AP CHEMISTRY SUMMER PACKET 2014: Instructor: Dr. Rajasekaran Renuka (Dr. R.)

Introduction

I feel extremely delighted that you have decided to take Advanced Placement Chemistry! This course is designed to give you a more complete experience of chemistry that will prepare you for the AP Chem Exam during next May and would also provide you with enriching college level experience. The only way to complete all the topics in this rigorous course is to move at a very rapid pace. I will complete all the portions of the course shortly after the end of the third quarter so we can begin reviewing for the exam. Therefore, it is critical for all students to complete the Summer Assignment to be ready to get after it in the fall.

Course Overview

Please visit http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2119.html for Course Overview, Full Course Description, and Lab Manual. We will be using the following text book: *Chemistry: The Central Science* (11th Edition) **by Brown et al.**

Why take AP Chemistry?

You have probably decided to take this course for several reasons. Here are some of the reasons why this course is beneficial:

- Students who successfully pass the AP Chem Exam (a score of 3 or better is considered passing) with a 4 and above are eligible to receive college credit at most colleges and universities in the United States. This can represent a considerable savings in time and money. Whereas a 4 will fetch you the College Credit for Level I College Chemistry, if you make a 5, you might receive two College credits.
- Some students, regardless of whether or not they passed the AP Chem Exam, elect to take freshman chemistry in college anyway. For most students freshman college chemistry is an extremely difficult course. Students who have taken AP Chem do immensely better than if they had not taken the course. If you planning on majoring in any science or medical field you will take college chemistry and this course will prepare you extremely well.
- AP Chem credit looks really good on your transcript. AP Chem will teach you to think at higher levels. In AP Chem, you will be encouraged and taught how to analyze deeply, synthesize concepts and evaluate approaches to problems, often in novel situations, sometimes even deriving your own techniques from application. This is exactly the type of thinking you will be expected to use in college.
- At Luella High School, you will find it can be easier to learn chemistry than in college because of the small class sizes and individual time and help that I can give you. Freshman college chemistry is usually taught in large lecture halls where individual assistance is difficult to find.

Tips for achieving success in AP Chemistry

- Study AP Chem every day for at least one hour. This means that if there are no formal assignments, you should be using this time to review your class notes, read the text book, and give yourself a practice quiz, etc. You must budget this time carefully. If you have a job or are involved in sports, your study time must take priority.
- Choose a study partner who you can also have as a lab partner. **Labs are very difficult if done alone.** Pairs are better than larger groups. Besides labs, get together at regularly scheduled times for study and homework. Avoid "splitting up" the work.
- Purchase a study guide (5 Steps to 5 in AP Chemistry) and use it for each chapter studied.
- Avoid getting behind in this course. If you get stuck on a concept or H/W set, get help immediately.
- Attend weekly study sessions regularly. Clear this time right away with your coach or boss or parent. During this time we are able to take the time to go over H/W problems, old exam questions & etc.

The Commitment

If you taking the AP Chem course, you have already enjoyed success in your academic career. Taking a course such as AP Chem will be very different than courses you have taken in the past. It will involve a level of work and commitment that you may not have experienced before. Below is list of realities that you must face:

- Straight-A students often get their first B in AP Chem and other students receive their first C. An A in this course will take tremendous effort.
- Missing class for sports, vacations, activities, etc, will result in falling behind and extreme difficulty in getting caught up. You may have been able to manage missing more than a few days each quarter in the past. In this course multiple missed days will be very hard to make up.
- Regardless of who teaches this course, it always follows the same pace, has the same workload, and the same difficulty level. There is a very specific amount of material that must be covered for the AP Test and there is no time to re-teach or slow down if some students are falling behind. We absolutely must be ready for the AP Test in May. You must accept the fact that you will have significant work outside of class and will need to get help on assignments and lab work.
- You must complete the summer assignment that follows here. We will have a test on this material on the **First day of class**. In order for us to save some valuable time later in the course, everyone needs to be ready to go. Carefully read the information on the summer packet on the pages that follow.

Please get started early and work consistently. Your goal must be to master the concepts and retain them. For this repeated practice is a must.

Despite these directions, there will be some students who will procrastinate and try to do all of this studying just before the start of school. Those students may even cram well enough to do well on the Day 1 Test. However, they will quickly forget the ions, and struggle every time that these formulas are used in lecture, homework, quizzes, tests and labs. Please remember that you will not be allowed to use the ions' charts and the periodic tables containing color codes and names any more in your AP class.

