

AP Chemistry

Summer Assignment 2020

- **Read the letter on the next page.**
 - **Complete the 9 worksheets in this packet.** ▪ THEY ARE DUE ON THE FIRST DAY OF SCHOOL!
 - A Pre-Test will be given based on this Homework
 - **Online AP Chemistry Test Prep book**
 - <https://openstax.org/details/books/chemistry-2e>
- Online resources:** [khanacademy.com](https://www.khanacademy.com)
[njctl.org](https://www.njctl.org)
- **Email me for your questions** ▪ ukala@houstonisd.org

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Hello future AP chemistry student,

This summer, you will be reviewing a few and basic chemistry concepts independently especially stoichiometry and solutions. Your goal is to understand the concepts to be ready tie different sections of chemistry into a cohesive knowledge. Given that AP chemistry is a rigorous and fast-paced college course, your solid understanding of the foundations of modern chemistry is necessary for your success in the program.

Who will succeed in AP chemistry?

AP chemistry is a **fast-paced**, challenging course for those students who can consistently work hard, pick up ideas quickly, and manage their time effectively. You will need to keep yourself on task, make certain you understand each day's ideas *before you leave the classroom*, and practice by working on chemistry problems regularly. Never tell yourself "I don't have chemistry homework." You may have a day where there is nothing due the next day, but you always have your book to read, you always have current and old chapters to review, and you always have your **AP practice test** with which to review.

Much like any college course, you are expected to **TEACH YOURSELF** the material. What we do in class is simply an added benefit.

If you are willing to put in the time and effort every day, we will work with you to make certain you do well in class and get a 5 on the AP exam. If you are smart but unwilling to do extra practice or homework, you should make an appointment with me right away to change to another science class where you can be a star. Success in AP chemistry certainly requires intelligence, but perseverance, grit and consistent effort are better measures of success in class.

Supplies that you will need:

For the class, you will need a scientific **calculator** (TI - 84), but any graphing calculator is fine for everything **except the multiple choice portions of the exams**.

You will need a **notebook/binder** for your notes. You will be surprised at the value those early notes will have for the AP exam in May. Keep all the guide sheets given to you as they will be valuable during your review.

Early on, get familiar with any **AP chemistry book**. Using this book independently will help you prepare for this class as well as the AP exam. You may also want download or access the Rice University chemistry OpenStax textbook : <https://openstax.org/details/books/chemistry>.

Parting Shots:

I am here to help you learn college-level chemistry. ***I am also here to help some of you to prepare for the rigors of a "real" college class.*** Every former AP student will tell you truthfully that their college science classes is a lot easier because of their high school AP work. With this, I am looking forward to a productive school year with you. Your success in class is my business!

Name: _____ Per _____ Date _____

AP Chemistry Worksheet 1: Significant Figures and Dimensional Analysis

For each problem below, write the equation and show your work. Always use units and box your final answer.

1. Round each of the following numbers to four significant figures, and express the result in scientific notation:

a. 300.235800 _____

b. 456,500 _____

c. 0.006543210 _____

d. 0.000957830 _____

e. - 0.035000 _____

2. Carry out the following operations, and express the answers with the appropriate number of significant figures: a. $1.24056 + 75.80$ _____

b. $23/67 - 75$ _____

c. $890,000 \times 112.3$ _____

d. $78,132 / 2.50$ _____

3. Perform the following conversions: a. 8.60 mL to L _____

b. 3.00 days to s _____

c. 200 ml water to grams of water _____

d. 75.00 g CO₂ to mole CO₂ _____

e. 32.5 L H₂ to cm³ _____

4. The density of pure silver is 10.5 g/cm³ at 20°C. If 5.25 g of pure silver pellets are added to a graduated cylinder containing 11.2 mL of water, to what volume level will the water in the cylinder rise?

5. The density of air at ordinary atmospheric pressure and 25°C is 1.19 g/L. What is the mass, in kilograms, of the air in a room that measures 12.5 x 15.5 x 8.0 ft³?

AP Chemistry Worksheet 2: Structure of the Atom and the Periodic Table

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Let's pretend you are holding two atoms of carbon that are isotopes. Describe what the two atoms have in common and what they have different.

