

**AP Chemistry Summer Assignment**  
Future AP Chemistry Student,

**May 2018**

Welcome to AP Chemistry! I am excited to be your teacher this upcoming school year to guide you through the exciting world of Chemistry. In order to ensure the best start for everyone at the start of that challenge, I have prepared a **summer assignment** that reviews **basic chemistry concepts**. This review will cover the essential concepts that you need to know upon entering the class in order to start the year strong. There will be an exam the first week of school over the material listed in this assignment.

The reference text for the summer assignment is “Chemistry: A Molecular Approach (3rd Ed)” by Nivaldo Tro. This will be your textbook for the next school year. In addition, you will be receiving a Flash Drive of interactive coursework on the first day of school. If you did not pick up a textbook prior to leaving for the summer, there are numerous online resources available to help teach you the information needed to answer the questions in this packet.

We will do some review, but extensive remediation is not an option as we work towards our goal of being 100% prepared for the AP Exam on **Thursday, May 9, 2019**. There will be a test covering the basic concepts included in the summer packet during the **first week** of school. It is essential that you come prepared.

Be prepared for a course that is graded with college level expectations. Approximately 70% of the grade is based on formal (test) assessments, at a level to prepare you for the AP test. There will also be lab grades (~25% of your grade). Do not expect any curves, reassessments or “fluff” assignments. Be aggressive in pursuit of knowledge not just the grades. Prioritize your time, do not procrastinate until the last moment, get help in class, participate in class discussions and seek support before grades sink.

You may contact me by **email**: ( [ahughett@pasco.k12.fl.us](mailto:ahughett@pasco.k12.fl.us) or [andy.hughett@gmail.com](mailto:andy.hughett@gmail.com) ) this summer. I will do my best to answer your questions **ASAP**. I will check my Pasco email weekly and my Gmail on a near daily basis. Plan accordingly for your questions.

Spread out the summer assignment. Please do not try to complete it all in the final week of the summer. Chemistry takes time to **process** and **grasp** at a level necessary for success in AP Chemistry. Remember, AP Chemistry is an **equivalent course to Introductory Chemistry** in college, including a full year of undergraduate laboratory. We will be performing a minimum of 2-3 formal lab assignments per quarter alongside the general curriculum. Taking a college level course **in high school is difficult, requires dedication**, and is a **great investment** in your education so prepare yourself and arrive ready to learn.

Have a **great summer** and look forward to an exciting, challenging year of chemistry,  
Mr. Hughett

Important Dates (mark your calendar!)

AP Scholar Day: Friday, August 3, 2018 – if you cannot make this, please email me!

AP Chemistry Exam: Thursday, May 9, 2019

## Chemistry Summer Assignment – **Due on the first day of school at the beginning of class:**

I believe that all science is supposed to be a collaborative effort. Science would never progress if we were not working together to achieve a common goal. I highly advocate the use of study groups and book/internet resources in order to assist you in solving problems. That being said, all work submitted must be your own.

**What to know for day 1:** Over the summer, you should be reviewing the concepts you learned in Chemistry I. At a **minimum**, you should be comfortable answering any problems in Chapters 1-2 of the textbook assigned for the summer. A general list of the topics are as follows:

- Classifying Matter (Pure Substances vs. Mixtures)
- Identifying Elements / Atoms / Compounds / Molecules / Polyatomic Ions
- Physical and Chemical Properties and Changes
- Significant Figures (These will be used all year in AP!)
- Using Dimensional analysis as a tool for unit conversions
- Precision, Accuracy, and Error
- Atomic Theory – How atoms are composed
- Atomic Number and Atomic Mass
- Basic Overview of the Periodic Table
- Formulas for Molecules and Compounds (Including Naming)
- The Mole and it's use as a unit in Chemistry (including basic Stoichiometry)
- Solving problems using basic formulas

Also, within the first 2 weeks of school, we will be having a quiz on the names of the elements of the periodic table, as well as polyatomic ions. Getting an early start memorizing these will save you valuable class time later! Flash cards are a great resource to help with this. A comprehensive list of all elements/ions to know is included in this packet.

While we will be spending a small amount of time in class reviewing these concepts, this time will be minimal. The more time you spend preparing, the easier the transition to more difficult concepts will be!

If you would like to have some advanced knowledge of what will be covered in the course, information about the AP exam, or what the expectations will be, please utilize the following links:

<http://media.collegeboard.com/digitalServices/pdf/ap/ap-chemistry-course-and-exam-description.pdf>

<http://www.collegeboard.com/ap/students/chemistry/index.html>

Show work for all the problems. Use dimensional analysis where necessary – show that units have cancelled in order to reach the unit asked for in the problem.

Answer on a separate sheet. This set of questions is not formatted.

