

AP Chemistry Summer Review Assignment 2020

To the AP Chemistry Student:

Welcome to my AP Chemistry class! I am looking forward to helping you gain a deeper appreciation for the science of chemistry and how it impacts our lives. I hope you are looking forward to an exciting and challenging year. Since you have elected to take this course, I assume you have the intelligence and motivation needed to be successful. Your hard work will pay off, and you will find AP Chemistry to be a very rewarding experience.

The Advance Placement Chemistry experience is designed to provide a full year of college-level chemistry, so it places heavy demands on the student, especially in terms of the time commitment required. In fact, the College Board suggests that students devote a **minimum of five hours per week** for individual study outside of the classroom. The ultimate objective, of course, is to prepare you to take the AP Chemistry test in May 2020, and in order to accomplish this, topics are covered very quickly. For this reason, most students take AP Chemistry after they already completed a year of high school chemistry, since that provides them with a foundation. In order to ensure the best start for you this year, I prepared a **Summer Assignment** that reviews many basic chemistry concepts. This is a required assignment. It is designed to let you know where you might have weaknesses in the fundamentals of chemistry needed for the AP Chemistry course.

If you have already taken a high school chemistry course, you will find much of the material in the Summer Assignment to be very familiar. But if you will be taking AP Chemistry as your first high school chemistry course, the problems in the Review Assignment will help you build a foundation in chemistry and contribute to your success. Extensive remediation is not an option as we work towards our goal of becoming completely prepared for the AP Exam in early May, so seek help early if you are floundering.

I recommend that you work throughout the summer on the Summer Assignment, rather than trying to complete it right before it is due, which will be the first day of class. It takes time for a student to process, practice and subsequently learn chemistry at the level necessary for success in AP Chemistry. Remember, AP Chemistry is an **equivalent course to a General Chemistry** college course, a full year program. Taking a college level course in high school is difficult, and it **requires commitment, hard work and time**, but completion of a class like this is a **great investment** in your education. Prepare yourself and arrive ready to learn!

Study Suggestions

You need to be prepared to really dig deep into a textbook. Not everything can be covered in depth in the class, we just do not have enough time. You may have to read over a paragraph several times to understand. You will have to do the example problems in the chapters in order to understand, sometimes more than once. You will have to take notes of your own from the reading. You will need to go to other resources, such as Kahn Academy, on the internet. You will have to do a lot of work outside of class on your own. I will be available for support and tutoring but you will have to do a lot of learning on your own.

Useful links:

www.apchemistrynmsi.wikispaces.com/home, www.tdwscience.com, www.brightstorm.com/science/chemistry, www.chemmybear.com, www.adriandindleschemistrypages.com, www.khanacademy.org/#Chemistry, www.bozemanscience.com/ap-chemistry/, and <http://education-portal.com/academy/course/general-chemistry-course.html>

Textbook: We will use Theodore L. **Brown**, H. Eugene **LeMay**, and Bruce E. **Bursten**. *Chemistry: The Central Science*, Thirteenth Edition, 2015, Pearson/Prentice Hall, Upper Saddle River, NJ.

I strongly suggest that you go to a used book store or go online and purchase the above textbook. It will be very difficult to do well in the class without the textbook.

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Advanced Placement Chemistry - Summer Review Packet

Task 1: Complete Learning Targets 1-13. Be sure to show all work on separate sheet of paper.

This is due on the first day of class

Task 2: Memorize the names of the elements and their corresponding symbols.

There will be quizzes during the first week.

- You need to know elements 1-36, plus Rb, Sr, Cs, Ba, Pd, Pt, Ag, Au, Sn, Sb, Pb, Bi, I, U and Pu.

Task 3: Memorize the ionic charges of the basic ions. There will be quizzes during the first week.

