

AP CHEMISTRY SUMMER ASSIGNMENT 2020

Congratulations on your decision to embark upon a journey this year as an AP chemistry student! This will be a challenging year, but when we reach the end you will be amazed at what you have accomplished. This school year was far from normal, however, that does not give us a reason not to try our hardest this coming school year. Regardless of how we return to school this year, I can promise you that I will give you 100% dedication every day and I hope to see that from you.

The goal of this course is to cover and learn of the necessary material to perform well on the AP Chemistry exam. This course is equally important for preparing you for future chemistry courses in your college careers. I have been extremely pleased to have former AP students tell me that their preparation for college chemistry directly related to the effort they put forth in my class, and have greatly benefited from the course. It is my goal to give you the same experience.

AP Chemistry is a math oriented course. I cannot stress this enough. We will learn to speak the language of chemistry through a deep understanding and mastery of mathematical skills. We will work all year to build up your math skills and that will start with your summer work. This packet has been adjusted from previous years to reflect that you do not have a textbook in your possession over the summer, therefore this assignment will be a series of practice problems. It is absolutely essential that you show all your work, and attempt every problem. 90% of chemistry is learning to solve new problems, and I can give you the best feedback if I can see your thought process on paper.

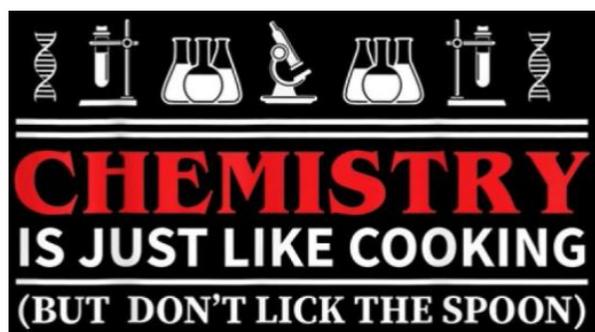
These integrative problems are uniquely challenging and incorporate several concepts. AP style problems will never test a single skill, you will use and apply a set of skills to solve each problem. This type of problem solving is what you will need to master for the AP exam. I promise we will challenge and build upon the way you problem solve.

Chemistry labs will also challenge your problem solving skills as well as develop your writing skills. Much of your lab experience will be collecting data, making predictions, and reasoning through practice problems that ask you to analyze the data you collect. Lab reports will be completed in a bound composition book and will reflect the standards held for chem lab reports at the college level. These reports will be a departure from the write-ups you have done in previous science courses, and will push you to become better writers.

I look forward to having you next year and cannot wait to get started on our chemistry adventure!

See you soon!

Miss. Gerardi



Assignment 1: Flash Cards

For this assignment you will be making flash cards to help you familiarize yourself with some basic information, because the sooner this information gets into your head, the more prepared you will be for class. You will need sets of flash cards for common ions (both monoatomic and polyatomic) and their charges, strong acids and bases, common acids, and a flow chart (or any graphic organizer of your choice) to organize the acid nomenclature rules. If there is overlap between the common acids list and the strong acids, you can consolidate and there is no need to repeat acids, just ensure all relevant information is included on the flash card. We will use these flash cards on the first day of class, so please bring them with you.

Assignment 2: Make a varsity tutors account

This website is a fantastic resource to get multiple choice questions by topic as well as a question by question breakdown. You do not need to pay for an account, the website will let you sign up for free. This website will be used throughout the year for review and homework activities, and can also be used as an independent study tool. Go to the link provided below and click the orange button that says "Create an Account". Please record your log in information somewhere where you will not lose it!

https://www.varsitytutors.com/ap_chemistry-practice-tests

Assignment 3: Practice Problems

For all of the assigned practice problems, please show all your work. If you attempt to turn in the summer packet without work being shown, you will not receive credit. These problems will ask you to focus on basic chemistry concepts as well as the math behind the concepts. Most of the practice problems will be very similar to those included in the stoichiometry assignments created for your time during quarantine. *I will have resources posted again on the AP Chemistry Schoology page for your reference while you work through these problems.*

Assignment 1: Flash Cards

This assignment is usually textbook based, however, given that you do not have textbooks, I have provided tables of the information you will turn into flash cards. As a reminder, please have these cards completed and with you on the first day of class.

