**2020-2021 AP Chemistry Summer Assignment**

Dear Future AP Chemistry Student,

Welcome to AP Chemistry. I’m looking forward to working with you in 2020-2021. AP Chemistry is certainly one of the most challenging AP courses and, therefore, one of the most rewarding. This course is not simply a rehashing of first year chemistry and then going into greater depth. Several topics in AP Chemistry are not taught in first-year chemistry. These topics include kinetics, equilibrium, thermodynamics, and electrochemistry. These brand-new concepts are not terribly difficult, but may present some challenges. **The BIGGEST factor, bar none, that will determine your success in AP Chemistry is your EFFORT!** Generally, a positive attitude and a good work ethic are the keys to success in any endeavor worth achieving.

In the past, the textbook used has been **Chemistry: The Central Science, 11th edition**. A pdf file is available for you to download at the following link:

<https://drive.google.com/file/d/14G3T3htH6NxuLSbSzCK_LFFct32i-m0I/view?usp=sharing>

The school year will begin with a review of chemical formulas, chemical equations and stoichiometry. These topics are covered in the first three chapters of the textbook. Please review these chapters over the summer.

To further assist you, I have prepared this summer assignment. All of the material in the summer packet should be familiar to you. The packet is designed to **fully** prepare you for the first test which will be given on Day 3 of the new school year.

You may contact me by email: **(lshelton@bartlettschools.org)** this summer. I will try to answer your questions as soon as possible. Stay safe.

Mr. Shelton

**Tasks to be Done this Summer**

1. Join AP Chem20 on Remind.com by texting *phlogiston* to 81010. Quizizz codes, links, and other information will be posted here throughout the year.

2. Review Chapters 1 – 3 of the online version of the Brown and LeMay textbook.

3. Using the resources listed below, complete the summer assignment included in this document by Monday, August 10, 2020.

**Resources**

[Brown and Lemay, Chemistry: The Central Science](https://drive.google.com/file/d/14G3T3htH6NxuLSbSzCK_LFFct32i-m0I/view?usp=sharing)

The textbook currently in use at BHS.

[Mr. Shelton’s AP Chemistry Website](https://mrsheltonchemistry.weebly.com/)

This is where PowerPoints, student notes, and many assignments will be posted.

[Chemical Nomenclature Notes](https://www.lcps.org/cms/lib/VA01000195/Centricity/Domain/12702/Unit%205%20-%20Notes%20Nomenclature%20DLB%20Key%20Pages%201-7.pdf)

A must-read resource on chemical nomenclature. Ignore at your peril, especially naming acids.

And finally…, **YOUR 1ST YEAR CHEMISTRY NOTES!**

**The First Test**

The test will be divided into 2 sections without time limits. Time limits are encouraged by the AP Chemistry testing committee to reflect the demands of the newly redesigned AP Exam. It is their position that if students truly know the basic material, they should be able to access that knowledge within an acceptable period of time. We will focus on time limits later.

**Part I:** no calculator

Memorized items such as polyatomic ions, ions and charges, compound formulas, diatomic molecules, balancing equations, identifying reaction types, predicting products, other concepts and data evaluation that will not require a calculator.

**Part II:** calculator

Integrated problems: calculations involving the application of all material in Part 1plus stoichiometry, percent yield, limiting reactants, empirical and molecular formulas.

**The Summer Assignment**

You are to use this assignment to guide you in your preparation for the first test on Wednesday, August 12. Some of the assignments are in a game format. Although these assignments will not be collected for a grade, it is in your best interest to work out the problems in order to do well on the test. Additionally, there will be online progress checks in Quizizz that will serve as a guide for you and for me. The opening of a Quizizz will be announced via Remind or posted on my AP chemistry website. Be on the lookout for these updates. I anticipate no more than three Quizizz throughout the summer.

* **Items to memorize**

[The AP Chemistry Summer Quizlet](https://quizlet.com/423975634/ap-chemistry-summer-quiz-flash-cards/)

* **Naming compounds and writing formulas**

 [ionic compounds](http://www.sciencegeek.net/Chemistry/taters/Unit2IonicCompoundFormulas.htm)

 [covalent compounds](http://www.sciencegeek.net/Chemistry/taters/Unit3BinaryNomenclature.htm)

* **Writing and balancing equations**

 [balancing equations](http://www.sciencegeek.net/APchemistry/APtaters/EquationBalancing.htm)

 [reaction types](http://www.sciencegeek.net/Chemistry/taters/EquationIdentification.htm)

 [predicting products](http://www.sciencegeek.net/APchemistry/APtaters/ReactionProducts.htm)

* **Molar Mass, Conversions and Stoichiometry**

[calculating molar mass](http://www.sciencegeek.net/Chemistry/taters/Unit2FormulaMass.htm)

[conversions](http://www.sciencegeek.net/Chemistry/taters/Unit4GramMoleVolume.htm)

[stoichiometry 1](http://www.sciencegeek.net/Chemistry/taters/Unit4Stoichiometry_B.htm)

[stoichiometry 2](http://www.sciencegeek.net/Chemistry/taters/Unit4Stoichiometry.htm)

* **Calculating Percent Mass, Empirical, Molecular and Hydrate Formulas**

1. What is the percent by mass of carbon in one mole of sodium carbonate?

~~2. In an experiment, a student gently heated a hydrated copper compound to remove the water of hydration. The following data was recorded. Calculate the experimental percent of water in the compound.~~