- Think about the valence electrons!
- Think about the common elements/ions in that group
 - Group 1 ions = +1
 - Group 2 ions = +2
 - Group 15 ions (N and P) = -3
 - Group 16 ions (O and S) = -2
 - Group 17 ions (halogens) = -1
 - Zn = +2; Ag = +1; Cu = +1 or +2; Fe = +2 or +3; Pb = +3 or +4; Sn = +2 or +4

Task 4: Memorize the names, symbols, and charges of the polyatomic ions below (there will be quizzes during the first week):

- Oxyanions – polyatomics containing oxygen, names end in *-ate* or *-ite*.
- ate* is used for the most common form.
- ite* is used for the form with the same charge, but one less oxygen
 - Example: NO_3^{1-} is nitrate while NO_2^{1-} is nitrite.
- Prefixes are also used
 - Per-* indicates one more oxygen than the *-ate* form.
 - Hypo-* indicates one fewer oxygen than the *-ite* form.
 - Example:
 - ClO_4^{1-} = perchlorate
 - ClO_3^{1-} = chlorate
 - ClO_2^{1-} = chlorite
 - ClO^{1-} = hypochlorite
 - F, Cl, Br, I all behave the same
 - Therefore, if chlorate is ClO_3^{1-} , the bromate ion is BrO_3^{1-}
 - If you learn the chlorate series, you also automatically know the bromate, iodate, and fluorate series.
- Hydrogen can be added to -2 or -3 ions to make a "new ion" i.e. $\text{H}_2\text{PO}_4^{1-}$ is dihydrogen phosphate (note the negative charge went up 1 for each H^+ added)

- Common Polyatomic Ions -			
Click on the table for a more complete list			
ion	name	ion	name
NH_4^+	ammonium	CO_3^{2-}	carbonate
NO_2^-	nitrite	HCO_3^-	hydrogen carbonate†
NO_3^-	nitrate	ClO^-	hypochlorite
SO_3^{2-}	sulfite	ClO_2^-	chlorite
SO_4^{2-}	sulfate	ClO_3^-	chlorate
HSO_4^-	hydrogen sulfate*	ClO_4^-	perchlorate
OH^-	hydroxide	$\text{C}_2\text{H}_3\text{O}_2^-$	acetate
CN^-	cyanide	MnO_4^-	permanganate
PO_4^{3-}	phosphate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
HPO_4^{2-}	hydrogen phosphate	CrO_4^{2-}	chromate
H_2PO_4^-	dihydrogen phosphate	O_2^{2-}	peroxide

*Bisulfate and †bicarbonate are widely used common names for hydrogen sulfate and hydrogen carbonate, respectively.

Learning Target 1 – I can determine the number of significant figures in a measurement.

Review Reading: Brown, LeMay 13th ed. Pg. 22-26.

Wikipedia: Significant Figures

Tyler DeWitt Chemistry Videos: Significant Figures

1) Determine the number of significant figures in the following measurements:

- a) 2.71 g _____ b) 0.00047 kg _____ c) 7.0×10^5 m _____ d) 1030 L _____
e) 150 pencils _____ f) 37500 g _____ g) 0.1010 cm _____

Learning Target 2 – I can convert number to scientific notation while applying significant figures.

Review Reading: Brown, LeMay 13th ed. Pg. 22-26

Wikipedia: Significant Figures

Tyler DeWitt Chemistry Videos: Significant Figures

2) Express each of the following in proper scientific notation (pay attention to sig figs and units).

- a) 0.000125 m _____ b) 155.0 mL _____
c) 123,030,000 kg _____ c) 481.9×10^{-9} cm _____

Learning Target 3 – I can add, subtract, multiply, and divide with the correct number of significant figures.

Review Reading: Brown, LeMay 13th ed. Pg. 22-26

Wikipedia: Significant Figures

Tyler DeWitt Chemistry Videos: Significant Figures

3) Calculate the correct answer with proper units and sig figs for each of the following:

- a) $12 \text{ g} + 0.677 \text{ g} + 86.33 \text{ g} =$ _____
b) $(355.78 \text{ g}) / (0.056 \text{ g}) =$ _____
c) $97.34 \text{ mL} - 34.1 \text{ mL} =$ _____
d) $14.68 \text{ m} \times 5 \text{ m} =$ _____

4) Perform the following calculations with scientific notation and report your answer with the correct number of significant figures.

