

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.
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.

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 1<sup>st</sup> year of chemistry. This packet includes notes, polyatomic ion flashcards, and practice problems. We will begin the semester with some review, but you will find it a much easier transition if you start your year prepared.

You may contact me by email this summer at [packk@pcsstn.com](mailto:packk@pcsstn.com).

**Part 1: Letter of Introduction** (due by Friday, June 30<sup>th</sup>)

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

- 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 pre-requisite 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 Tuesday, August 1. You will also take a quiz on basic math 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 <sup>+</sup>   | Hydrogen    |
| Li <sup>+</sup>  | Lithium     |
| Na <sup>+</sup>  | Sodium      |
| K <sup>+</sup>   | Potassium   |
| Rb <sup>+</sup>  | Rubidium    |
| Cs <sup>+</sup>  | Cesium      |
| Be <sup>2+</sup> | Beryllium   |
| Mg <sup>2+</sup> | Magnesium   |
| Ca <sup>2+</sup> | Calcium     |
| Ba <sup>2+</sup> | Barium      |
| Sr <sup>2+</sup> | Strontium   |
| Al <sup>3+</sup> | Aluminum    |
|                  |             |
| Anions           | Name        |
| H <sup>-</sup>   | Hydride     |
| F <sup>-</sup>   | Fluoride    |
| Cl <sup>-</sup>  | Chloride    |
| Br <sup>-</sup>  | Bromide     |
| I <sup>-</sup>   | Iodide      |
| O <sup>2-</sup>  | Oxide       |
| S <sup>2-</sup>  | Sulfide     |
| Se <sup>2-</sup> | Selenide    |
| N <sup>3-</sup>  | Nitride     |
| P <sup>3-</sup>  | Phosphide   |
| As <sup>3-</sup> | Arsenide    |
| Type II Cations  | Name        |
| Fe <sup>3+</sup> | Iron(III)   |
| Fe <sup>2+</sup> | Iron(II)    |
| Cu <sup>2+</sup> | Copper(II)  |
| Cu <sup>+</sup>  | Copper(I)   |
| Co <sup>3+</sup> | Cobalt(III) |
| Co <sup>2+</sup> | Cobalt(II)  |
| Sn <sup>4+</sup> | Tin(IV)     |
| Sn <sup>2+</sup> | Tin(II)     |
| Pb <sup>4+</sup> | Lead(IV)    |
| Pb <sup>2+</sup> | Lead(II)    |
| Hg <sup>2+</sup> | Mercury(II) |
|                  |             |
|                  |             |
|                  |             |
|                  |             |

