

## AP CHEMISTRY 2010/11 Summer Assignment

This course is designed to be the equivalent of the general chemistry course usually taken during the first college year. This is an academic, quantitative chemistry course. Chemistry is the study of atoms and molecules and how they interact according to physical laws. Such study is applicable to your everyday life and this will be demonstrated this repeatedly throughout the year.

Topics of study include structure of matter, states of matter, reactions, descriptive chemistry, and chemical calculations.

**Your success in this course** will directly reflect on the amount of time and energy you put into it.

Here are some hints to help you:

- Participate actively and ask questions as soon as you need help.
- Keep detailed notes about demonstrations and examples presented in class.
- Keep up with your work.
- Be open to a variety of learning styles and activities.
- Be willing to receive help from your peers, and help others.

**Absences:** If you are absent, be sure to have a classmate pick up all papers and assignments. If you are sick for more than one day, have a classmate bring assignments to you. Each day in chemistry is dependent on understanding the previous day's work. Try not to get behind.

For excused absences, you will have one day to complete work for each day of class you missed. If you missed an assessment/deadline you will be penalized according to the Handbook rules.

Unit outlines are provided and are posted on the web. I should never hear, "I was absent. What did we do?" You should already know and be prepared for the day you return to class.

### **Labs:**

We will be completing 2-3 labs each month. Although you will be working closely, you and your partner must keep separate and unique lab work.

**Homework:** Homework will be assigned most nights (and on weekends) and should take 30-45 minutes to complete. Homework will typically be checked a few times during the quarter. If you cannot show it then and there you lose a mark on the hwk/participation grade.

**Tests and Quizzes:** There will be frequent short quizzes on topics covered in class. Some of these may be "pop" There will also be unit tests..

**Class Behavior:** Safety and respect are the key words.

**Help....** Not everyone understands an explanation in a text or from a teacher. Therefore I recommend that if you have difficulty at any point then you seek out other sources of information/explanation.... examples are other texts, friends or family, the internet... even me again as I usually have several ways of explaining the same thing and one of the ways may work with you!

What ever you do, do not try and hide the fact that you are not understanding. Tackle it immediately or the gap will be harder to make up.

I am available to help before school and most lunch hours. Sorry, I am not usually available after school.

**ALL STUDENTS ENROLLED IN ADVANCED PLACEMENT CHEMISTRY ARE EXPECTED TO TAKE THE AP EXAM IN MAY**

## ABOUT THE AP CHEMISTRY COURSE

Since this is a college level course taught in high school, it is very demanding, both in time and effort required. Much of the work involves solving math-type word problems. It is highly recommended that AP Chemistry students be concurrently enrolled in one of the higher-level mathematics courses available. Homework is assigned most days until the final review for the AP Chemistry Exam. The amount of work outside of class depends upon the student and his/her background; however, students should be prepared to spend anywhere from 45 minutes to an hour each night after school on just their AP Chemistry homework. Those students who are heavily involved in after school activities etc will have to learn to manage their time very carefully.

## WHY TAKE AP CHEMISTRY?

There are several reasons why a student might want to take AP Chemistry, including (but not limited to!) the following:

1. AP Chemistry will challenge you to the limits of your academic ability. In the past you may have found classes "too easy", and therefore not stimulating you to do your very best. This will not be the case in AP Chemistry.
2. AP Chemistry will teach you to think at higher levels. Learning will rarely be of the "parrot-back" variety (i.e. where the teacher gives a lecture, and the student is expected to give back the same information on a test---similar to a parrot!) In AP Chemistry, you will be forced to think and apply concepts to new situations, and even derive your own theories from application. This is excellent preparation for the higher levels of thinking required in college.
3. Of course, one of the most obvious benefits to this course is that when you take and pass the AP Chemistry Exam given in May, you may receive college credit for the course when you enroll at most colleges and universities in the United States. This will save you both time and money.

(However, fewer colleges are offering this option these days)

[Some students who have passed the AP Exam elect to take first year college chemistry anyway, where they find the material an easy review, and achieve top grades while others around them are frustrated and struggling in a class which is too large and/or the instructor is unavailable for help! I especially recommend this approach for students considering majoring in chemistry or biochemistry.]

4. AP Chemistry looks great on your transcript or on a letter of recommendation. More and more of the best colleges and universities are looking for ways that students have distinguished themselves in high school. Being a "straight A" student no longer carries the weight it once did, and many 4.0 grade average students are finding themselves denied entry at the college of their choice. One of the first things admissions officers ask counselors about a potential candidate for their university is 'did this student take the most challenging courses available?' Taking AP Chemistry is a way of distinguishing yourself in high school.
5. As difficult as AP Chemistry is, you will find that it will never be as easy to learn Freshman Chemistry as it is now! There are several reasons for this:
  - a. High school classes are generally much smaller than college classes.
  - b. Most college professors don't regard teaching Freshman Chemistry as a priority; many concentrate on their research, and consider teaching to be an interruption and distraction to that end.