2. Fill in the gaps in the following table, assuming each column represents a neutral atom:

Nuclear Symbol	$^{39}_{19}\text{K}$				
Protons	19	25			82
Neutrons		30	64		
Electrons			48	56	
Mass #	39			137	207

3. Write the correct symbol, with both superscripts and subscripts, for each of the following :

(a) the isotope of sodium with mass 23

(b) the atom of vanadium that contains 28 neutrons

(c) the isotope of chlorine with mass 37

(d) an atom of magnesium that has an equal number of protons and neutrons

4. Give the name and the common ionic charge for elements found in each of these groups of the Periodic Table:

(a) Group 1

(b) Group 2

(c) Group 17

(d) Group 18

5. Describe where each type of element is found on the Periodic Table.

(a) Metals

(b) Non-metals

(c) Transition metals

(d) Lanthanides

(e) Actinides

6. Identify the 7 diatomic elements.

AP Chemistry Worksheet 3: Naming Inorganic Compounds

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Give the name for each of the following ionic compounds:

- a. AlF_3
- b. $\text{Fe}(\text{OH})_2$
- c. $\text{Cu}(\text{NO}_3)_2$
- d. $\text{Ba}(\text{ClO}_4)_2$
- e. Li_3PO_4
- f. Hg_2S
- g. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
- h. $\text{Cr}_2(\text{CO}_3)_3$
- i. K_2CrO_4
- j. $(\text{NH}_4)_2\text{SO}_4$

2. Write the chemical formula for each of the following compounds:

- a. copper (I) oxide
- b. potassium peroxide
- c. aluminum hydroxide
- d. zinc nitrate
- e. mercury (I) bromide
- f. iron (III) carbonate
- g. sodium hypobromite

3. Give the name or chemical formula, as appropriate, for each of the following acids:

- a. HBrO_3
- b. HBr
- c. H_3PO_4
- d. hypochlorous acid
- e. iodic acid
- f. sulfurous acid

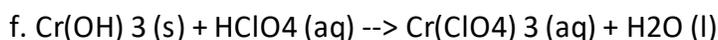
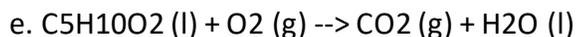
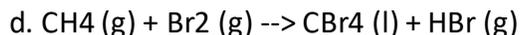
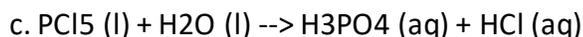
4. Give the name or chemical formula, as appropriate, for each of the following molecular substances:

- a. SF_6
- b. IF_5
- c. XeO_3
- d. dinitrogen tetroxide
- e. hydrogen cyanide
- f. tetraphosphorous hexasulfide

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AP Chemistry Worksheet 5: Balancing Equations & Patterns of Reactivity

For each problem below, write the equation and show your work. Always use units and box in your final answer.



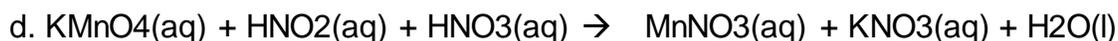
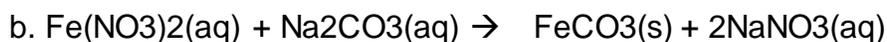
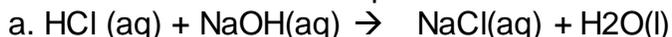
2. Write balanced chemical equations to correspond to each of the following descriptions: a. Solid calcium carbide, CaC_2 , reacts with water to form an aqueous solution of calcium hydroxide and acetylene gas, C_2H_2 .

b. When solid potassium chlorate is heated, it decomposes to form solid potassium chloride and oxygen gas.

c. Solid zinc metal reacts with sulfuric acid to form hydrogen gas and an aqueous solution of zinc sulfate.

d. When liquid phosphorous trichloride is added to water, it reacts to form a solution of phosphorous acid and hydrochloric acid.

3. Write the NET IONIC equation for the following reactions:



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AP Chemistry Worksheet 6: Empirical and Molecular Formulas

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Determine the empirical formula of each of the following compounds if a sample contains

a. 0.104 mol K, 0.052 mol C, and 0.156 mol O

b. 5.28 g Sn and 3.37 g F

c. 87.5 percent N and 12.5 percent H by mass

2. What is the molecular formula of each of the following compounds? a. empirical formula CH_2 , molar mass = 84 g/mol

b. Nicotine, which is 74.1% carbon, 8.6% hydrogen, and 17.3% nitrogen by mass and has a molar mass of about 160 g/mol.

3. Determine the empirical and molecular formulas of each of the following substances: a. Ibuprofen, a headache remedy contains 75.69 percent C, 8.80 percent H, and 15.51 percent O by mass; molar mass about 206 g

b. Benzene contains only carbon and hydrogen and is 7.74% hydrogen by mass. The molar mass of benzene is 78.1 g/mol.