| Ions to Memorize  |                                  |
|---|----------------------------------|
| Cations   | Name                             |
| Ag <sup>+</sup>   | Silver                           |
| Zn <sup>2+</sup>  | Zinc                             |
| Hg <sub>2</sub> <sup>2+</sup>                             | Mercury(I)                       |
| NH <sub>4</sub> <sup>+</sup>                              | Ammonium                         |
|   |                                  |
|   |                                  |
| Anions  | Name                             |
| NO <sub>2</sub> <sup>-</sup>                              | Nitrite                          |
| NO <sub>3</sub> <sup>-</sup>                              | Nitrate                          |
| SO <sub>3</sub> <sup>2-</sup>                             | Sulfite                          |
| SO <sub>4</sub> <sup>2-</sup>                             | Sulfate                          |
| HSO <sub>4</sub> <sup>-</sup>                             | Hydrogen sulfate (bisulfate)     |
| OH <sup>-</sup>   | Hydroxide                        |
| CN <sup>-</sup>   | Cyanide                          |
| PO <sub>4</sub> <sup>3-</sup>                             | Phosphate                        |
| HPO <sub>4</sub> <sup>2-</sup>                            | Hydrogen phosphate               |
| H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>               | Dihydrogen phosphate             |
| NCS <sup>-</sup>  | Thiocyanate                      |
| CO <sub>3</sub> <sup>2-</sup>                             | Carbonate                        |
| HCO <sub>3</sub> <sup>-</sup>                             | Hydrogen carbonate (bicarbonate) |
| ClO <sup>-</sup>  | Hypochlorite                     |
| ClO <sub>2</sub> <sup>-</sup>                             | Chlorite                         |
| ClO <sub>3</sub> <sup>-</sup>                             | Chlorate                         |
| ClO <sub>4</sub> <sup>-</sup>                             | Perchlorate                      |
| BrO <sup>-</sup>  | Hypobromite                      |
| BrO <sub>2</sub> <sup>-</sup>                             | Bromite                          |
| BrO <sub>3</sub> <sup>-</sup>                             | Bromate                          |
| BrO <sub>4</sub> <sup>-</sup>                             | Perbromate                       |
| IO <sup>-</sup>   | Hypoiodite                       |
| IO <sub>2</sub> <sup>-</sup>                              | iodite                           |
| IO <sub>3</sub> <sup>-</sup>                              | iodate                           |
| IO <sub>4</sub> <sup>-</sup>                              | Periodate                        |
| C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup> | Acetate                          |
| MnO <sub>4</sub> <sup>-</sup>                             | Permanganate                     |
| Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>              | Dichromate                       |
| CrO <sub>4</sub> <sup>2-</sup>                            | Chromate                         |
| O <sub>2</sub> <sup>2-</sup>                              | Peroxide                         |
| C <sub>2</sub> O <sub>4</sub> <sup>2-</sup>               | Oxalate                          |
| NH <sub>2</sub> <sup>-</sup>                              | Amide                            |
| BO <sub>3</sub> <sup>3-</sup>                             | Borate                           |
| S <sub>2</sub> O <sub>3</sub> <sup>2-</sup>               | 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).

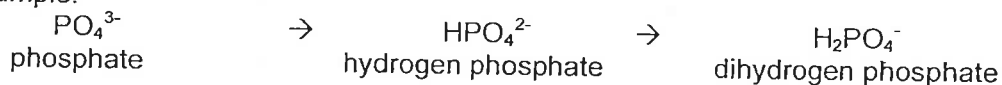
2. Metals that can form more than one ion will have their positive charge denoted by a roman numeral in parenthesis immediately next to the name of the

### Polyatomic Anions

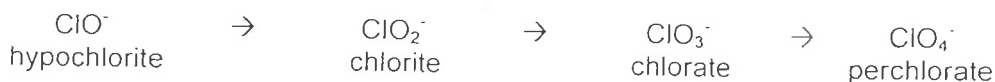
Most of the work on memorization occurs with these ions, but there are a number of patterns that can greatly reduce the amount of memorizing that one must do.

1. "ate" anions have one more oxygen than 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  $\text{SO}_4^{2-}$ , so sulfite has the same charge but one less oxygen ( $\text{SO}_3^{2-}$ )
  - b. nitrate is  $\text{NO}_3^-$ , so nitrite has the same charge but one less oxygen ( $\text{NO}_2^-$ )
2. If you know that a sulfate ion is  $\text{SO}_4^{2-}$  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:



3. Learn the hypochlorite  $\rightarrow$  chlorite  $\rightarrow$  chlorate  $\rightarrow$  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:



## 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 | $1.6 \times 10^3$ feet   | Two significant figures   |
| 1 600 feet | $1.60 \times 10^3$ feet  | Three significant figures |
| 1 600 feet | $1.600 \times 10^3$ feet | Four significant figures  |