- c. At times Freshman Chemistry is used to "weed out" students. Most colleges prefer not to have large class sizes in their upper division courses. Therefore the grades and difficulty level of the freshman courses are adjusted so that only small numbers of very outstanding students will be able to move on. This can result in a large portion of students in freshman chemistry flunking the course!

During the first 3 weeks of the first quarter you will be assessed as to whether I think that you are coping with the course. This summer assignment will be a part of that assessment. If you are showing strong signs that you are not coping you may be advised to drop the course.

## AP CHEMISTRY FIRST DAY TEST

AP Chemistry is a difficult course. It is not all about memorization; however, having these items memorized is very helpful for success in learning the concepts covered in the course. Make flashcards, have your friends and family quiz you, take the lists with you on vacation, or do whatever it takes to get this information firmly planted in your head. Do not wait until the night before school begins. The first day test will cover six areas of memorization:

1. Polyatomic ions (names and charges)
2. Variable valences for transition metals
3. Rules for naming acids
4. Rules for naming ionic and covalent compounds.
5. Solubility rules
6. Determining oxidation numbers.

If this seems like too much work for the summer, please drop the course. Advanced Placement Chemistry is a college level course. You will need to be dedicated and work very hard if you are to be successful. That said, much of this is just revision!

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### 1 Rules for Naming and Acid

When the name of the anion ends in -ide, the acid name begins with the prefix hydro-, the stem of the anion has the suffix -ic and it is followed by the word acid.

-ide becomes hydro \_\_\_\_\_ic Acid  $\text{Cl}^-$  is the Chloride ion so  $\text{HCl}$  = hydrochloric acid

When the anion name ends in -ite, the acid name is the stem of the anion with the suffix -ous, followed by the word acid.

-ite becomes \_\_\_\_\_ous Acid .....  $\text{ClO}_2^-$  is the Chlorite ion so  $\text{HClO}_2$  = Chlorous acid.

When the anion name ends in -ate, the acid name is the stem of the anion with the suffix -ic, followed by the word acid.

-ate becomes \_\_\_\_\_ic Acid .....  $\text{ClO}_3^-$  is the Chlorate ion so  $\text{HClO}_3$  = Chloric acid.

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### 2. Rules for Naming Ionic Compounds... Binary compounds (2 different atoms)...(see below for polyatomic ions. -ate. -ite contain oxygen. The -ate has more oxygens than the -ite)

1. Balance Charges (charges should equal zero)
  2. Cation (positive) is always written first (in name and in formula)
  3. Change the ending of the anion to -ide
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### 3 Solubility Rules

1. All compounds containing alkali metal cations or the ammonium ion are soluble.
2. All compounds containing  $\text{NO}_3^-$ ,  $\text{ClO}_4^-$ ,  $\text{ClO}_3^-$ , and  $\text{C}_2\text{H}_3\text{O}_2^-$  anions are soluble.
3. All chlorides, bromides, and iodides are soluble except those containing  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ , or  $\text{Hg}^{2+}$ .
4. All sulfates are soluble except those containing  $\text{Hg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ , or  $\text{Ba}^{2+}$ .
5. All hydroxides are insoluble except compounds of the alkali metals,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ , and  $\text{Ba}^{2+}$ .
6. All compounds containing  $\text{PO}_4^{3-}$ ,  $\text{S}^{2-}$ ,  $\text{CO}_3^{2-}$ , and  $\text{SO}_3^{2-}$  ions are insoluble except those that also contain alkali metals or  $\text{NH}_4^+$ .

### 4 Rules for Determining Oxidation Number

**Oxidation Number:** A number assigned to an atom in a molecular compound or molecular ion that indicates the general distribution of electrons among the bonded atoms.

1. The oxidation number of any uncombined element is 0.
2. The oxidation number of a monatomic ion equal the charge on the ion.
3. The more electronegative element in a binary compound is assigned the number equal to the charge it would have if it were an ion.
4. The oxidation number of fluorine in a compound is always  $-1$
5. Oxygen has an oxidation number of  $-2$  unless it is combined with F, when it is  $+2$ , or it is in a peroxide, when it is  $-1$ .
6. The oxidation state of hydrogen in most of its compounds is  $+1$  unless it combined with a metal, in which case it is  $-1$ .
7. In compounds, the elements of groups 1 and 2 as well as aluminum have oxidation number of  $+1$ ,  $+2$ , and  $+3$ , respectively
8. The sum of the oxidation numbers of all atoms in a neutral compound is 0.
9. The sum of the oxidation number of all atoms in a polyatomic ion equals the charge of the ion.

