

# AP Chemistry

## Summer Assignment 2020

Welcome to AP Chemistry! I am eagerly anticipating a great year of Chemistry. In order to ensure the best start for everyone next fall, I have prepared a **summer assignment** that reviews **basic chemistry concepts**. There is a multitude of great chemistry resources available via the Internet. With the ready access to hundreds of websites either in your home or at the local library, I am confident that you will have enough resources to prepare adequately for the fall semester. There are few old chemistry textbooks which can be picked up for your reference. The reference text book as part of AP course is "Chemistry- The Central Science" by LeMay, Brown, Burstein (you may wait until the fall to check one out from the library).

For those students who have already taken a high school chemistry course, much of the material in the summer packet will be familiar to you. It will be important for everyone to come to class **the first day** prepared. While I review, extensive remediation is not an option as we work towards our goal of being 100% prepared for the AP Exam in **early May 2021**. There will be a **test covering** the basic concepts included in the summer packet during the **first week** of school.

I hope you decided to take this class because you have a love of Chemistry or want to push yourself academically. Whatever reason made you decide to take it, **be aggressive in your pursuit of knowledge for better grades**. **Prioritize your learning process, do not procrastinate** until the last minute, get help in class, participate in class discussions and seek support before grades sink below expectations. I believe this class offers a lot to build your study skill set that can help in your future too.

You may contact me by **email: (estafford@mauryk12.org)** this summer. I will do my best to answer your questions **ASAP**.

I hope you are looking forward to an **exciting year** of chemistry. You are all certainly **wonderful** students, and with **plenty** of motivation and hard work you should find AP Chemistry a successful and rewarding experience. Finally, I recommend that you 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. 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 **enjoy** learning chemistry.

Mrs. Stafford

## Assignment

Utilize Internet Resources to complete the following problems. The URLs below represent a fraction of the available chemistry addresses available. Please feel free to expand the list and find other web sites that help prepare you for the coming year.

<http://www.chemtopics.com/lectures.html>

<https://www.chemteam.info/ChemTeamIndex.html>

<https://thecrashcourse.com/courses/chemistry>

Show work for all the problems. (Hand written or typed solutions will be accepted) This includes questions that cover topics from general chemistry to basic mole concepts. Most importantly, know the concepts. It is not all about solving the problem and just completing the assignment.

### Metric System

#### **Length**

1. 70 cm to m =	2. 49 cm to mm =
3. 8 m to mm =	4. 14.76 m to cm =
5. 59.8 mm to cm =	6. 3.542 mm to cm =
7. 5.3 km to m =	8. 9.24 km to m =

#### **Volume and Mass (Hint: 1 cm<sup>3</sup> = 1 mL)**

9. 6 L to ml =	10. 4.1 L to ml =
11. 8.7 L to ml =	12. 12.5 L to ml =
13. 925 ml to L =	14. 412 ml to L =
15. 2 cm <sup>3</sup> to ml =	16. 3.1 cm <sup>3</sup> to ml =

17. 8 cm x 7 cm x 6 cm = \_\_\_\_\_ cm<sup>3</sup> also = \_\_\_\_\_ ml  
18. 4 cm x 9 cm x 12 cm = \_\_\_\_\_ cm<sup>3</sup> also = \_\_\_\_\_ ml  
19. 15 cm x 12 cm x 5 cm = \_\_\_\_\_ cm<sup>3</sup> also = \_\_\_\_\_ ml  
20. 32 cm x 28 cm x 17 cm = \_\_\_\_\_ cm<sup>3</sup> also = \_\_\_\_\_ ml

#### **Convert:**

21. 8000 g to kg =  
22. 25,000 g to kg =  
23. 5.2 kg to g =  
24. 12.42 kg to g =  
25. 4.2 g to mg =  
26. 3.89 g to cg =  
27. 598 mg to g =  
28. 7634 cg to g =

#### Significant Figures and Scientific Notation

- What does it mean by “significant numbers, digits, or figures”? Why is important to consider significant in calculations. How does it help the scientist?
- State the number of significant digits in each measurement.