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

- |               |                            |                          |                                      |
|---------------|----------------------------|--------------------------|--------------------------------------|
| (a) 0.0420 cm | answer = 0.0 <u>420</u> cm | (e) 2 403 ft.            | answer = <u>2 403</u> ft.            |
| (b) 5.320 in. | answer = <u>5.320</u> in.  | (f) 80.5300 m            | answer = <u>80.5300</u> m            |
| (c) 10 lb.    | answer = <u>10</u> lb.     | (g) 200. g               | answer = <u>200</u> g                |
| (d) 0.020 ml  | answer = 0. <u>020</u> ml  | (h) $2.4 \times 10^3$ kg | answer = <u>2.4</u> $\times 10^3$ 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  $0.024 \times 1244$  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 =  $2.1 \text{ cm} \times 3.24 \text{ cm} = 6.804 \text{ cm}^2$

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  $6.8 \text{ cm}^2$

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

Solution: Volume =  $10.2 \text{ cm} \times 8.24 \text{ cm} \times 1.8 \text{ cm} = 151.2864 \text{ cm}^3$

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  $150 \text{ cm}^3$ .

### 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  $528 \div 0.14$  would be rounded off to contain *two* significant figures. The answer to  $0.340 \div 3242$  would be rounded off to contain three significant figures.

**Sample Problem #5:** Calculate  $20.45 \div 2.4$

Solution:  $20.45 \div 2.4 = 8.52083$

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 your data.

**Sample Problem #6:** Add  $42.56 \text{ g} + 39.460 \text{ g} + 4.1 \text{ g}$

Solution:

$$\begin{array}{r} 42.56 \text{ g} \\ 39.460 \text{ g} \\ \underline{4.1 \text{ g}} \\ \text{Sum} = 86.120 \text{ g} \end{array}$$

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:

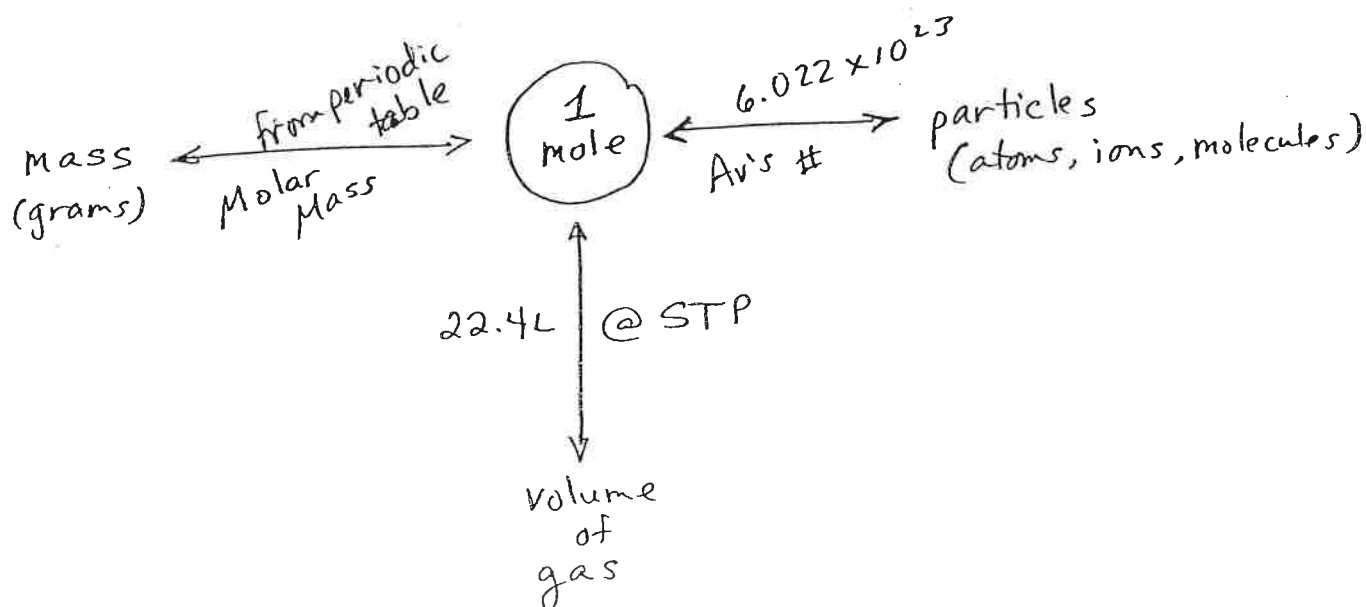
$$\begin{array}{r} 12.523 \text{ g} \\ 12.497 \text{ g} \\ \underline{12.515 \text{ g}} \\ 37.535 \text{ g} \end{array}$$