4. Many homes in rural America are heated by propane gas, a compound that contains only carbon and hydrogen. Complete combustion of a sample of propane produced 2.641 g of carbon dioxide and 1.442 g of water as the only products. Find the empirical formula of propane. (Hint: Figure out how many moles of C and H were produced. They all came from the fuel.)

5. Menthol, the substance we can smell in mentholated cough drops, is composed of C, H, and O. A 0.1005 g sample of menthol is combusted, producing 0.2829 g of CO₂ and 0.1159 g of H₂O. a. What is the empirical formula for menthol?

b. If the compound has a molar mass of 156 g/mol, what is its molecular formula?

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AP Chemistry Worksheet 7: Chemical Equations and Calculations

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. The fermentation of glucose, C₆H₁₂O₆, produces ethyl alcohol, C₂H₅OH, and CO₂ as shown here:



a. How many moles of CO₂ are produced when 0.300 mol of C₆H₁₂O₆ reacts in this fashion?

b. How many grams of C₆H₁₂O₆ are needed to form 2.00 g of C₂H₅OH?

c. How many molecules of CO₂ form when 2.00 g of C₂H₅OH are produced?

2. Automotive air bags inflate when sodium azide, NaN₃, rapidly decomposes to its component elements:



a. How many moles of N₂ are produced by the decomposition of 1.50 moles of NaN₃?

b. How many grams of NaN₃ are required to form 5.00 g of nitrogen gas?

c. How many grams of NaN₃ are required to produce 10.0 L of nitrogen gas if the gas has a density of 1.25 g/L?

Name: _____

AP Chemistry Worksheet 8: Limiting Reactants & Theoretical Yield

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. The fizz produced when an Alka-Seltzer tablet is dissolved in water is due to the reaction between sodium bicarbonate, NaHCO_3 , and citric acid, $\text{H}_3\text{C}_6\text{H}_5\text{O}_7$:



In a certain experiment 50 mL of 1.0 M sodium bicarbonate and 20 mL of 1.0 M of citric acid are allowed to react.

a. Which reactant is the limiting reactant? You must show work to support your answer.

b. How many grams of carbon dioxide form?

c. How much of the limiting reactant is left when the reaction is complete?

d. How much of the excess reactant remains after the reaction is complete?

2. A student reacts 25.0 mL of 0.50M silver nitrate with 10.0 mL of 0.25 M hydrobromic acid.

a. Write the balanced net ionic reaction.

b. What are the limiting and excess reactants? Show your calculations below and box the theoretical yield.

c. If the actual yield of bromobenzene was 56.7 g, what was the percent yield?

Pg 11 AP Chemistry Worksheet 9: Gases (Review Gas Laws!)

Directions: *Examine each question and then write the form of the gas law you plan to use to solve each question. Show which values you have, which values are missing and/or which values need to be calculated. Be careful to use standard units of volume (liters), temperature (Kelvins) & pressure (Atm or mm of Hg).*

Note: 1 atm = 760 mm Hg

1. A gas occupies 3.5L at 2.5 mm Hg pressure. What is the volume at 10 mm Hg at the same temperature?

2. A constant volume of oxygen is heated from 100°C to 185°C. The initial pressure is 4.1 atm. What is the final pressure?

3. A sample of 25L of NH₃ gas at 10°C is heated at constant pressure until it fills a volume of 50L. What is the new temperature in °C?

4. An unknown gas weighs 34g and occupies 6.7L at 2 atm and 245K. What is its molecular weight?

5. An ideal gas occupies 400ml at 270 mm Hg and 65°C. If the pressure is changed to 1.4 atm and the temperature is increased to 100°C, what is the new volume?

6. What is the volume of 23g of neon gas at 1°C and a pressure of 2 atm?

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7. The pressure is 6.5 atm, 2.3 mole of Br₂ gas occupies 9.3 L . What is the temperature in °C?

8. A 600mL balloon is filled with helium at 700mm Hg barometric pressure. The balloon is released and climbs to an altitude where the barometric pressure is 400mm Hg. What will the volume of the balloon be if, during the ascent, the temperature drops from 24 to 5°C?

9. An unknown gas has a volume of 200L at 5 atm and -140°C. What is its volume at STP (standard temp = 273K, standard pressure = 1 atm)?

10. In an autoclave, a constant amount of steam is generated at a constant volume. Under 1.00 atm pressure the steam temperature is 100°C. What pressure setting should be used to obtain a 165°C steam temperature for the sterilization of surgical instruments?

11. Explain what each of the following changes would do to the **pressure** in a closed container (increase or decrease pressure).

- A) Some of the gases are removed
- B) The container size (volume) is decreased
- C) Temperature is increased
- D) Temperature is decreased
- E) Gases are added to the container