Welcome to AP Chemistry!

Since you have signed up for this class, I am assuming that you know the following:

1. It has a pre-requisite of Chemistry 1 and your previous science instructor's approval.
2. It is a college class. The material will not be watered down or compromised because you are taking it early. Your advantage is that you have a class smaller than your average college chemistry lecture and more of my time and help. The content is significantly harder than in the high school chemistry 1 course.
3. You are expected to take the initiative in your learning by doing the assigned work and more when necessary, by coming to class prepared, and by asking for help as soon as you need it. The course will require you to watch videos and/or complete practice problems nightly. If you do not actively pay attention to the videos and the sample problems, then this class will be very difficult.

We will be working together toward a common goal. It will be terrific if you make a "5" on the exam next May, but that is not our ultimate goal. Our goal this coming year will be to help you learn as much as possible about chemistry fundamentals, making you as prepared as possible for college. It should be less about competition and more about real learning.

Take the initiative this summer by reviewing what you have learned in your 1st year of chemistry. This packet includes notes, polyatomic ion flashcards, and practice problems. Memorize the polyatomic ions as you will need to know the name, formula, and charge. **We will begin the year with a pre-test over the packet. This will be the first grade of Q1.**

You may contact me by email this summer at packk@pcsstn.com.

Part 1: Letter of Introduction (due by Friday, June 30th)

Your first assignment is to successfully send an email to me. Use the following guidelines:

a) Use written, full sentences.
b) The subject should read "AP Chem: Introduction <insert your name here>"
c) Begin the email with a formal salutation, such as "Mrs. Pack,"
d) Now, introduce yourself to me. Tell me about yourself.
    a. What do you like to do (hobbies, movies, sports, music, interests, etc.)
    b. Do you have a job?
    c. Tell me about what is important to you (friends, family, pets, etc.)
    d. What are your strengths /weaknesses academically?
    e. What is your career goal?
    f. Is this your first AP course?
    g. Why are you taking this class?
    h. What are your study skills?
    i. Anything else you would like to tell me about yourself?

Part 2: Chemistry Basics Review

Attached are a series of notes and problems to reinforce the chemistry basics from your first year in Chemistry.

If you can't remember how to do the worksheets and/or you threw away your chemistry binder, Tyler DeWitt on YouTube is a great resource. He has videos for everything chemistry.

This assignment will review all of the prerequisite knowledge expected of you. It is the quantity, not the difficulty of the problems, that has the potential to overwhelm, so complete this worksheet over an extended period of time. By taking your time to review and understand all parts of this assignment, you will help yourself to the rigor and pacing of AP Chem.

It is VERY important that this assignment be completed individually. It will be a total waste of your time to copy the assignment. The summer assignment will be due on the first day of class on Monday, August 5. You will also take a test on basic math found in chemistry and naming compounds (including polyatomic ions) on the first day of school.

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 on the first day of class, when I will give you a quiz on them. You will always be allowed a periodic table, which makes indentifying 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. This was a focus in first year chemistry, so if you are unsure what this means, get help BEFORE the start of the year.
    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 next to the name of the

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-} then 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

Significant Figures in Measurement and Calculations

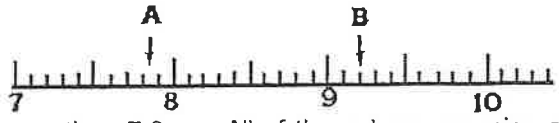
A successful chemistry student habitually labels all numbers, because the unit is important. Also of great importance is the number itself. Any number used in a calculation should contain only figures that are considered reliable; otherwise, time and effort are wasted. Figures that are considered reliable 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
(b) 4.8055 cm answer = 4.81 cm
(c) 5.333 g answer = 5.33 g
(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.

You will need to memorize these rules for the rest of the year... start memorizing over the summer!