### 5 Variable Valences For Transition Metals

Name	Symbol	Charge	Stock Name
Chromium	Cr	+2	Chromium (II)
		+3	Chromium (III)
Manganese	Mn	+2	Manganese (II)
		+3	Manganese (III)
Iron	Fe	+2	Iron (II)
		+3	Iron (III)
Cobalt	Co	+2	Cobalt (II)
		+3	Cobalt (III)
Copper	Cu	+1	Copper (I)
		+2	Copper (II)
Lead	Pb	+2	Lead (II)
		+4	Lead (IV)
Mercury	Hg	+1	Mercury (I)
		+2	Mercury (II)
Tin	Sn	+2	Tin (II)

		+4	Tin (IV)
Gold	Au	+1	Gold (I)
		+3	Gold (III)
Silver	Ag	+1	Silver
		+2(rarely)	Silver (II)
Bismuth	Bi	+3	Bismuth (III)
		+5	Bismuth (V)
Antimony	Sb	+3	Antimony (III)
		+5	Antimony (V)
Cadmium	Cd	+2	Cadmium
Zinc	Zn	+2	Zinc

## 6 Polyatomic Ions

Name	Symbol	Charge
ammonium	NH <sub>4</sub>	+1
acetate	C <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	-1
bromate	BrO <sub>3</sub>	-1
chlorate	ClO <sub>3</sub>	-1
chlorite	ClO <sub>2</sub>	-1
cyanide	CN	-1
dihydrogen phosphate	H <sub>2</sub> PO <sub>4</sub>	-1
hypochlorite	ClO	-1
hydrogencarbonate(bicarbonate)	HCO <sub>3</sub>	-1
hydrogen sulfate (bisulfate)	HSO <sub>4</sub>	-1
hydrogen sulfite (bisulfite)	HSO <sub>3</sub>	-1
hydroxide	OH	-1
iodate	IO <sub>3</sub>	-1
nitrate	NO <sub>3</sub>	-1
nitrite	NO <sub>2</sub>	-1
perchlorate	ClO <sub>4</sub>	-1
permanganate	MnO <sub>4</sub>	-1
thiocyanate	SCN	-1
carbonate	CO <sub>3</sub>	-2
chromate	CrO <sub>4</sub>	-2
dichromate	Cr <sub>2</sub> O <sub>7</sub>	-2
oxalate	C <sub>2</sub> O <sub>4</sub>	-2
selenate	SeO <sub>4</sub>	-2
silicate	SiO <sub>3</sub>	-2
sulfate	SO <sub>4</sub>	-2
sulfite	SO <sub>3</sub>	-2
phosphate	PO <sub>4</sub>	-3
phosphite	PO <sub>3</sub>	-3

This assignment **MUST** be handed in on the first day back at the beginning of the short period. Failure to do so may result in you being dropped from the course. The first day test may also be in this period or in the first full period. Be prepared for either day!

So, good luck and try to develop the ability to 'see pictures of what is happening' in your head.



## ASSIGNMENT

1. **Read the first two chapters of the text...Chemistry by ZUMDAHL**
2. **Distinguish between the following terms: Allotropes, isotopes, isomers**
3.  **$\text{CH}_2\text{Cl}_2$  is a typical covalent compound with polar bonds while  $\text{NaCl}$  is a typical ionic compound. Use these examples to help answer the following questions.**
  - a **Bonding is said to be the result of valence electrons being attracted simultaneously to 2 or more nuclei. Discuss this statement and show how ionic bonds and covalent bonds are 2 extreme examples of this statement.**
  - b **Describe the bonding in  $\text{NaCl}$ . What properties (chemical and physical) is it likely to have. Explain how ionic bonding gives it these properties.**
  - c **Repeat part b for  $\text{CH}_2\text{Cl}_2$  in terms of covalent bonds... both polar and nonpolar.**
- 4 **Organic Chemistry. We do not cover this in our course but there are questions in AP where a knowledge of the basics are useful.**
  - a **Explain the difference between alkanes, alkenes and alkynes. Give the general formula for each group and name the first 5 examples of each. Show the structural isomers for  $\text{C}_5\text{H}_{10}$**
  - b **Write a typical equation to represent the combustion of an alkane.**
  - c **What is a functional group?**
  - d **How do you recognize each of the following organic compounds... organic acid, an alcohol, ether, aldehyde and ketone (both by properties and by formula)**
5. **Distinguish between the following: Lewis diagram, structural formula,**