**USE SIGNIFICANT FIGURES in problems. All problems we solve this year will be to the proper number of significant figures – begin getting comfortable with these now!**

## List of Elements and Polyatomic Ions

It is very important that you know all of these prior to taking the AP exam! The Periodic Table provided on the exam simply has the Chemical Symbols, without any names. The sooner you get comfortable using proper names for elements and ions, the better! NOTE: You should only have to memorize the NAMES and CHARGES of these elements/ions. You do not have to memorize atomic numbers or atomic masses!

Elements to know: (Reminder – you will have a quiz over all of these by the end of week 2!)

1. All of the elements from 1-56 (Hydrogen – Barium)
2. The following additional elements: Pt, Au, Hg, Pb, Rn, Fr, Ra, U, Pu
3. The following table of polyatomic ions:

$\text{NH}_4^{+1}$	<b>ammonium</b>
$\text{NO}_3^{-1}$	<b>nitrate</b>
$\text{NO}_2^{-1}$	<b>nitrite</b>
$\text{ClO}^{-1}$	<b>hypochlorite</b>
$\text{ClO}_2^{-1}$	<b>chlorite</b>
$\text{ClO}_3^{-1}$	<b>chlorate</b>
$\text{ClO}_4^{-1}$	<b>perchlorate</b>
$\text{OH}^{-1}$	<b>hydroxide</b>
$\text{CN}^{-1}$	<b>cyanide</b>
$\text{C}_2\text{H}_3\text{O}_2^{-1}$	<b>acetate</b>
$\text{MnO}_4^{-1}$	<b>permanganate</b>
$\text{CO}_3^{-2}$	<b>carbonate</b>
$\text{HCO}_3^{-1}$	<b>bicarbonate (hydrogen carbonate)</b>
$\text{SO}_4^{-2}$	<b>sulfate</b>
$\text{SO}_3^{-2}$	<b>sulfite</b>
$\text{HSO}_4^{-1}$	<b>bisulfate</b>
$\text{HSO}_3^{-1}$	<b>bisulfite</b>
$\text{CrO}_4^{-2}$	<b>chromate</b>
$\text{Cr}_2\text{O}_7^{-2}$	<b>dichromate</b>
$\text{O}_2^{-2}$	<b>peroxide</b>
$\text{C}_2\text{O}_4^{-2}$	<b>oxalate</b>
$\text{PO}_4^{-3}$	<b>phosphate</b>
$\text{HPO}_4^{-2}$	<b>hydrogen phosphate</b>
$\text{H}_2\text{PO}_4^{-1}$	<b>dihydrogen phosphate</b>
$\text{SiO}_4^{-4}$	<b>silicate</b>

Answer the following questions on a separate sheet of paper. Show all work, where necessary. When using dimensional analysis, show how units cancel to give you the appropriate unit for your answer. Ensure all answers that need units have them.

- Write the **most common guidelines** to determine significant figures (digits) with an example?
- Use **dimensional analysis** to convert the following – show your work:
  - 200 meters = \_\_\_\_ miles.
  - 650 in = \_\_\_\_ meters
  - 4 years = \_\_\_\_ seconds.
  - 109 mm = \_\_\_\_ inches
- How many **significant figures** are in each of the following?
  - 1.9200 mm
  - 0.0301001 kJ
  - $6.022 \times 10^{23}$  atoms
  - 460.000 L
  - 0.000036 cm<sup>3</sup>
  - 10000
  - 1.001
  - 0.001345
- Record the following in correct **scientific notation**:
  - 4050,000,000 cal
  - 0.000123 mol
  - 0.00345 Å
  - 700,000,000 atoms
- Calculate the following to the **correct number** of significant figures.
  - $1.270 \text{ g} / 5.296 \text{ cm}^3$
  - $12.235 \text{ g} / 1.010 \text{ L}$
  - $12 \text{ g} + 0.38 \text{ g}$
  - $170 \text{ g} + 2.785 \text{ g}$
  - $2.100 \times 3.2102$
  - $2.35 - 0.4 - 1.23$
- Label each of the following as either a **physical process** or a **chemical process**.
  - Corrosion of aluminum metal.
  - Melting of ice.
  - Pulverizing an aspirin.
  - Digesting a candy bar.
  - Explosion of nitroglycerin
- What is the difference between Precision and Accuracy?
- Classify the following as a pure substance or a mixture. If it is a pure substance, classify as an element or a compound. If it is a mixture, classify it as homogeneous or heterogeneous.
  - Sweat
  - Aluminum
  - Carbon dioxide
  - Vegetable Soup
  - Wine
  - Iron
  - Hydrogen peroxide
  - Coffee
- Define the words: **atomic number, atomic mass, mass number, molecular formula, structural formula, empirical formula, isotopes, cation, anion, metalloid, and allotrope.**
- In which Group(s) will you find the following types of elements? Give a physical or chemical property and 3 examples of each:

**Alkali metals, Alkaline earth metals, Halogens, Noble Gases, Transition Metals**
- Which 7 elements always exist as diatomic molecules? Provide chemical formulas.
- What are the characteristic properties of metals, nonmetals, and metalloids?
- Perform the following unit conversions:
  - $515 \text{ km} = \text{_____ m? _____ dm? _____ cm?}$
  - $122.3 \text{ s} = \text{_____ ms? _____ ks?}$
  - $1228 \text{ g/L} = \text{_____ g/mL? _____ kg/cL?}$
  - $554 \text{ K/s} = \text{_____ mK/s? _____ cK/ms?}$

14. Ethylene Glycol (antifreeze) has a density of  $1.11 \text{ g/cm}^3$ .
- What is the mass in g of 417 mL of this liquid?
  - What is the volume (in L) of 4.1 kg of this liquid?
15. A steel cylinder has a length of 2.16 in, a radius of 0.22 in, and a mass of 41 g. What is the density of this steel in  $\text{g/cm}^3$ ?
16. Identify the following statements as TRUE or FALSE:
- If an atom has an equal number of protons and electrons, it will be charge-neutral
  - Electrons are attracted to protons
  - Electrons are much lighter than neutrons
  - Protons have twice the mass of neutrons
  - Protons and electrons have charges of the same magnitude but opposite signs
  - Protons have about the same mass as neutrons
  - Some atoms don't have any protons
  - Protons and neutrons have charges of the same magnitude but opposite signs
17. Determine **number of protons and neutrons** in each of the following.
- $^{39}_{19}\text{K}$
  - $^{23}_{11}\text{Na}$
  - $^{208}_{82}\text{Pb}$
  - $^{33}_{15}\text{P}$
18. Determine the number of protons and the number of electrons in each ion:
- $\text{Ni}^{2+}$
  - $\text{S}^{2-}$
  - $\text{Br}^-$
  - $\text{Cr}^{3+}$
  - $\text{Ba}^{2+}$
  - $\text{K}^+$
19. Predict the charge of the ion formed by each of the following elements:
- O
  - Na
  - Al
  - Rb
  - F
20. Write the symbol for each element and classify it as a metal, nonmetal, or metalloid:
- gold
  - tin
  - fluorine
  - argon
  - tellurium
21. An element has two naturally occurring isotopes. Isotope 1 has a mass of 120.9038 amu and a relative abundance of 57.4%. Isotope 2 has a mass of 122.9042 amu. Find the atomic mass of this element and identify it.
22. Bromine has two naturally occurring isotopes (Br-89 and Br-81) and an atomic mass of 79.904 amu. The mass of Br-81 is 80.9163 amu and its natural abundance is 49.31%. Calculate the mass and natural abundance of Br-79.
23. What is the amount, in moles, of each elemental sample?
- 11.8g Ar
  - 3.55 g Zn
  - 26.1g Ti
  - 0.211 g Li
24. What is the mass, in grams, of each elemental sample?
- 0.0355 mol Ba
  - $2.3 \times 10^{-3}$  mol Sb
  - 43.9 mol Br
  - 1.3 mol W
25. Calculate the number of atoms in each sample:
- 5.18g P
  - 2.26g Hg
  - 1.87g Bi
26. Calculate the mass, in grams, of each sample:
- $1.1 \times 10^{23}$  gold atoms
  - $2.82 \times 10^{22}$  helium atoms
  - $1.8 \times 10^{23}$  lead atoms
27. A 7.36g sample of copper is contaminated with an additional 0.51g of Zinc. Suppose an atomic mass measurement was performed on this sample. What would the measured atomic mass be?
28. Calculate the average mass, in grams, of one single platinum atom.
29. Take the reaction:  $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$ . In an experiment, 3.25 g of  $\text{NH}_3$  are allowed to react with 3.50 g of  $\text{O}_2$ . (HINT: BALANCE THE EQUATION FIRST)
- What is the limiting reagent?
  - How many grams of NO will be formed?
  - How many grams of the excess reagent are left when the reaction is complete?
30. Write the balanced equation for the reaction of acetic acid with aluminum hydroxide to form water and aluminum acetate.

31. Lastly, I want to know a little bit about you. Why are you taking AP Chemistry? What is your goal in this class (grade, or knowledge)? What are your post-high school plans? Tell me something unique about you – what do you do that makes you special (play an instrument, have a hobby – something outside of your GPA or class rank).

Again, this is simply a brief overview of the topics you should have an understanding of upon entering class next year. Any additional studying/review will pay dividends as the year goes on! Chemistry is an incredibly intensive course that requires a lot of practice to master. Begin developing a list of good resources and good study habits now. If you have any questions about anything, please do not hesitate to email me.

Good luck! I look forward to seeing you in the fall!