SOLUBILITY RULES

1. Salts of ammonium (NH_4^+) and Group IA are always soluble.

2.
   a. All chlorides (Cl^-) are soluble except AgCl, Hg_2Cl_2, and $PbCl_2$ which are insoluble.
   b. All bromides (Br^-) are soluble except AgBr, Hg_2Br_2, $HgBr_2$, and $PbBr_2$ which are insoluble.
   c. All iodides (I^-) are soluble except AgI, Hg_2I_2, HgI_2, and PbI_2 which are insoluble.

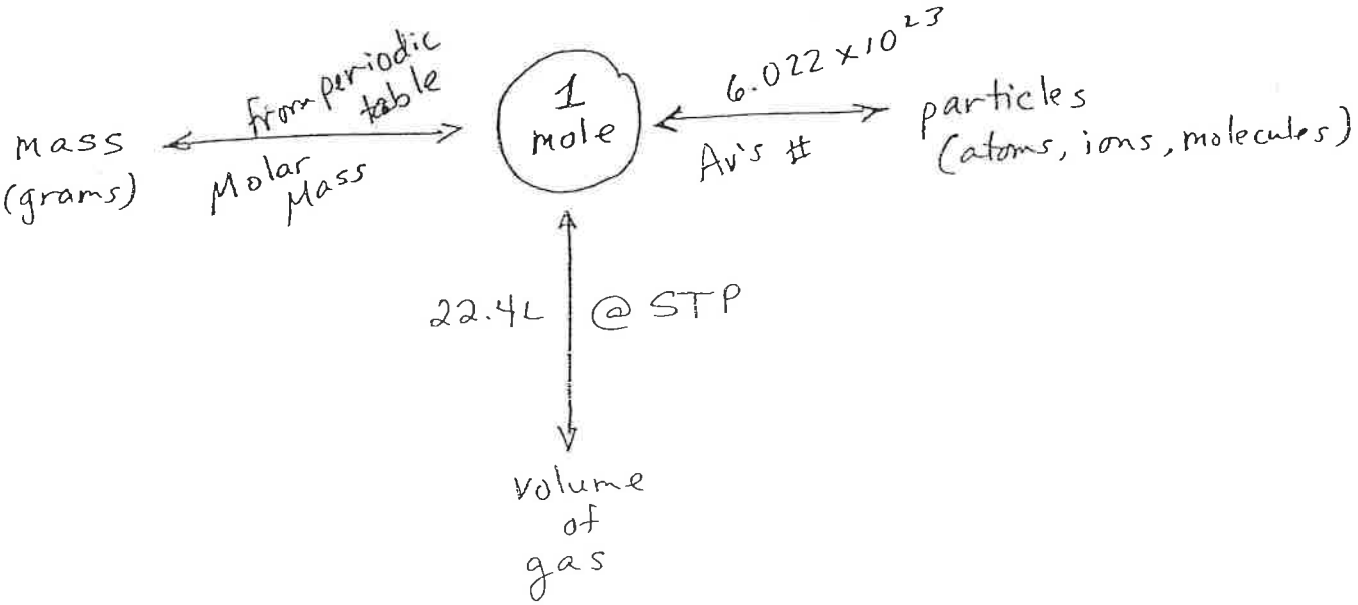
3. Chlorates (ClO_3^-), nitrates (NO_3^-), and acetates (CH_3COO^-) are soluble.

4. Sulfates (SO_4^{-2}) are soluble except $CaSO_4$, $SrSO_4$, $BaSO_4$, Hg_2SO_4, $HgSO_4$,$PbSO_4$, and Ag_2SO_4 which are insoluble.

5. Phosphates (PO_4^{-3}), and carbonates (CO_3^{-2}) are insoluble except NH_4^+ and Group IA compounds.
6. All metallic oxides (O^{-2}) are insoluble except NH_4^+ and Group IA compounds.