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 ( $\text{NH}_4^+$ ) and Group IA are always soluble.
2.
  - a. All chlorides ( $\text{Cl}^-$ ) are soluble except  $\text{AgCl}$ ,  $\text{Hg}_2\text{Cl}_2$ , and  $\text{PbCl}_2$  which are insoluble.
  - b. All bromides ( $\text{Br}^-$ ) are soluble except  $\text{AgBr}$ ,  $\text{Hg}_2\text{Br}_2$ ,  $\text{HgBr}_2$ , and  $\text{PbBr}_2$  which are insoluble.
  - c. All iodides ( $\text{I}^-$ ) are soluble except  $\text{AgI}$ ,  $\text{Hg}_2\text{I}_2$ ,  $\text{HgI}_2$ , and  $\text{PbI}_2$  which are insoluble.
3. Chlorates ( $\text{ClO}_3^-$ ), nitrates ( $\text{NO}_3^-$ ), and acetates ( $\text{CH}_3\text{COO}^-$ ) are soluble.
4. Sulfates ( $\text{SO}_4^{2-}$ ) are soluble except  $\text{CaSO}_4$ ,  $\text{SrSO}_4$ ,  $\text{BaSO}_4$ ,  $\text{Hg}_2\text{SO}_4$ ,  $\text{HgSO}_4$ ,  $\text{PbSO}_4$ , and  $\text{Ag}_2\text{SO}_4$  which are insoluble.
5. Phosphates ( $\text{PO}_4^{3-}$ ), and carbonates ( $\text{CO}_3^{2-}$ ) are insoluble except  $\text{NH}_4^+$  and Group IA compounds.
6. All metallic oxides ( $\text{O}^{2-}$ ) are insoluble except  $\text{NH}_4^+$  and Group IA compounds.
7. All metallic hydroxides ( $\text{OH}^-$ ) are insoluble except  $\text{NH}_4^+$  and Group IA and Group IIA from calcium down.
8. All sulfides ( $\text{S}^{2-}$ ) are insoluble except  $\text{NH}_4^+$  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. |
| _____ $5.1 \times 10^4$ 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:

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<sup>3</sup>, calculate the mass in grams of the cylinder. (assume pi = 3.14)



## Nomenclature

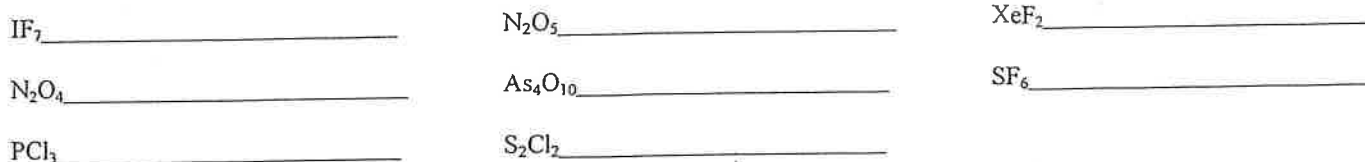
*Rules for Naming Ionic Compounds (metal + nonmetal)*

