PHYSICAL SCIENCE REVIEW AND SUMMER SYLLABUS FOR AP CHEMISTRY

Although a little early, WELCOME TO AP CHEMISTRY ! You will soon learn that although fun at times, AP Chemistry is an extremely intense course. In order to better ensure your success, it is highly recommended that you do some reviewing over the summer. When you walk into our classroom in the Fall, it will be expected that you are very comfortable with the chemistry learned this year in AC physical science. ***In fact, expect to take a quiz during the first week of school covering all of the chemistry you have learned.*** Additionally, it is highly recommended that you read and do practice problems for Chapter ONE and TWO from your AP Chemistry textbook, *Chemistry: The Central Science* (Brown, Bursten, LeMay). Much of the information in these two chapters is simply a review of physical science. I know that I am expecting a lot to have you do work over the summer; however, reviewing these chapters over the summer will give us a significant head start on the year -hopefully allowing us more time for REVIEW before the AP exam in May!

Below, you will find a study guide and some practice problems that should help you understand exactly what I expect you to know. Just like your AC Physical Science teacher warned, you will definitely find your AC physical science notebook to be a very valuable resource. Also, you will need to check out an AP chemistry book from the book depository for your summer review. I recommend you do this before the school year ends! The book depository will be able to sign-out books two weeks prior to finals, and for the week after finals. If you know you will be gone the entire summer, it is expected that you will bring your textbook with you (or make copies of the first two chapters**). *I will collect your practice problems on the second day of school, next fall.***

I am certainly looking forward to finally meeting you. Please do not hesitate to contact me over the summer if you have any questions or concerns.

Sincerely,

Mr. Collins (Andrew)
collinsa@aaps.k12.mi.us

A. Chapter ONE: The Basics

1. Be able to define and distinguish between a homogeneous and heterogeneous mixture.
2. Be able to define and distinguish between an intensive property and an extensive property.
3. What is the formula for density and what does it mean to say that an object is DENSE?
4. Become familiar with the three temperature scales. What is the significance of the Kelvin scale? Be able to convert from one temperature scale to another. (The conversion for °C to °F will be provided)
5. Know how to do calculations in scientific notation.
6. Know and be able to apply the rules for significant digits.
7. Know the difference between accuracy and precision.
8. Be able to do dimensional analysis or unit converting.
9. Know the name, symbol, molecular mass of ALL of the elements....just kidding. Just know the name and symbol of all of the elements specified on the "I Can't Wait To Memorize All Of These Elements List" which is attached. Don't forget the naming/charge rules for the polyions as well!
10. Practice doing calculations with logs without using a calculator.
11. Review the difference between physical and chemical changes.
12. Expect to solve algebraic equations and use the quadratic equation.

** PRACTICE PROBLEMS: (pg 29-33) 1.8, 1.12, 1.16, 1.22, 1.24, 1.30, 1.32, 1.34, 1.36, 1.38, 1.40, 1.42
- Hey, by the way.....Answers to odd numbered problems are located in the back of you book!

B. Chapter TWO: Atoms, Molecules and Ions

1. What were Dalton's ideas about the atom?
2. What did J.J. Thomson discover about the atom? What experiment did he do?
3. What did Earnest Rutherford discover about the atom? What experiment did he do?
4. Be able to READ the periodic table to determine the # of neutrons, protons, and electrons in a given atom symbol. What does the atomic number and atomic mass number represent?
4. What is an isotope? What is an ion? (anion? cation?) Be able to site examples of each.
5. Be able to locate and identify significant characteristics of the following element families - alkali metals, alkaline earth metals, halogens, noble gases and transition metals.
6. What properties distinguish a metal from a nonmetal? Luster? Conductivity? ....
7. Be able to define and distinguish between an atom, molecule, diatomic molecule, polyatomic molecule, ion, compound and ionic compound. There will be some overlap in these definitions!

8. Be able to determine the ion charge of main group elements. (pg 50) Be able to name and write formulas for simple ionic compounds. (ex: NaBr=sodium bromide, MgO = magnesium oxide, $MgCl_2$ = magnesium chloride, etc....) Make sure you can balance your ionic compounds.
9. Relearn the polyions (name and formula) - NH_4^+ = Ammonium ion, NO_3^- = nitrate ion, etc. **Refer to attached sheet, "Common Polyions to Memorize."** It is soooo important that you KNOW these polyions! It is required that you make some flash cards so you can refresh yourself with these ions throughout the year!
10. Be able to name ionic compounds using the polyions. (ex: Na_2SO_4 = sodium sulfate) Make sure your charges are balanced!
11. What are Roman numerals used for when naming compounds involving transition metals? What does the Roman numeral refer to?
12. How do you recognize and name molecular compounds?
13. How do you name acids? Practice using the flow chart for naming that is attached.
14. What is a hydrate and how do you name them?
15. Be able to define and distinguish between an empirical formula and a molecular formula.

** PRACTICE PROBLEMS: (pg 66-70) 2.8, 2.16, 2.26, 2.34, 2.42, 2.46, 2.54, 2.55, 2.56 (AND, define each compound (2.54-56)...is it an acid, ionic compound or molecular compound????