All research on human memory shows us that frequent, short periods of study, spread over long periods of time will produce much greater retention than long periods of study of a short period of time.
Best of luck to you all

You will do the Following Immediately

1. **Send me an email, with your full name, mentioning that you are an AP Chemistry Student for 2014-2015 school year.**
2. **I will then be sending you the code for creating an EDMODO account – which is free and a code for Remind101 account, which is also free.**
3. **I will also be sending you the code for creating the WEBASSIGN account – which would be around $12 for the whole year.**

We are going to have an exciting, challenging and fun year. I look forward working with you all next year. I hope you have a great summer. If you do have any questions please feel free to email me at renuka.rajasekaran@henry.k12.ga.us. I cannot promise to check it every day, but I will get back to you as soon as I can.

Remember your summer assignment and First-Day Test, and I'll see you on the first day of the school!

Dr. R.

AP Chemistry Summer Assignment: Mastery of Foundation Concepts

(1) Master the formulas, charges, and names of the common ions. By acquiring mastery on this, you should be able to:
- write the names of these ions when given the formula and charge
- write the formula and charge when given the names
- find the charge on an element in the anion given the charge of the anion
- write the name and formulas of the acids associated with anions
- write the name and formulas of the bases associated with cations
- write the name and formulas of radicals: ammonium ion, hydrated copper(II) ion, and the associated salts.

(2) Master Atomic Structure and Periodic Trends. By acquiring mastery on this, you should be able to:
- Develop a scheme on the successive development of atomic model and highlight the revision/improvement at each step of development
- Distinguish between, Shell, Subshell, and Orbital
- Explain Pauli's Exclusion Principle, Hund's Rule of Maximum Multiplicity, de Broglie's hypothesis, and the Uncertainty Principle & Schroidinger's wave equation
- Define all the four quantum numbers, give the numeric formula for deriving quantum numbers, and list down the quantum numbers for any given electron
- Draw aufbau diagram, shell structure, and box diagram for electronic configuration
- Write electronic configuration in the formula form given the atomic number
- Give the name of the element given the electronic configuration
- Identify on the Periodic Table, valence shell configuration of every element, electronic dot structure of every element, names of special groups and periods, metalloids, non-metals, and elements in the diatomic state
- Define Metallic Character, Ionization Energy, Electronegativity, Electron Affinity, Atomic Radius, and Ionic Radius
- Interpret the Periodic Trend of Metallic Character, Ionization Energy, Electronegativity, Electron Affinity, Atomic Radius, and Ionic Radius

(3) Master Principles of Chemical Bonding. By acquiring this mastery, you should be able to
- Identify bonds as Covalent, Ionic, and Coordinate
- Predict the properties of compounds based on the bonding present in them
- Identify, illustrate, and Describe Intermolecular Forces
- Discuss the consequences of hydrogen bonding

(4) Master Types of Reactions. By acquiring mastery on this, you should be able to:
(a) Identify the types of reaction, given a set of chemical equations
(b) Contrast Synthesis with Decomposition
(c) Distinguish between single and double replacement reactions
(d) Correlate the acid-base neutralization reaction to Double Replacement reaction
(e) Relate combustion to thermochemistry and chemical energetics

(5) Master properties of solutions and the Solubility Rules. By acquiring mastery on this, you should be able to:
- Identify soluble, sparingly soluble, and insoluble compounds
- Construct Ionic Equations
- Derive Net Ionic Equations
- Identify Spectator Ions

(6) Master Thermochemistry concepts. By acquiring mastery on this, you should be able to:
- Distinguish between Exothermic and Endothermic reactions
- Define, Heat, Enthalpy, and Entropy

- Explain Collision Theory and Activation Energy
- Distinguish between Spontaneous and Non-Spontaneous Reactions
- Define Hess's Law of Constant heat Summation
- Use a set of known thermochemical equations to derive the Heat of an unknown reaction

(7) Master the concepts of Acids, Bases, and Neutralization Reactions. By acquiring mastery on this, you should be able to:

- Identify water as the fundamental chemical from which acids and bases are born
- Name the acid, base, or salt given the formula
- Give the formula of the acid, base, or salt given the name
- Identify the hydrogen ion as a proton
- Identify acids as monoprotic, diprotic, and triprotic
- Define Acidity of Bases and Basicity of Acids
- Construct equations of neutralization reaction between an acid and a base
- Construct the formula and name of the salt formed between an acid and a base given the names of the acid and the base
- Define Molarity, Molality, Weight (or mass) per Liter, and Equivalents per liter
- Calculate Molarity, Molality, Weight (or mass) per Liter, and Equivalents per liter
- Define and distinguish between strong acid & weak acid and strong base and a weak base
- Define and identify conjugate acid and conjugate base
- Workout problems based on pH and hydrogen /hydronium ion concentration
- Work out problems based on pH + pOH = 14
- Work out problems based on Ionic Product of Water