A. Balance Charges (charges should net zero)

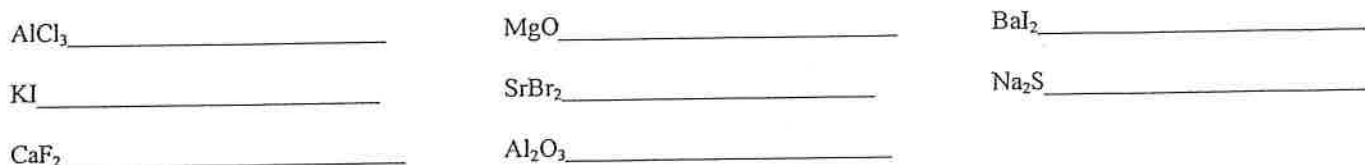
B. Cation is always written first (in name and formula)

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

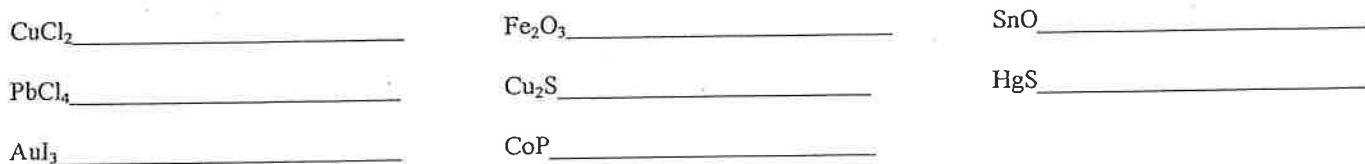
I. Name these binary compounds of two non metals



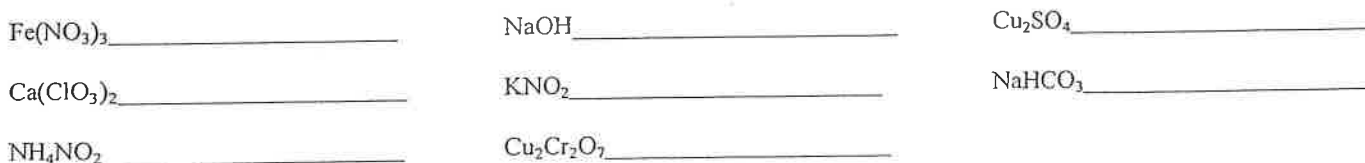
II. Name these binary compounds with a fixed charge metal.



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



IV. Name these compounds with polyatomic ions.



Acids- For simplicity the acids we will be concerned with naming are really just a special class of ionic compounds where the cation is always H<sup>+</sup>. So, if the formula has hydrogen written first, then this usually indicates that the hydrogen is a H<sup>+</sup> cation and that the compound is an acid. When dissolved in water, acids produce H<sup>+</sup> 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



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:  $\text{ClO}_2^-$  is the chlorite ion, so  $\text{HClO}_2 = \text{chlorous acid}$

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:  $\text{ClO}_3^-$  is the chlorate ion, so  $\text{HClO}_3 = \text{chloric acid}$

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.

|  |                               |   |
|--|-------------------------------|---|
| $\text{HClO}_4$ _____                  | $\text{H}_2\text{SO}_4$ _____ | $\text{HC}_2\text{H}_3\text{O}_2$ _____ |
| $\text{H}_3\text{PO}_4$ _____          | $\text{HNO}_2$ _____          | $\text{H}_2\text{CrO}_4$ _____          |
| $\text{H}_2\text{C}_2\text{O}_4$ _____ | $\text{H}_2\text{CO}_3$ _____ |   |

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-*.

|                                 |   |                      |
|---------------------------------|---|----------------------|
| $\text{CO}$ _____               | $\text{NH}_4\text{CN}$ _____            | $\text{HIO}_3$ _____ |
| $\text{NI}_3$ _____             | $\text{AlP}$ _____                      | $\text{OF}_2$ _____  |
| $\text{LiMnO}_4$ _____          | $\text{HClO}$ _____                     | $\text{SO}_2$ _____  |
| $\text{CuCr}_2\text{O}_7$ _____ | $\text{K}_2\text{O}$ _____              | $\text{HF}$ _____    |
| $\text{FeF}_3$ _____            | $\text{KC}_2\text{H}_3\text{O}_2$ _____ | $\text{MnS}$ _____   |

