are in 0.557 g of ammonium carbonate?

56. What is the mass, in grams, of 0.0438 moles of iron (III) phosphate?

57. What is the mass, in grams, of 2.69 x 10^{23} molecules of aspirin, $C_9H_8O_4$?

58. What is the molar mass of diazepam (Valium) if 0.05570 mol has a mass of 15.86 g?

59. Determine the empirical formulas of the following compounds. (EF is 4 steps; 1-Find the mass, 2-Find the moles,3- Div by small, 4-Mult. 'til whole)
   a. 10.4 % C, 27.8 % S, and 61.7% Cl

b. Monosodium glutamate (MSG), a flavor enhancer in certain foods, 35.51 g C, 4.77 g H, 37.85 g O, 8.29g N, 13.60 g Na

60. Find the molecular formulas of the following compounds. (MFmass/EFmass = n, then MF = n(EF)) *Hint: You must find EF first*
    a. 73.8% carbon, 8.7% hydrogen, 17.5% nitrogen, molar mass = 166.0 g/mol

    b. 80.0% carbon, 20.0% hydrogen, molar mass = 30.0 g/mol

61. 4 $FeCr_2O_7$ + 8 K_2CO_3 + O_2 →2 Fe_2O_3 + 8 K_2CrO_4 + 8 CO_2
    a. How many grams of FeCr2O7 are required to produce 44.0 g of CO2?

    b. How many grams of O2 are required to produce 100.0 g of Fe2O3?

    c. If 300.0 g of FeCr2O7 react, how many grams of O2 will be consumed?

    d. How many grams of Fe2O3 will be produced from 300.0 g of FeCr2O7?

    e. How many grams of K2CrO4 are formed per gram of K2CO3 used?

62. 12. Given the reaction: S + O_2 →SO_2
    a. a. How many grams of sulfur must be burned to give 100.0 g of SO_2?

b. b. How many grams of oxygen must be required for the reaction in part (a)?

63. 6 NaOH + 2 Al →2 Na_3AlO_3 + 3 H_2
   a. How much aluminum is required to produce 17.5 g of hydrogen?

   b. How much Na_3AlO_3 can be formed from 165.0 g of sodium hydroxide?

   c. How many moles of NaOH are required to produce 3.00 g of hydrogen?

   d. How many moles of hydrogen can be prepared from 1.00 gram of aluminum?

64. The following *unbalanced* reaction takes place at high temperatures.
   ___Cr_2O_3 (s) + ___Al (l) →___Cr (l) + ___Al_2O_3 (l)
   If 42.7 g Cr2O3 and 9.8 g Al are mixed and reacted until one of the reactants is used up.
   a. Which reactant is the limiting reactant and which is in excess?

   b. How many grams of chromium will be formed?
   c. How much of excess reactant will be left?

65. Calculate the mass of water produced when 42.0 g of propane, C_3H_8, is burned with 115 g of oxygen. *Hint: Write balanced equation first*

CONGRATULATIONS, you have made it! Be proud of yourself, and get ready for a fun-filled, challenging year which will push you to your limits, make you a better student, get you very prepared for college, and prove to yourself how brilliant you really are! Remember, I am on your side and just want to help! I am trying to give you the tools to succeed. I pledge I will not ever give you an assignment or make you learn something that is not necessary for your success. If you need anything, please do not hesitate to email me or come see me! Don't be a stranger!

   See you in the fall!
   Mrs. Lawson