3. A 100. gram sample of compound of sodium contains 36.5 grams of sodium, 25.4 grams of sulfur, and 38.1 grams of oxygen. What is the empirical formula for the compound? Na2SO3

4. Fat makes up a major portion of all soaps. A fat used in many soaps is 76.5% carbon, 12.2% hydrogen, and 11.3% oxygen. What is its empirical formula? What is the molecular formula of a fat with a molecular mass of 705 g/mol? C9H17O Molecular: C45H85O5

5. A sample of a substance is determined to be composed of 0.89 g of potassium, 1.18 g of chromium, and 1.27 g of oxygen. Calculate the empirical formula. K2Cr2O7

6. Strychnine, a deadly poison, has a molecular mass of 334 g/mol and a percentage composition of 75.42% carbon, 6.63% hydrogen, 8.38% nitrogen, and the balance oxygen. What is the molecular formula of strychnine? (Hint: DO NOT round up the number found for carbon in the empirical formula.) C21H22N2O2 (EF and MF)

7. A 10. gram sample of a compound contains 7.22 grams of magnesium and 2.78 grams of nitrogen. What is its empirical formula? Mg3N2

8. An organic compound with a molecular mass of 140 g/mol is 68.54% carbon, 8.63% hydrogen, and 22.83% oxygen. What is the molecular formula of the compound? EF: C4H6O MF: C8H12O2

* **Stoichiometry Percent Yield, Limiting Reactants, Empirical, Molecular and Hydrate Formulas**

1. What mass of precipitate forms when a solution containing 6.24 g of potassium sulfide is reacted with a solution containing 19.2 g barium nitrate? K2S (aq) + Ba(NO3)2 (aq) → BaS(s) + 2 KNO3 (aq) LR- K2S 9.59 g BaS

2a) What mass of water forms when solutions containing 3.27 g of hydrochloric acid and 7.62 g of calcium hydroxide are mixed? 2 HCl (aq) + Ca(OH)2 (aq) → CaCl2(aq) + 2 H2O(l) LR- HCl 1.62 g H2O

2b) How much, in grams, of the reactant in excess remains unreacted? 4.30 g Ca(OH)2

3. If 16.8 grams of copper is placed into a solution containing 25.65 g of silver nitrate, what mass of silver will be produced? Cu (s) + 2 AgNO3 (aq) → Cu(NO3)2 (aq) + 2 Ag (s) LR- AgNO3 16.29 g Ag

4. If 19.8 g of ammonium phosphate is mixed in solution with 12.4 g of calcium nitrate, what mass of precipitate is produced? 2 (NH4)3PO4 (aq) + 3 Ca(NO3)2 (aq) → Ca3(PO4)2 (s) + 6 NH4NO3 (aq) LR- Ca(NO3)2 20.6 g Ca3(PO4)2

5. For the reaction PCl3 + Cl2 → PCl5, 16.0 g of phosphorus trichloride is reacted with 13.2 g of chlorine gas. What is the maximum mass of phosphorus pentachloride that could be produced? LR- PCl3 24.3 g PCl5

6. In a combustion reaction, 24.3 g of methanol (CH3OH) was burned in the presence of 14.7 g of oxygen.

2CH3OH (l) + 3O2 (g) → 2CO2 (g) + 4H2O (l) LR- O2

a) How much, in grams, of the excess reactant was leftover? 14.6 g CH3OH unreacted

b) What mass of water was produced? 11.0 g H2O

7. 42.7 g of solid calcium oxide was mixed with 72.6 g of water. CaO (s) + H2O (l) → Ca(OH)2 (aq)

a) What mass of product was formed? LR- CaO 56.4 g Ca(OH)2

7b) What mass of the reactant in excess was not reacted? 58.9 g H2O

8. 5.0 g acetic acid is mixed with 15.0 g of baking soda,

NaHCO3. CH3COOH + NaHCO3 (s) → NaCH3COO (aq) + CO2 (g) + H2O (l)

a) what mass of gas can be produced? 3.4 g CO2 b) what volume of gas at STP would be produced? 1.7 L CO2

9. 37.4 g iron (II) chloride in solution was mixed with 42.3 g potassium permanganate in the presence of acid. The following reaction occurred: \_FeCl2 + \_KMnO4 + \_HCl → \_FeCl3 + \_MnCl2 + \_KCl + \_H2O

a) What mass of iron (III) chloride was produced? 47.9 g FeCl3 LR- FeCl2

b) How many moles of HCl were required? 0.472 moles HCl

c) What mass of the excess reactant was not used? 33.0 g KMnO4

10. In the reaction 2NH3 → 3H2 + N2 if 12.0 g of ammonia experimentally produced only 1.87 g of hydrogen, what was the percent yield? 87.6 %

11 Excess hydrochloric acid was reacted with 8.57 g of calcium carbonate and produced 3.11 g of CO2.

a) What was the percent yield? 2HCl (aq) + CaCO3 (s) → CaCl2 (aq) + CO2 (g) + H2O (l) 82.5 % yield for CO2

b) In another experiment, using 9.21 g of calcium carbonate, 1.90 L of CO2 was collected. What is the percent yield? 92.2 % yield for CO2