- 1) 2804 m                      2) 2.84 km                      3) 5.029 m  
4) 0.003068 m                5) 4.6 x 10<sup>5</sup> m                6) 4.06 x 10<sup>-5</sup> m  
7) 750 m                        8) 75 m                         9) 75,000 m

10) 75.00 m

11) 75,000.0 m

12) 10 cm

- State the following measurements in scientific notation.

1) 2804 m

2) 2.84 km

3) 5.029 m

4) 0.003068 m

5)  $4.6 \times 10^5$  m

6)  $4.06 \times 10^{-5}$  m

7) 750 m

8) 75 m

9) 75,000 m

10) 75.00 m

11) 75,000.0 m

12) 10 cm

### The Periodic Table

1. Give the **chemical symbols** for the following elements:  
a. carbon    b. sulfur    c. krypton    d. fluorine    e. lead    f. arsenic    g. potassium    h. chlorine  
i. Iron    j. mercury    k. copper
2. Write **the names** for each of the element symbols:  
a. Na    b. Au    c. Ag    d. Sn    e. Fe    f. Hg    g. K    h. Pb
3. Define the words: **atomic number, atomic mass, mass number, molecular formula, structural formula, empirical formula, isotopes, cation, anion, metalloid, allotrope, and isoelectronic.**
4. Why do we call  $\text{Mg}(\text{NO}_3)_2$  magnesium nitrate, but we call  $\text{Ni}(\text{NO}_3)_2$  nickel(II) nitrate?
5. The molecular formula of morphine, a pain-killing narcotic, is  $\text{C}_{17}\text{H}_{19}\text{NO}_3$ .
  - a. What is the molar mass?
  - b. What fraction of atoms in morphine is accounted for by carbon?
  - c. Which element contributes least to the molar mass?
6. Write a **balanced equation** for the following:
  - a. Reaction of boron trifluoride gas with water to give liquid hydrogen fluoride and solid boric acid, ( $\text{H}_3\text{BO}_3$ ).
  - b. Reaction of magnesium oxide with iron to form iron (III) oxide and magnesium.
  - c. The decomposition of dinitrogen oxide gas to its elements.
  - d. The reaction of calcium carbide solid with water to form calcium hydroxide and acetylene ( $\text{C}_2\text{H}_2$ ) gas.
7. Classify the following into diatomic molecule, molecular (covalent) compound, ionic compound, or element.
  - a.  $\text{F}_2$     b.  $\text{Cl}_2$     c. C    d. NaCl    e. KF    f.  $\text{CO}_2$     g.  $\text{H}_2$     h. Ag
  - i. Rust ( $\text{Fe}_2\text{O}_3$ )    j. MgO    k.  $\text{O}_2$     l.  $\text{I}_2$     m. CO    n.  $\text{K}_2\text{CO}_3$

### Common Chemistry Math Problems

1. Strontium consists of four isotopes with masses and their percent abundance of 83.9134 amu (0.5%), 85.9094 amu (9.9%), 86.9089 amu (7.0 %), and 87.9056 amu (82.6 %). Calculate the atomic mass of Sr.
2. What mass of iron is required to replace silver when starting with 25.00g of silver nitrate?  
$$\text{Fe}(s) + \text{AgNO}_3 \rightarrow \text{Fe}(\text{NO}_3)_2 + \text{Ag}$$
3. Calculate the percentage by mass of the elements in each of the following compounds:
  - a. oxygen in sulfuric acid ( $\text{H}_2\text{SO}_4$ )
  - b. hydrogen in acetone ( $\text{CH}_3\text{COCH}_3$ )
4. Determine the empirical and molecular formula of the following substance: Ibuprofen, a headache remedy contains 75.6 % C, 8.80 % H, and 15.5 % O by mass and has a molar mass about 206 g/mol.
5. When benzene ( $\text{C}_6\text{H}_6$ ) reacts with bromine ( $\text{Br}_2$ ), bromobenzene ( $\text{C}_6\text{H}_5\text{Br}$ ) is obtained:  
$$\text{C}_6\text{H}_6 + \text{Br}_2 \rightarrow \text{C}_6\text{H}_5\text{Br} + \text{HBr}$$
  - a. What is the theoretical yield of bromobenzene in this reaction when 30.0g of benzene reacts with 65.0 g of bromine?
  - b. If the actual yield of bromobenzene was 56.7 g, what was the percentage yield?