C. **OTHER INFORMATION TO KNOW!**.....no practice problems suggested. Refer to your physical science notebook!!
Periodic Chemistry/Quantum Chemistry:
1. Be able to identify and define the 3 parts to a wave - wavelength, frequency and amplitude.
2. Be able to do calculations with the wave formula $c = \lambda \cdot \nu$ (λ = wavelength (lambda), ν = frequency (nu), c = the constant of the speed of light)
3. Be able to explain how waves exhibit both wave-like and particle-like behavior. What is a photon?
4. Be able to define and distinguish between a covalent bond and an ionic bond. What kind of elements make ionic bonds? What kind of elements make covalent bonds?
5. What is electronegativity? What is the trend for electronegativity on the periodic table (As you go across the periodic table, what happens to electronegativity?...etc) How do electronegativity differences influence bonding (ionic vs covalent)?
6. What does the term, atomic radii, refer to? What is the trend for atomic radii on the periodic table?
7. Be able to write electron configurations for main group and transition metals.

Gas Laws, Pressure. States of Matter:
1. Be familiar with the basic units of pressure - atm, Pa, kPa, torr, barr, millibars, mm Hg, lb/in^2. Practice converting among them.
2. Be able to explain how a mercury barometer and/or manometer work.
3. What is atmospheric pressure? What happens to atmospheric pressure as you change altitude? Why does this happen?
4. Be able to explain how a mercury thermometer works.
5. Understand and be able to do calculations with Boyle's , Charles's, and the Combined Gas Law equation.
6. Be familiar with the postulates of the Kinetic Molecular Theory of Gases. How do they support the Gas Laws.
7. Be able to define all of the possible phases changes (pg 421, fig 11.19) and indicate whether the phase change REQUIRES or RELEASES energy.
8. What does Heat of Fusion and Heat of Vaporization refer to. What units do these values have and why?
9. Be able to calculate the amount of heat released or absorbed during certain phase changes.
10. What does specific heat refer to? Heat capacity?
11. Be able to draw and interpret a heating or cooling curve.

Good Luck with your studies and have a happy, restful summer!!

THE "I CAN'T WAIT TO MEMORIZE ALL OF THESE ELEMENTS" LIST

Aluminum	**Al**	Germanium	**Ge**	Polonium	**Po**
Antimony	**Sb**	Gold	**Au**	Potassium	**K**
Argon	**Ar**	Helium	**He**	Radium	**Ra**
Arsenic	**As**	Hydrogen	**H**	Radon	**Rn**
Barium	**Ba**	Iodine	**I**	Rubidium	**Rb**
Beryllium	**Be**	Iron	**Fe**	Scandium	**Sc**
Bismuth	**Bi**	Krypton	**Kr**	Selenium	**Se**
Boron	**B**	Lead	**Pb**	Silicon	**Si**
Bromine	**Br**	Lithium	**Li**	Silver	**Ag**
Cadmium	**Cd**	Magnesium	**Mg**	Sodium	**Na**
Calcium	**Ca**	Manganese	**Mn**	Strontium	**Sr**
Carbon	**C**	Mercury	**Hg**	Sulfur	**S**
Cesium	**Cs**	Neon	**Ne**	Thallium	**Tl**
Chlorine	**Cl**	Nickel	**Ni**	Tin	**Sn**
Chromium	**Cr**	Nitrogen	**N**	Titanium	**Ti**
Cobalt	**Co**	Oxygen	**O**	Tungsten	**W**
Copper	**Cu**	Phosphorus	**P**	Uranium	**U**
Fluorine	**F**	Platinum	**Pt**	Xenon	**Xe**
Gallium	**Ga**	Plutonium	**Pu**	Zinc	**Zn**

COMMON POLYIONS TO REMEMBER (Make flashcards! This is required! 1. Put the name of the ion on one side 2. Write the formula on the other side)

1^+ CHARGE	
FORMULA	NAME
NH_4^+	ammonium
2^- CHARGE	
FORMULA	NAME
SO_4^{2-}	sulfate
SO_3^{2-}	sulfite
CO_3^{2-}	carbonate
CrO_4^{2-}	chromate
$Cr_2O_7^{2-}$	dichromate
HPO_4^{2-}	hydrogen phosphate OR biphosphate
HPO_3^{2-}	hydrogen phosphite OR biphosphite
$C_2O_4^{2-}$	oxalate
3^- CHARGE	
FORMULA	NAME
PO_4^{3-}	phosphate
PO_3^{3-}	phosphite

1- CHARGE	
FORMULA	NAME
OH^-	hydroxide
CN^-	cyanide
SCN^-	thiocyanate
MnO_4^-	permanganate
ClO_4^-	perchlorate (+ Br, I)
ClO_3^-	chlorate (+ Br, I)
ClO_2^-	chlorite (+ Br, I)
ClO^-	hypochlorite (+ Br, I)
NO_3^-	nitrate
NO_2^-	nitrite
CH_3COO^-	acetate
$H_2PO_4^-$	dihydrogenphosphate
HCO_3^-	hydrogen carbonate OR bicarbonate

*Use the group number of the element to determine monatomic ions. Ex: Sodium is in group 1. It forms Na^+. Calcium is group 2. It forms Ca^{2+}.

Family 7 series (halogens): prefixes and suffixes used to indicate the relative amounts of oxygen

Substitute group 7 elements (Cl, Br, I)

	prefix	**halogen**	**suffix**
most oxygen	per		ate
			ate
			ite
least oxygen	hypo		ite

Examples: ClO_4^- is perchlorate, BrO_3^- is bromate, IO_2^- is iodite, IO^- is hypoiodite (fluorine, a halogen of course, is not included in this naming scheme because it does not commonly form these type of molecules due to its strong electronegativity.