

## Summer Assignment for AP Chemistry:

I hope you are all ready for a fun, yet challenging year. You have a good foundation in basic chemistry from Chem 1, but AP Chem will be a little different. Rather than just memorizing how to do particular types of problems, you must instead really understand the chemistry behind each process and be able to apply it to all sorts of different situations. Students who finish AP Chemistry come out with a better understanding of the world around them. They also come out with a sense of accomplishment. It is a difficult class, but with determination and perseverance, you will surely succeed.

Like almost all AP level courses, this course comes with a summer assignment. This assignment is strongly recommended, but not a requirement. It will undoubtedly help you as we dive deeper, but you are not going to get a grade for the completion of the assignment. I will assume though that you are proficient at these concepts.

Start out the year on a good note. If you need help with the assignment, you will find it in your Chem 1 notes or on the internet. You may also feel free to work together with other students enrolled in the class. The assignment is designed to force you to review topics covered in Chem 1 that I expect you to be familiar with and having retained. Those topics include:

- Naming and writing formulas for ionic compounds and acids
- Empirical and Molecular formula calculations
- Stoichiometric calculations
- Balancing reaction equations
- Predicting products of the basic types of reactions

We will begin the year with a brief project that will very quickly review the material listed above, and then test on that material. However, you will want to be able to do the simple tasks attached to this document, before the project.

There is no guarantee of a 5 on the AP Chemistry Exam, but I will guarantee you the opportunity to learn chemistry at a substantially deeper level than you've seen it thus far. You will however only get out of the class what you put into it. Welcome aboard and I am pumped about getting the opportunity to work with you for another year. I know that we will learn so much together and keep each other challenged throughout the year to give our best on everything covered. If you have any questions this summer as you begin to prepare, feel free to email me at [jason.swango@fayette.kyschools.us](mailto:jason.swango@fayette.kyschools.us).

Naming and writing chemical formulas is an essential skill to know before starting AP Chemistry. Use your Chem I notes and the link below to review the concept. In Chem I you learned some polyatomic ions. However, now you need to have the most common ones memorized by the second week of school. For a little help try this link:

<http://misterguch.brinkster.net/ionic.html>

### I. Chemical Bonding IA. Chemical Formulas

1. Write formulas for the following substances:

- (A) Barium sulfate \_\_\_\_\_
- (B) Ammonium chloride \_\_\_\_\_
- (C) Chlorine monoxide \_\_\_\_\_
- (D) Silicon tetrachloride \_\_\_\_\_
- (E) Magnesium fluoride \_\_\_\_\_
- (F) Sodium oxide \_\_\_\_\_
- (G) Sodium peroxide \_\_\_\_\_
- (H) Copper (I) iodide \_\_\_\_\_
- (I) Zinc sulfide \_\_\_\_\_
- (J) Potassium carbonate \_\_\_\_\_
- (K) Hydrobromic acid \_\_\_\_\_
- (L) Perchloric acid \_\_\_\_\_
- (M) Lead (II) acetate \_\_\_\_\_
- (N) Sodium permanganate \_\_\_\_\_
- (O) Lithium oxalate \_\_\_\_\_
- (P) Potassium cyanide \_\_\_\_\_
- (Q) Iron (III) hydroxide \_\_\_\_\_
- (R) Silicon dioxide \_\_\_\_\_
- (S) Nitrogen trifluoride \_\_\_\_\_
- (T) Chromium (III) oxide \_\_\_\_\_
- (U) Calcium chlorate \_\_\_\_\_
- (V) Sodium thiocyanate \_\_\_\_\_
- (W) Cobalt (III) nitrate \_\_\_\_\_
- (X) Nitrous acid \_\_\_\_\_
- (Y) Ammonium phosphate \_\_\_\_\_
- (Z) Potassium chromate \_\_\_\_\_

2. Name each of the following compounds (Give acid names where appropriate)

- (A)  $\text{CuSO}_4$  \_\_\_\_\_
- (B)  $\text{PCl}_3$  \_\_\_\_\_
- (C)  $\text{Li}_3\text{N}$  \_\_\_\_\_
- (D)  $\text{BaSO}_3$  \_\_\_\_\_
- (E)  $\text{N}_2\text{F}_4$  \_\_\_\_\_
- (F)  $\text{KClO}_4$  \_\_\_\_\_
- (G)  $\text{NaH}$  \_\_\_\_\_
- (H)  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$  \_\_\_\_\_
- (I)  $\text{HNO}_2$  \_\_\_\_\_
- (J)  $\text{Sr}_3\text{P}_2$  \_\_\_\_\_
- (K)  $\text{Mg}(\text{OH})_2$  \_\_\_\_\_
- (L)  $\text{Al}_2\text{S}_3$  \_\_\_\_\_
- (M)  $\text{AgBr}$  \_\_\_\_\_
- (N)  $\text{P}_4\text{O}_{10}$  \_\_\_\_\_
- (O)  $\text{HC}_2\text{H}_3\text{O}_2$  \_\_\_\_\_
- (P)  $\text{CaI}_2$  \_\_\_\_\_
- (Q)  $\text{MnO}_2$  \_\_\_\_\_
- (R)  $\text{Li}_2\text{O}$  \_\_\_\_\_
- (S)  $\text{FeI}_3$  \_\_\_\_\_
- (T)  $\text{Cu}_3\text{PO}_4$  \_\_\_\_\_
- (U)  $\text{PCl}_3$  \_\_\_\_\_
- (V)  $\text{NaCN}$  \_\_\_\_\_
- (W)  $\text{Cs}_3\text{N}$  \_\_\_\_\_
- (X)  $\text{Zn}(\text{NO}_3)_2$  \_\_\_\_\_
- (Y)  $\text{N}_2\text{O}$  \_\_\_\_\_
- (Z)  $\text{HF}$  \_\_\_\_\_

### IIB. Covalent Bonding

For each compound in this list...draw their Lewis structure, determine their 3-Dimensional shape, decide if they are polar or nonpolar, and what type of Intermolecular Forces between each molecule.