(8) Master concepts of Reaction Kinetics and Chemical Equilibrium. By acquiring mastery on this, you should be able to:

- Define "Rate" and express "Rate" in a mathematical relationship
- Identify factors affecting "Reaction Rate"
- Define Chemical Equilibrium in terms of dynamism and rate
- State Le Chatelier- Braun Principle
- Predict the effect of different stresses on chemical equilibrium
- Relationship between Kc and Kp
- Define and calculate Mole fraction
- Find Partial Pressure from Total Pressure

(9) Master Principles of Stoichiometry. By acquiring mastery of this, you should be able to

- Balance Equations
- State Avogadro's hypothesis
- convert mass into moles
- Convert moles into mass
- Derive formula mass from mass and number of moles
- Find molar volume from mass or volume
- Find mass or volume from molar volume
- Find percent yield
- Find Empirical Formulas

(10) Master properties of gases. By acquiring mastery of this, you should be able to

- Explain gas laws and phenomena
- Kinetic theory of gases

Resources

I. **Review Material:** A strong foundation with the fundamental concepts is indispensable for getting started with AP Chemistry. For ensuring this, you may want to consult: **Regent Review Packet** (you

need to google it to get this), which is available for free on the websites of several schools and teachers. For Chemical Formulas, you may like additionally consult: http://boomeria.org/chemtextbook/cch4.html

II. **Practice Quizzes/Tests:** Attempt all the following quizzes, to get a minimum of 90 percent in each quiz.

(1) Softschools.com topic-wise quizzes http://www.softschools.com/quizzes/chemistry/

Matter Properties Quiz
Subatomic Particles Quiz
Elements, Compounds & Mixtures Quiz
Acids and Bases (pH scale) Quiz
Exothermic and Endothermic Chemical Reactions Quiz
Physical and Chemical Changes Quiz
Mixtures and Compounds Quiz
States of Matter Quiz
Solute vs. Solvent Quiz
Chemical Bonding I: Ionic Bonding Quiz
Chemical Bonding II: Covalent Bonding Quiz
Chemical Bonding III: Metallic Bonding Quiz
Atomic Theory I Quiz
Atomic Theory II: Early Models of the Atom Quiz
Atomic Theory III: The Quantum Mechanical Model Quiz
Nuclear Chemistry I Quiz
Nuclear Chemistry II: Problem Solving Quiz
The Periodic Table I: History Quiz
The Periodic Table II: Classification Quiz
The Periodic Table IV: Family Names Quiz
Matter Quiz
Elements & Compounds Quiz
Mixtures I: Classification Quiz
Mixtures II: Separation Quiz
Ionic Bonding I: Formation Quiz
Ionic Bonding II: Nomenclature Quiz
Ionic Bonding III: Practice Quiz
Covalent Bonding I: Formation Quiz
Chemical Bonding Identification Practice Quiz
Lewis Structures & Molecular Shapes Quiz
Polarity I: Electronegativity Quiz
Polarity II: Molecular Shape Quiz
Counting Particles & Avogadro's Number Quiz
Molar Mass Quiz
Mole-Mass Conversions Quiz
Mass-Mole Conversions Quiz
Percent Composition Quiz
Empirical & Molecular Formulas Quiz
Mole Ratios Quiz
Stoichiometry I: Mole-Mole Problems Quiz
Stoichiometry II: Mole-Mass Problems Quiz
Stoichiometry III: Mass-Mass Problems Quiz
Stoichiometry IV: Limiting Reactants Quiz
Stoichiometry V: Percent Yield Quiz
Stoichiometry VI: Mixed Problems Quiz
Gases: Behavior Quiz
Gases: Pressure Quiz
The Gas Laws I: Boyle's, Charles' & Gay-Lussac's Quiz
The Gas Laws II: Combined & Avogadro's Principle Quiz
The Gas Laws III: Ideal Gas Law Quiz
Gases: Gas Stoichiometry Quiz
Solutions: Characteristics Quiz
Solutions: Concentration I Quiz
Solutions: Concentration II Quiz
Solubility Rules Quiz
Solutions: Preparation & Dilution Quiz
Solutions: Mixed Review Quiz
The Periodic Table: Alkali Metals Quiz
The Periodic Table: Alkaline Earth Metals Quiz
The Periodic Table: Halogens Quiz
The Periodic Table: Noble Gases Quiz
The Periodic Table: Transition Metals Quiz
Properties of Matter Quiz
Isotopes Quiz
Oxidation-Reduction Reactions Quiz
Agents of Oxidation & Reduction Quiz
Oxidation Numbers Quiz
Properties of Water Quiz
Solubility Quiz
Unsaturated Hydrocarbons Quiz
Chemical Equilibrium Quiz