- a) $0.14 \times (6.02 \times 10^{23}) =$ _____
b) $\frac{(9.875 \times 10^4) - (9.795 \times 10^4)}{9.875 \times 10^4} \times 100 =$ _____ (assume that 100 is an exact number)
c) $\frac{(3.8 \times 10^{-12} + 4.0 \times 10^{-13})}{(4 \times 10^{12} + 6.3 \times 10^{13})} =$ _____

Learning Target 4 – *I can use conversion factors to solve dimensional analysis problems.*

Review Reading: Brown, LeMay 13th ed. Pg. 27-31

Khan Academy: Dimensional Analysis

Tyler DeWitt Chemistry Videos: Unit Conversions

- 5) Solve the following problems using dimensional analysis.
- A large railroad car is filled with 1745 gallons of milk. The car springs a leak in the bottom, and milk starts dripping out at a rate of 204.84 mL/sec. If the train is traveling at a speed of 65.4 miles per hour, calculate how many miles it will travel before all the milk has drained out of the car. (1 gal = 3.78 L, 1 mile = 5280 ft, 1 in = 2.54 cm)
 - The world record for the hundred meter dash is 9.77 seconds. What is the corresponding average speed in units of m/sec, km/hr, ft/sec, and miles/hour.

Learning Target 5 – *I can explain density and use the density equation to find an unknown.*

Review Reading: Brown, LeMay 13th ed. Pg. 19-20

Khan Academy: Density

- A rectangular block has dimensions of 2.9 cm x 3.5 cm x 10.0 cm. The mass of the block is 615.0 grams. What are the volume and the density of the block?
- The density of pure silver is 10.5 g/mL at 20°C. If 5.25 grams of pure silver pellets are added to a graduated cylinder containing 11.2 mL of water, to what volume will the water in the cylinder rise?

Learning Target 6 – *I can define and explain terms that identify physical/chemical characteristics of matter.*

Review Reading: Brown, LeMay 13th ed. Pg. 6-14

Wikipedia: Matter

- 8) Define the following terms:
- | | |
|---------------------|----------------------------|
| a) solid – | e) homogeneous mixture – |
| b) liquid – | f) heterogeneous mixture - |
| c) gas – | g) chemical change – |
| d) pure substance – | h) physical change – |
- 9) Identify the following as a physical property, physical change, chemical property, or chemical change.
- Ethanol has a density of 0.697 g/mL.
 - The solution turns blue upon mixing water and food coloring.
 - Wood burns in an oven.
 - Methyl alcohol is highly flammable.
 - Ice melts in a beaker.
 - Methyl ethanoate smells like apples.
 - A car crashes into a wall.
 - Sugar dissolves in water.

Learning Target 7 – *I can identify the number of protons, neutrons, and electrons in atoms and isotopes.*

Review Reading: Brown, LeMay 13th ed. Pg. 47-50

Tyler Dewitt Chemistry Videos: Isotope

10) What number of protons and neutrons are contained in the nucleus of each of the following atoms? Assuming each atom is uncharged, what number of electrons are present?

- a) ^{235}U b) ^{13}C c) ^{57}Fe d) ^{208}Pb

11) Complete the following table:

Name	Mass #	Atomic #	# of Protons	# of Neutrons	# of Electrons	Symbol
Gallium-	70					
						$^{31}\text{P}^{-3}$
Strontium-80						
						$^{55}\text{Mn}^{+2}$

Learning Target 8 – *I can calculate the average atomic mass of an isotope using percent abundance.*

Review Reading: Brown, LeMay 13th ed. Pg. 50-51

Tyler Dewitt Chemistry Videos: Atomic Mass

12) An element consists of 1.40% of an isotope with a mass of 203.973 amu, 24.10% of an isotope with a mass of 205.9745 amu, 22.10% of an isotope with a mass of 206.9759 amu, and 52.40% of an isotope with a mass of 207.9766 amu. Calculate the average atomic mass and identify the element.