Writing chemical equations is also an essential skill. In Chem I, you used the rxns packet to help you predict products of reactions. In AP Chem, you have to memorize all of that information and more! Zoikes! Don't worry; you'll learn it a little at a time. But, you should at least be able to do it with the "cheat sheet" (rxns packet). If you need help, there are several excellent links on this page: <http://www.chemtopics.com/unit02/unit2.htm>

## II. Chemical Equations

For each equation below, identify the type (synthesis, decomposition, single replacement, double replacement, or combustion), predict the products, and then write the balanced reaction. Remember to use the solubility rules for double replacement reactions and the activity series for single replacement reactions. Hint: when writing these reactions, ignore all of the information about heat, or bubbling, or mixing. These are just excess words used to make complete sentences. Simply pull out the chemical formulas.

For example:

*Solutions of silver nitrate and magnesium iodide are combined.*

This is a double replacement reaction.  $2\text{AgNO}_3 + \text{MgI}_2 \rightarrow 2\text{AgI} + \text{Mg}(\text{NO}_3)_2$

1. Ammonium sulfate reacts with barium nitrate.
2. Zinc metal is added to a solution of copper (II) chloride.
3. Propane gas ( $\text{C}_3\text{H}_8$ ) is burned in excess oxygen.
4. Solid calcium chlorate is heated strongly.
5. Magnesium and nitrogen gas are heated together.
6. Chlorine gas is bubbled through a solution of sodium bromide.
7. Solutions of lead nitrate and calcium iodide are combined.
8. Sulfuric acid is combined with sodium hydroxide.
9. Isopropyl alcohol ( $\text{C}_3\text{H}_7\text{OH}$ ) is burned in oxygen.
10. Iron metal shavings are added to hydrochloric acid.
11. Solid sodium carbonate is heated in a crucible.
12. Sodium metal is added to distilled water.

The final summer topic is stoichiometry. For help on percent composition or empirical formulas, try this link: [http://www.wwnorton.com/college/chemistry/gilbert/concepts/chapter4/ch4\\_3.htm](http://www.wwnorton.com/college/chemistry/gilbert/concepts/chapter4/ch4_3.htm) For help with stoichiometry or mole conversions, try one of the many links on this page: <http://www.chemtopics.com/unit01/unit1.htm>

### III. Stoichiometry

- 1) Find the mass percent of nitrogen in each of the following compounds:
  - a. NO
  - b. NO<sub>2</sub>
  - c. N<sub>2</sub>O<sub>4</sub>
  - d. N<sub>2</sub>O
  
- 2) Benzene contains only carbon and hydrogen and has a molar mass of 78.1 g/mol. Analysis shows the compound to be 7.74% H by mass. Find the empirical and molecular formulas of benzene.
  
  
  
  
  
  
  
  
  
  
- 3) Calcium carbonate decomposes upon heating, producing calcium oxide and carbon dioxide gas.
  - (A) Write a balanced chemical equation for this reaction.
  
  - (B) How many grams of calcium oxide will be produced after 12.25 g of calcium carbonate is completely decomposed?
  
  
  
  
  
  
  
  - (C) What volume of carbon dioxide gas is produced from this amount of calcium carbonate, at STP?

- 4) Hydrogen gas and bromine gas react to form hydrogen bromide gas.
- (A) Write a balanced chemical equation for this reaction.
- (B) 3.2 g of hydrogen gas and 9.5 g of bromine gas react. Which is the limiting reagent?
- (C) How many grams of hydrogen bromide gas can be produced using the amounts in (b)?
- (D) How many grams of the excess reactant are left unreacted?
- (E) What volume of HBr, measured at STP, is produced in (B)?
- 5) When ammonia gas, oxygen gas and methane gas ( $\text{CH}_4$ ) are combined, the products are hydrogen cyanide gas and water.
- (A) Write a balanced chemical equation for this reaction.
- (B) Calculate the mass of each product produced when 225 g of oxygen gas is reacted with an excess of the other two reactants.
- (C) If the actual yield of the experiment in (B) is 105 g of HCN, calculate the percent yield.
- 6) When solutions of potassium iodide and lead (II) nitrate are combined, the products are potassium nitrate and lead (II) iodide.
- (A) Write a balanced equation for this reaction, including (aq) and (s).
- (B) Calculate the mass of precipitate produced when 50.0mL of 0.45M potassium iodide solution and 75mL of 0.55M lead (II) nitrate solution are mixed.
- (C) Calculate the volume of 0.50M potassium iodide required to react completely with 50.0mL of 0.50M lead (II) nitrate.