## Ions

- Know the common ion charges of elements in groups 1,2, 13-18.
- Know the ion charge for silver is +1 and zinc is +2.
- Know how to determine the ion charge of transition metals from the compound name or formula. (example: iron (III) oxide, Fe is +3; FeO, Fe is +2.
- The following is a table of polyatomic ions that are important to know. Make flash cards and study them often.

### **Table of Polyatomic Ions for AP Chemistry**

<b>Symbol</b>	<b>Name</b>	<b>Symbol</b>	<b>Name</b>
$\text{BO}_3^{3-}$	borate	$\text{MnO}_4^-$	permanganate
$\text{C}_2\text{H}_3\text{O}_2^-$	acetate	$\text{N}_3^-$	azide
$\text{C}_2\text{O}_4^{2-}$	oxalate	$\text{NH}_2^-$	amide
$\text{ClO}^-$	hypochlorite	$\text{NH}_4^+$	ammonium
$\text{ClO}_2^-$	chlorite	$\text{NO}_2^-$	nitrite
$\text{ClO}_3^-$	chlorate	$\text{NO}_3^-$	nitrate
$\text{ClO}_4^-$	perchlorate	$\text{OH}^-$	hydroxide
$\text{CN}^-$	cyanide	$\text{PO}_3^{3-}$	phosphite
$\text{CO}_3^{2-}$	carbonate	$\text{PO}_4^{3-}$	phosphate
$\text{CrO}_4^{2-}$	chromate	$\text{P}_2\text{O}_7^{4-}$	diphosphate
$\text{Cr}_2\text{O}_7^{2-}$	dichromate	$\text{SO}_3^{2-}$	sulfite
$\text{HCO}_3^-$	hydrogen carbonate	$\text{SO}_4^{2-}$	sulfate
$\text{HC}_2\text{O}_4^-$	hydrogen oxalate	$\text{S}_2\text{O}_7^{2-}$	disulfate
$\text{HPO}_4^{2-}$	hydrogen phosphate	$\text{H}_3\text{O}^+$	hydronium
$\text{H}_2\text{PO}_4^-$	dihydrogen phosphate	$\text{Hg}_2^{2+}$	mercury (I)
$\text{HSO}_3^-$	hydrogen sulfite	$\text{C}_2\text{H}_3\text{O}_2^-$	acetate
$\text{HSO}_4^-$	hydrogen sulfate	$\text{CH}_3\text{COO}^-$	acetate

## Nomenclature

- Name the following compounds (and understand the rules behind naming them):  
a.  $\text{CaF}_2$     b.  $\text{Fe}_2\text{O}_3$     c.  $\text{BaSO}_4$     d.  $\text{HNO}_3$     e.  $\text{Al}(\text{OH})_3$     f.  $\text{SO}_2$     g.  $\text{AgI}$   
h.  $\text{Na}_2\text{S}$     i.  $\text{N}_2\text{O}_4$     j.  $\text{CaCO}_3$     k.  $\text{HCl}$
- Write the formula for the following compounds (and understand the rules for writing them):  
a. sodium chloride    b. tin (IV) iodide    c. zinc sulfide    d. ammonium chloride  
e. hydrofluoric acid    f. potassium fluoride    g. carbonic acid    h. dihydrogen monoxide