Monatomic Cations		
1+	H ⁺	hydrogen
	Li ⁺	lithium
	Na ⁺	sodium
	K ⁺	potassium
	Rb ⁺	rubidium
	Cs ⁺	cesium
	Ag ⁺	silver
2+	Mg ²⁺	magnesium
	Ca ²⁺	calcium
	Sr ²⁺	strontium
	Ba ²⁺	barium
	Zn ²⁺	zinc
	Cd ²⁺	cadmium
3+	Al ³⁺	aluminum
	Bi ³⁺	bismuth

Monatomic Anions		
1-	H ⁻	hydride
	F ⁻	fluoride
	Cl ⁻	chloride
	Br ⁻	bromide
	I ⁻	iodide
2-	O ²⁻	oxide
	S ²⁻	sulfide
3-	N ³⁻	nitride
	P ³⁻	phosphide
4-	C ⁴⁻ (C ₂ ²⁻)	carbide

Polyatomic Anions	
OH ⁻	hydroxide
CN ⁻	cyanide
O ₂ ²⁻	peroxide
CO ₃ ²⁻	carbonate
C ₂ O ₄ ²⁻	oxalate
NO ₂ ⁻	nitrite
NO ₃ ⁻	nitrate
PO ₃ ³⁻	phosphite
PO ₄ ³⁻	phosphate
SO ₃ ²⁻	sulfite
SO ₄ ²⁻	sulfate
S ₂ O ₃ ²⁻	thiosulfate
ClO ⁻	hypochlorite
ClO ₂ ⁻	chlorite
ClO ₃ ⁻	chlorate
ClO ₄ ⁻	perchlorate
CH ₃ COO ⁻ or C ₂ H ₃ O ₂ ⁻	acetate

Polyatomic Cations	
NH ₄ ⁺	ammonium
H ₃ O ⁺	hydronium

Strong Acids		Strong Bases	
Hydrobromic acid	HBr	Barium hydroxide	Ba(OH) ₂
Hydrochloric acid	HCl	Calcium hydroxide	Ca(OH) ₂
Hydroiodic acid	HI	Lithium hydroxide	LiOH
Nitric acid	HNO ₃	Potassium hydroxide	KOH
Perchloric acid	HClO ₄	Sodium hydroxide	NaOH
Sulfuric acid	H ₂ SO ₄	Strontium hydroxide	Sr(OH) ₂

Weak acids		Weak bases	
Acetic acid	CH ₃ COOH	Ammonia	NH ₃
Carbonic acid	H ₂ CO ₃	Diethylamine	(CH ₃ CH ₂) ₂ NH
Formic acid	CHOOH	Methylamine	CH ₃ NH ₂
Hydrocyanic acid	HCN	Sodium bicarbonate	NaHCO ₃
Hydrofluoric acid	HF		
Phosphoric acid	H ₃ PO ₄		

Names of Common Acids

Binary Acids

HF, hydrofluoric acid

HCN, hydrocyanic acid*

HCl, hydrochloric acid

H₂S, hydrosulfuric acid

HBr, hydrobromic acid

HI, hydroiodic acid

*Contains three elements but is named as a binary acid

Oxoacids

HClO₄, perchloric acid

HNO₃, nitric acid

HClO₃, chloric acid

HNO₂, nitrous acid

HClO₂, chlorous acid

HClO, hypochlorous acid

H₂SO₄, sulfuric acid

H₂SO₃, sulfurous acid

H₃PO₄, phosphoric acid

H₂CO₃, carbonic acid

H₃PO₃, phosphorous acid

Organic Acids

HCOOH, formic acid

CH₃COOH, acetic acid

C₆H₅COOH, benzoic acid

Nomenclature of Acids

The acids we will consider in Chem 1310 fall into three categories:

- 1) **binary acids**: compounds of hydrogen and a non-metal
- 2) **oxoacids**: compounds of hydrogen, oxygen, and a third element
- 3) **organic acids**: compounds that contain the carboxylic acid group, $-\text{CO}_2\text{H}$

The name of an acid is closely connected to that of the anion from which it is derived. There is a separate rule for each category of acid.

- 1) For **binary acids**: Add the prefix, *-hydro*, to the root of the non-metal's name, and change the suffix of the anion name from *-ide* to *-ic*.

Example: The stem for chlorine is *chlor*.



In naming an acid based on the element, sulfur, the full name, **sulfur-** is used. Thus, H_2S is *hydrosulfuric* acid, rather than *hydrosulfic* acid, as the name "sulfide" might suggest. The compound, H_2S , is called hydrogen sulfide when it is in pure form but it is called hydrosulfuric acid when its acidic properties in aqueous solution are being discussed.

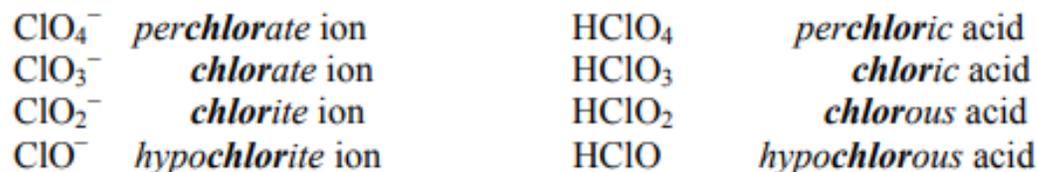
- 2) For **oxoacids**: Change the suffix, *-ate*, to *-ic*; change the suffix, *-ite*, to *-ous*.