(2) Practice Quiz or Test at http://chemistry.about.com/library/weekly/blatomquiz2.htm

(3) Practice Quiz or Test at http://www.mhhe.com/cgi-bin/netquiz_get.pl?qfooter=/usr/web/home/mhhe/physsci/chemistry/goldberg/student/quizzes/footerq.htm&test=/usr/web/home/mhhe/physsci/chemistry/goldberg/student/quizzes/ch18c.txt&answers=/usr/web/home/mhhe/physsci/chemistry/goldberg/student/quizzes/ch18cans.txt&email=1

Additional Resources for Mastery and Retention: See Appendix

I. Common Polyatomic Ions
II. Monoatomic Ion Charges on the Periodic table
III. A Periodic Table containing Diatomic Elements
IV. A Flow Chart on the Methodology for Naming Ionic Compounds

Remember: ***A mastery of the common ions, their formulas and their charges, is essential to success in AP Chemistry. Really, I mean it. If you learn this list of polyatomic ions, you just may do well in this course. If you don't, you will surely encounter a great deal of difficulty. If you need help with memorizing them you can come after school, but really I can't do anything with you other than what I recommend in the following sentence:***
"say aloud and write them over and over and over and over and over and over and over" until you got them. Flash cards might provide additional support. For extra help, visit http://www.wimp.com/polyatomicions/

You are expected to be very familiar with all of these ions and the diatomic elements on the first day of class; your FIRST DAY TEST will have ample number of questions on ions to check your mastery of this, along with other concepts.