7. All metallic hydroxides (OH^-) are insoluble except NH_4^+ and Group IA and Group IIA from calcium down.

8. All sulfides (S^{-2}) are insoluble except NH_4^+ and Groups IA and IIA.



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 signigicant 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:

Three determinations were made of the percentage of oxygen in mercuric oxide. The results were 7.40%, 7.43%, and 7.35%. What was the average percentage?

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 ml of the liquid?

A copper cylinder, 12.0 cm in radius, is 44.0 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)

Nomenclature

Rules for Naming Ionic Compounds (metal + nonmetal)

A. Balance Charges (charges should net zero)

B. Cation is always written first (in name and formula)

C. Change the ending of the anion to -ide (unless polyatomic ion, then named as given)

I. Name these binary compounds of two non metals

IF_7_____ N_2O_5_____ XeF_2_____

N_2O_4_____ As_4O_{10}_____ SF_6_____

PCl_3_____ S_2Cl_2_____

II. Name these binary compounds with a fixed charge metal.

$AlCl_3$_____ MgO_____ BaI_2_____

KI_____ $SrBr_2$_____ Na_2S_____

CaF_2_____ Al_2O_3_____

III. Name these binary compounds of cations with variable charges. (use roman numerals)

$CuCl_2$_____ Fe_2O_3_____ SnO_____

$PbCl_4$_____ Cu_2S_____ HgS_____

AuI_3_____ CoP_____

IV. Name these compounds with polyatomic ions.

$Fe(NO_3)_3$_____ $NaOH$_____ Cu_2SO_4_____

$Ca(ClO_3)_2$_____ KNO_2_____ $NaHCO_3$_____

NH_4NO_3_____ $Cu_2Cr_2O_7$_____

Acids- Foe simplicity the acids we will be concerned with naming are really just a special class of ionic compounds where the cation is always H^+. So, if the formula has hydrogen written first, then this usually indicates that the hydrogen is a H^+ cation and that the compound is an acid. When dissolved in water, acids produce H^+ ions (also called protons, since removing the single electron from a neutral hydrogen atom leaves behind one proton).

Rules for Naming an Acid

A. When the name of an anion ends in -ide, the acid name begins with hydro-, the stem of the anion has the suffix -ic and it is followed by the word acid.

ide becomes hydro_____ic acid

Example Cl is the Chloride ion so HCl = hydrochloric acid

HF H_2S

HI HBr

B. When the anion name ends in -ite, the stem of the anion has the suffix -ous and it is followed by the word acid.

-ite becomes _____ous acid

Example: ClO_2^- is the chlorite ion, so $HClO_2$ = chlorous acid

C. When the anion name ends in -ate, the stem of the anion has the suffix -ic and it is followed by the word acid.

-ate becomes _____ic acid

Example: ClO_3^- is the chlorate ion, so $HClo_3$ = chloric acid

I like to remember - "I ate something and got sick. I spend nite at the house.

I. Name the following acids using the correct naming rules.

$HClO_4$ _____ H_2SO_4 _____ $HC_2H_3O_2$ _____

H_3PO_4 _____ HNO_2 _____ H_2CrO_4 _____

$H_2C_2O_4$ _____ H_2CO_3 _____

II. Name these compounds appropriately.

Hint: Some of these compounds are covalently bonded (nonmetal + nonmetal) so you will have to use prefixes to indicate how many of each element is in the compound: *mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, deca-.*

CO _____ NH_4CN _____ HIO_3 _____

NI_3 _____ AlP _____ OF_2 _____

$LiMnO_4$ _____ HClO _____ SO_2 _____

$CuCr_2O_7$ _____ K_2O _____ HF _____

FeF_3 _____ $KC_2H_3O_2$ _____ MnS _____

III. Write the chemical formula.

Tin (IV) phosphide _____ copper (II) cyanide _____

Magnesium hydroxide _____ sodium peroxide _____

sulfurous acid _____ lithium silicate _____

potassium nitride _____ chromium (III) carbonate _____

gallium arsenide _____ cobalt (II) chromate _____

zinc fluoride _____ dichromic acid _____

Composition

Complete the following problems showing all work.