Example: The stem for nitrogen is *nitr*.



The prefixes *per-* and *hypo-* are used in the names of oxoacids just as they are used in the names of oxoanions.

Example: There are four oxoacids that contain chlorine.



Assignment 3: Practice Problems

Balancing Reactions and Identifying Types of Reactions

Remember the type of reactions are synthesis, decomposition, single replacement, and double replacement.

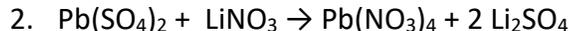


Stoichiometry Practice

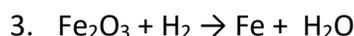
For these problems, you will be practicing essential skills for solving nearly every chemistry problem you will face this year. Remember, there are resources posted on Schoology to help you through these problems. Don't forget to balance these problems before you begin to solve!



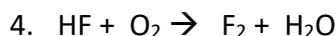
How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid?



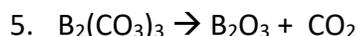
How many grams of lithium nitrate will be needed to make 250 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?



How many grams of iron can be made from 16.5 grams of Fe_2O_3 assuming that you have an excess amount of hydrogen gas?



How many liters of fluorine gas can be produced when 0.67 L of HF reacts with excess O_2 ?



Boron carbonate decomposes into boron oxide and carbon dioxide. How many moles of CO_2 are produced when 5.0 mol of boron carbonate decomposes completely?

Stoichiometry with Limiting Reactants

For each of the following problems you will need to balance the reaction and determine the limiting reactant before solving the problem. Remember, there are resources posted on Schoology to help you through these problems.

6. Determine the grams of sodium chloride produced when 10.0 g of sodium react with 10.0 g of chlorine gas according to the equation: $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$

7. Determine the mass of lithium hydroxide produced when 50.0g of lithium are reacted with 45.0g of water according to the equation: $\text{Li} + \text{H}_2\text{O} \rightarrow \text{LiOH} + \text{H}_2$

8. Determine the percent yield of water produced when 68.3 g of hydrogen reacts with 85.4g of oxygen and 86.4g of water are collected according to the equation: $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$

Intermolecular Forces Short Response

For the short response problem below, please answer all parts of the problem and label your responses clearly. I have provided links and resources on Schoology for this information.

- a. Identify the three main intermolecular forces.

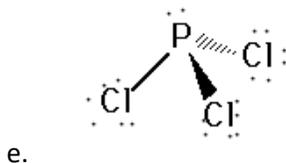
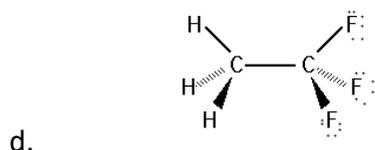
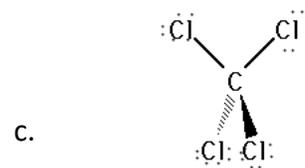
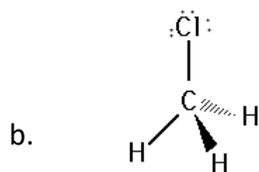
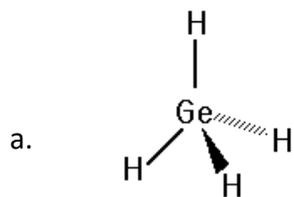
- b. Describe what makes each of these forces unique, being sure to include electron behavior in your descriptions.

- c. Draw the Lewis Structures for the following compounds
Methane (CH_4)
Methanol (CH_3OH)
Iodomethane (CH_3I)
Methylamine (CH_3NH_2)

- d. Rank the compounds above from lowest to highest boiling point and provide a detailed explanation for your ranking choices.

Polarity and Molecular Shape Review

For the problems below, identify the polar and nonpolar bonds present in each molecule. State whether the molecule is polar or nonpolar, and if the molecule is polar, draw in the molecular dipole.



For the images below, fill in the blanks on the chart below with the proper electron pair geometry and molecular geometry terms. See Schoology for resources for this information.

Number of Electron Dense Areas	Electron-Pair Geometry	Molecular Geometry				
		No Lone Pairs	1 lone Pair	2 lone Pairs	3 lone Pairs	4 lone Pairs
 2	<input type="text"/>	 <input type="text"/>				
 3	<input type="text"/>	 <input type="text"/>	 <input type="text"/>			
 4	<input type="text"/>	 <input type="text"/>	 <input type="text"/>	 <input type="text"/>		
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