APPENDIX

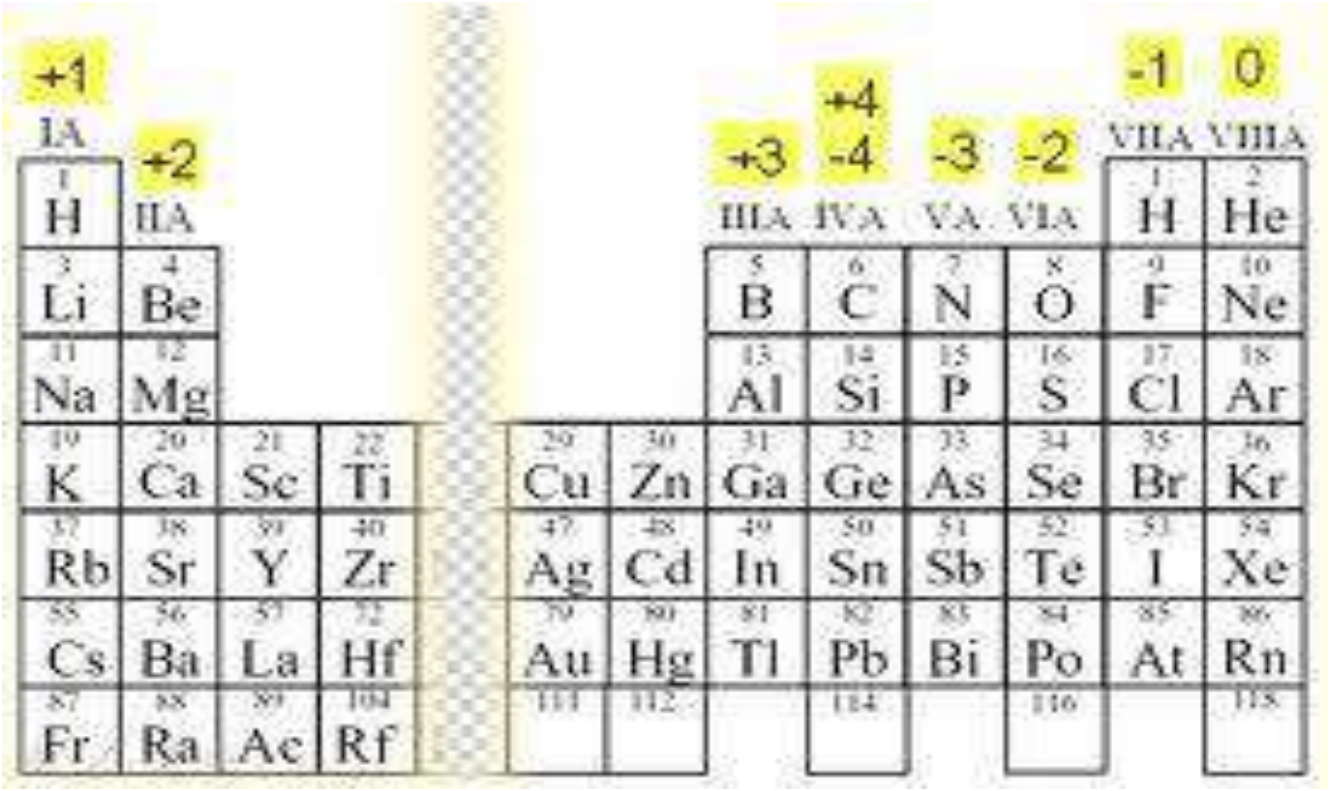
Common Polyatomic Ions

$C_2H_3O_2^-$	acetate	OH^-	hydroxide
NH_4^+	ammonium	ClO^-	hypochlorite
CO_3^{2-}	carbonate	NO_3^-	nitrate
ClO_3^-	chlorate	NO_2^-	nitrite
ClO_2^-	chlorite	$C_2O_4^{2-}$	oxalate
CrO_4^{2-}	chromate	ClO_4^-	perchlorate
CN^-	cyanide	MnO_4^-	permanganate
$Cr_2O_7^{2-}$	dichromate	PO_4^{3-}	phosphate
HCO_3^-	bicarbonate	SO_4^{2-}	sulfate
HSO_4^-	bisulfate	SO_3^{2-}	sulfite
HSO_3^-	bisulfite		

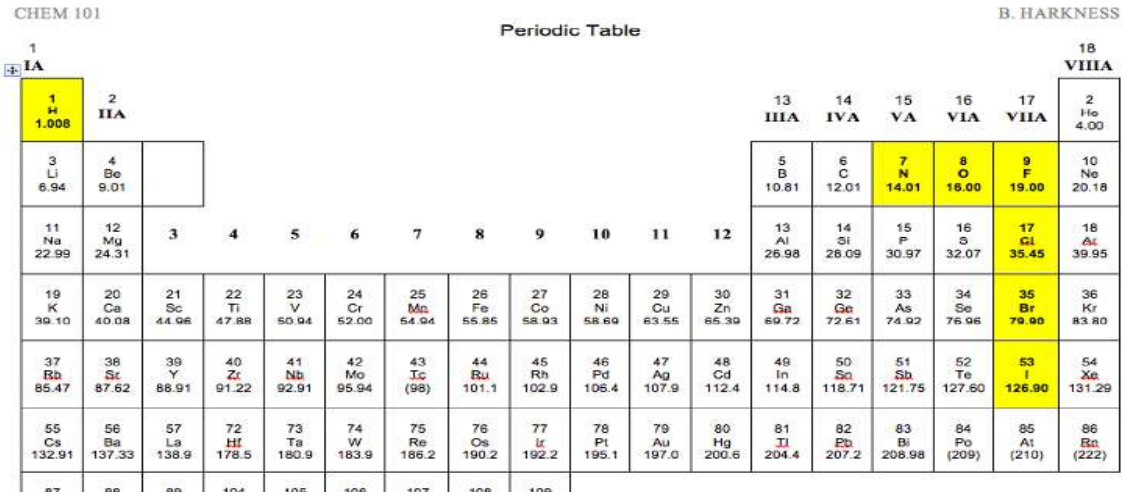
ClO_2^-	**Chlorite**
ClO_3^-	**Chlorate**
ClO_4^-	**Perchlorate**

Visit http://www.wimp.com/polyatomicions/ for the great way to remember polyatomic ions.

I. Monoatomic Ion Charges on the Periodic Table



II. The Seven Diatomic Elements



****PLEASE LEARN THESE *****

THESE SEVEN ELEMENTS exist as diatomic molecules under ordinary conditions (normal room temp and pressure) when used as elements in reactions they are written like this:

H_2 hydrogen **F_2** fluorine **Br_2** bromine

N_2 nitrogen **Cl_2** chlorine **I_2** iodine **O_2** oxygen

IV. Methodology for Arriving at the Formulas of Ionic Compounds