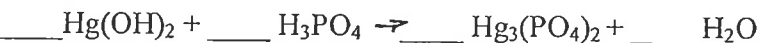
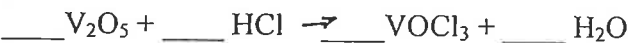
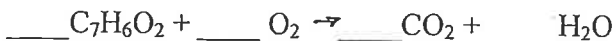
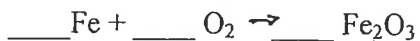
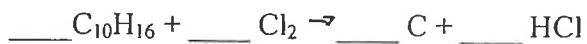
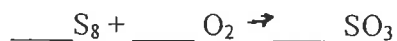
III. Write the chemical formula.

|                           |                                |
|---------------------------|--------------------------------|
| 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 _____           |

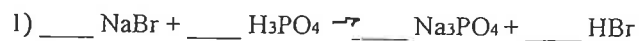


## Balancing Equations

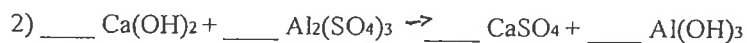
I. Balance the following equations with the lowest whole number coefficients.



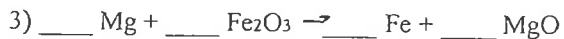
II. Balance the following equations and indicate the type of reaction taking place:



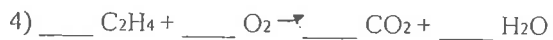
Type of reaction: \_\_\_\_\_



Type of reaction: \_\_\_\_\_



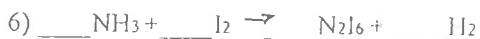
Type of reaction: \_\_\_\_\_



Type of reaction: \_\_\_\_\_



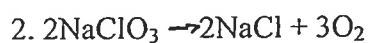
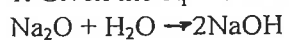
Type of reaction: \_\_\_\_\_



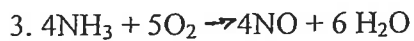
Type of reaction: \_\_\_\_\_

## Stoichiometry and Limiting Factor

1. Given the equation below, what mass of water would be needed to react with 10.0g of sodium oxide?

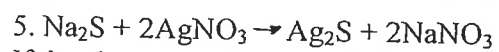


What mass of sodium chloride is formed along with 45.0g of oxygen gas?



What mass of water will be produced when 100.0g of ammonia is reacted with excess oxygen?

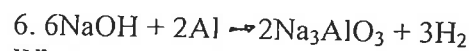
4. If the reaction in #3 is done with 25.0g of each reactant, which would be the limiting factor?



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?



What volume of hydrogen gas (measured at STP) would result from reacting 75.0g of sodium hydroxide with 50.0g of aluminum?

|                     |                             |                           |
|---------------------|-----------------------------|---------------------------|
| <b>Sulfite</b>      | <b>Sulfate</b>              | <b>Hydrogen sulfate</b>   |
| <b>Phosphate</b>    | <b>Dihydrogen Phosphate</b> | <b>Hydrogen Phosphate</b> |
| <b>Nitrite</b>      | <b>Nitrate</b>              | <b>Ammonium</b>           |
| <b>Thiocyanate</b>  | <b>Carbonate</b>            | <b>Hydrogen carbonate</b> |
| <b>Borate</b>       | <b>Chromate</b>             | <b>Dichromate</b>         |
| <b>Permanganate</b> | <b>Oxalate</b>              | <b>Amide</b>              |
| <b>Hydroxide</b>    | <b>Cyanide</b>              | <b>Acetate</b>            |
| <b>Peroxide</b>     | <b>Hypochlorite</b>         | <b>Chlorite</b>           |
| <b>Chlorate</b>     | <b>Perchlorate</b>          | <b>Thiosulfate</b>        |