Learning Target 9 – *I can define and use the Law of Definite Proportions and the Law of Multiple Proportions.*

Review Reading: Brown, LeMay 13th ed. Pg. 42-43

Khan Academy: Laws of Definite and Multiple Proportions.

13) Explain:

- a) Law of Definite Proportions:
b) Law of Multiple Proportions:

14) Solve the following problem:

Tin – Oxygen Compound	Tin % by mass	Oxygen % by mass
Stannous oxide	88.10%	11.90%
Stannic oxide	78.70%	21.30%

Tin – Oxygen Compound	Tin mass	Oxygen mass
Stannous oxide	100.0 g	
Stannic oxide	100.0 g	

- a) Use the Law of Definite Proportions to determine the mass of oxygen needed to combine with the given masses of tin for stannous oxide and stannic oxide.
b) Does the Law of Multiple Proportions hold true in this case? Explain why or why not.

Learning Target 10 – I can name and write formulas for ionic and molecular compounds.Review Reading: Brown, LeMay 13th ed. Pg. 58-68

Tyler Dewitt Chemistry Videos: Chemical Formulas

15) Name or give the formula for the following compounds:

Name	Formula
Sodium fluoride	
	K ₂ O
Calcium phosphate	
	FeCl ₃
Iron(II) chloride	
	SnO ₂
Sodium sulfate	
	CaCO ₃
Lithium phosphate	
	Zn(NO ₃) ₂
Calcium hydroxide	
	Na ₂ SO ₄
Copper(II) nitrate	
	SO ₂
Phosphorus pentabromide	
	N ₂ O ₅
Sulfuric acid	
	HNO ₃
Hydrochloric acid	
	HClO ₃

Learning Target 11 – I can write and balance chemical equations.Review Reading: Brown, LeMay 13th ed. Pg. 82-89

Tyler Dewitt Chemistry Videos: Chemical Reactions

16) Identify the type of reaction and write the balanced chemical equations (include states of matter):

- Iron metal reacts with oxygen to form rust, iron(III) oxide.
- Calcium metal reacts with water to produce aqueous calcium hydroxide and hydrogen gas.
- Aqueous barium hydroxide reacts with aqueous sulfuric acid to produce solid barium sulfate and water.

17) Identify the type of reaction and write the balanced chemical equations (include states of matter):

- Solid magnesium is heated in the presence of nitrogen gas.
- Aluminum foil is added to a solution of copper(II) chloride.
- A solution of lead(II) nitrate is added to a solution of sodium sulfate.
- Solid potassium chlorate is heated.
- Propane gas is burned.

Learning Target 12 – *I can do conversions associated with moles.*

Review Reading: Brown, LeMay 13th ed. Pg. 91-97

Tyler Dewitt Chemistry Videos: Moles

18) Solve the following problems:

- a) Calculate the mass of 500. atoms of iron (Fe).
- b) How many formula units are present in 87.2 g of lead(IV) carbonate?
- c) Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. It is marketed as Nutra-Sweet. The molecular formula of aspartame is $C_{14}H_{18}N_2O_5$.
 - i) Calculate the molar mass of aspartame.
 - ii) Calculate the mass, in grams, of 1.56 mol of aspartame.
 - iii) How many molecules are in 5.0 mg of aspartame?
 - iv) How many atoms of nitrogen are in 1.2 g aspartame?
 - v) What is the mass of one molecule of aspartame?

Learning Target 13 - *I can calculate percent by mass for an element in a compound.*

Review Reading: Brown, LeMay 13th ed. Pg. 91

Tyler Dewitt Chemistry Videos: Percent Composition

19) Calculate the percent by mass for each element in aspartame from the previous problem.