1. A 0.941 gram piece of magnesium metal is heated and reacts with oxygen. The resulting magnesium oxide weighed 1.560 grams. Determine the percent composition of each element in the compound.

2. Determine the empirical formula given the following data for each compound:
   a) Fe = 63.53%, S = 36.47%

   b) Fe = 46.55%, S = 53.45%

3. A compound contains 21.6% sodium, 33.0% chlorine, 45.1% oxygen. Determine the empirical formula of the compound.

Balancing Equations

I. Balance the following equations with the lowest whole number coefficients.

____ S_8 + ____ O_2 → ____ SO_3

____ $C_{10}H_{16}$ + ____ Cl_2 → ____ C + ____ HCl

____ Fe + ____ O_2 → ____ Fe_2O_3

____ $C_7H_6O_2$ + ____ O_2 → ____ CO_2 + ____ H_2O

____ $KClO_3$ → ____ KCl + ____ O_2

____ H_3AsO_4 → ____ As_2O_5 + ____ H_2O

____ V_2O_5 + ____ HCl → ____ $VOCl_3$ + ____ H_2O

____ $Hg(OH)_2$ + ____ H_3PO_4 → ____ $Hg_3(PO_4)_2$ + ____ H_2O

II. Balance the following equations and indicate the type of reaction taking place:

1) ____ NaBr + ____ H_3PO_4 → ____ Na_3PO_4 + ____ HBr Type of reaction: _____

2) ____ $Ca(OH)_2$ + ____ $Al_2(SO_4)_3$ → ____ $CaSO_4$ + ____ $Al(OH)_3$ Type of reaction: _____

3) ____ Mg + ____ Fe_2O_3 → ____ Fe + ____ MgO Type of reaction: _____

4) ____ C_2H_4 + ____ O_2 → ____ CO_2 + ____ H_2O Type of reaction: _____

5) ____ $PbSO_4$ → ____ $PbSO_3$ + ____ O_2 Type of reaction: _____

6) ____ NH_3 + ____ I_2 → ____ N_2I_6 + ____ H_2 Type of reaction _____

Stoichiometry and Limiting Factor

1. Given the equation below, what mass of water would be needed to react with 10.0g of sodium oxide?
$Na_2O + H_2O \rightarrow 2NaOH$

2. $2NaClO_3 \rightarrow 2NaCl + 3O_2$
What mass of sodium chloride is formed along with 45.0g of oxygen gas?

3. $4NH_3 + 5O_2 \rightarrow 4NO + 6\ H_2O$
What mass of water will be produced when 100.0g of ammonia is reacted with excess oxygen?

4. If the reaction in #3 is done with 25.0g of each reactant, which would be the limiting factor?

5. $Na_2S + 2AgNO_3 \rightarrow Ag_2S + 2NaNO_3$
If the above reaction is carried out with 50.0g of sodium sulfide and 35.0g of silver nitrate, which is the limiting factor?

What mass of the excess reactant remains?

What mass of silver sulfide would precipitate?

6. $6NaOH + 2Al \rightarrow 2Na_3AlO_3 + 3H_2$
What volume of hydrogen gas (measured at STP) would result from reacting 75.0g of sodium hydroxide with 50.0g of aluminum?

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_3^{2-}
HPO_4^{2-}	$H_2PO_4^-$	PO_4^{3-}
NH_4^+	NO_3^-	NO_2^-
HCO_3^-	CO_3^{2-}	NCS^- SCN^-
$Cr_2O_7^{2-}$	CrO_4^{2-}	BO_3^{3-}
NH_2^-	$C_2O_4^{2-}$	MnO_4^-
$C_2H_3O_2^-$ CH_3COO^-	CN^-	OH^-
ClO_2^-	ClO^-	O_2^{2-}
$S_2O_3^{2-}$	ClO_4^-	ClO_3^-