Greetings AP Chemistry Class of 2019,
The summer assignment is enclosed in the following 34 page attachment. Please print out the information and read carefully. Basically memorize **Part A** and be prepared to take a quiz on this section the second day of school. Hence, spend a little time each day on this section and you will breeze through it in the fall. **Part B** is the application process that you will hand in to me. It ranges from pages 7-33. Some material will come back to you and some you will need to use the internet to learn from (YouTube, etc.). I will also be happy to answer any questions you may have throughout the summer, as I check email often. I will also be happy to meet with you all if you desire a help session at the Tiverton Library – just let me know and I can set it up and send out the information to the class via email. So please check your email often throughout the summer and please respond to my emails by saying such things as "Got the email". This way I know everyone knows what is going on. On page #34 is a list of supplies, please has them for day 1.

Page #2 - AP Intro Letter

Pages #3 –6 **Summer Assignment - Part A** . The information in these 4 pages must be committed to memory for a **QUIZ ON THE SECOND DAY OF SCHOOL.**

Pages #7- 33 **Summer Assignment - Part B** - A series of exercises asking you to intensely review your sophomore year of chemistry - **due by 2 PM on Friday August 17, 2018 in the Main Office. THIS IS 10% OF YOUR 1st Quarter Grade – 20% off for each day late.**

Page #34 - **List of School Supplies** - please have these on the first day of class

Welcome to AP Chemistry,

I am very excited for an awesome year ahead! In order to ensure the best start for you next fall, I have prepared a **Summer Assignment** that reviews many basic chemistry concepts. These problems will help you build a foundation in chemistry and contribute to your success. This is a required assignment, and your first few assessments will be drawn from these topics.

The Advance Placement Chemistry experience covers a full year of freshman college-level chemistry, so it places heavy demands on the student, especially in terms of the time commitment required. In fact, the College Board suggests that students devote a ***minimum of five hours per week*** for individual study outside of the classroom. The ultimate objective, of course, is to prepare you to take the AP Chemistry test in May 2019, and in order to accomplish this, topics are covered very quickly. However, if anytime during the year you fall behind or are absent, please seek help immediately.

It is also important that you realize up front how your performance in this course will be measured. Although homework does not count as much as tests or quizzes, doing homework on a regular basis is vital to success on the assessments. Homework is practice. So PLEASE practice, practice, practice. All assessments will be graded using an AP rubric. The good news is that there is a vast amount of chemistry available on the Internet. I encourage you to seek these resources often. With ready access to these websites as well as the classroom experiences and a good work ethic, I am confident that you will have everything you need to learn chemistry at the AP level.

Finally, I recommend that you spread out the Summer Assignment, rather than trying to complete it in the final week of the summer! It takes time for a student to process, practice and subsequently learn chemistry at the level necessary for success in AP Chemistry. Taking a college level course in high school is difficult, and it **requires commitment, hard work and time**, but completion of a class like this is a **great investment** in your education. Prepare yourself and arrive ready to learn!

Please let me know via e-mail, lcusumano@tivertonschools.org if you have any questions or concerns. Please do not hesitate to contact me.

Have a great vacation!

Ms. Cusumano

Part A–Vital Information

Although this is a problem-solving course, memorization of some topics/rules is necessary. This information in Part A has to be second nature to you to ensure your success in this course. Master the memorization material listed below. Do whatever it takes to commit this information to memory. **YOU WILL HAVE A QUIZ ON ALL OF *PART A* MATERIAL THE SECOND DAY OF SCHOOL.**

Subject #1 – Key Elements and Symbols in the Periodic Table

- Know the names and symbols of element 1 to 38
- Also know the names and symbols of the following: Ag, Cd, I, Xe, Cs, Ba, W, Hg, Pb, Sn, Rn, Fr, U, Th, Pu, and Am as well as quickly locate these elements on the periodic table since the periodic table provided on the exam does not include element names

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Subject #2 – The Six Strong Acids

- HCl – Hydrochloric Acid
- HBr – Hydrobromic Acid
- H_2SO_4 – Sulfuric Acid
- $HClO_4$ -Perchloric Acid
- HI - Hydroiodic Acid
- HNO_3 - Nitric Acid

Subject #3 –Strong Bases

- Group 1 metal hydroxides (NaOH, KOH, etc.)
- Group 2 metal hydroxides - $Ba(OH)_2$, $Sr(OH)_2$,$Ca(OH)_2$ -these are only slightly soluble – others are insoluble
- Ammonia is a weak base (NH_3)

Table # 1- Monatomic Ions

Ions usually with one oxidation state	
Li^{+} Lithium Ion	N^{3-} Nitride
Na^{+} Sodium Ion	P^{3-} Phosphide
K^{+} Potassium Ion	O^{2-} Oxide
Mg^{2+} Magnesium Ion	S^{2-} Sulfide
Ca^{2+} Calcium Ion	F^{-} Fluoride
Sr^{2+} Strontium Ion	Cl^{-} Chloride
Ba^{2+} Barium Ion	Br^{-} Bromide
Al^{3+} Aluminum Ion	I^{-} Iodide
Cations with more than one oxidation state	
1^{+}	2^{+}
Cu^{1+} Copper (I)	Cu^{2+} Copper (II)
2^{+}	3+
Fe^{2+} Iron(II) Cr^{2+} Chromium(II) Co^{2+} Cobalt (II)	Fe^{3+} Iron(III) Cr^{3+} Chromium(III) Co^{3+} Cobalt (III)
2^{+}	4^{+}
Sn^{2+} Tin(II) Pb^{2+} Lead (II)	Sn^{4+} Tin(IV) Pb^{4+} Lead (IV)

Note that silver and zinc is always assumed to be the following:

Silver ion = Ag^{+} **Zinc Ion = Zn^{2+}**

Table #2 – The Nine Most Important Polyatomic Ions

Polyatomic Ion	Name
NH_4^{+}	Ammonium (Only Positively Charged Polyatomic Ion)
NO_3^{-1}	Nitrate
MnO_4^{-1}	Permanganate
CH_3COO^{-1}	Acetate
OH^{-1}	Hydroxide
CN^{-1}	Cyanide
CO_3^{2-}	Carbonate
SO_4^{2-}	Sulfate
PO_4^{3-}	Phosphate

Table #3 – Diatomic

Elements	Formula
Hydrogen	H_2
Nitrogen	N_2
Oxygen	O_2
Fluoride	F_2
Chloride	Cl_2
Bromide	Br_2
Iodide	I_2

Table #4 – Solubility Rules

These rules you will see inside this packet where you will get a chance to apply them. You need to know these cold. Remember that soluble means an aqueous compound is made (aq) and insoluble means that a precipitate is made (ppt).

- **Soluble with NO exceptions** – all Group 1A (Li^+, Na^+, etc.), ammonium ion (NH_4^+), nitrate (NO_3^{1-}), acetate (CH_3COO^{1-})

- **Soluble with exceptions**
  - All chlorides (Cl^{1-}), bromides (Br^{1-}), and iodides (I^1)are soluble except those of Cu^+, Ag^+, Pb^{2+}, and Hg_2^{2+}
  - All sulfates (SO_4^{2-}) are soluble except those of Pb^{2+}, Ca^{2+}, Sr^{2+}, and Ba^{2+}

- **Insoluble with exceptions**
  - Most carbonates (CO_3^{2-}) .and phosphates (PO_4^{3-}) are insoluble except those of Group IA and the ammonium ion
  - Most sulfides (S^{2-}) are insoluble except those of Group IA and IIA and the ammonium ion.
  - Most hydroxides (OH^{1-}) are insoluble except those of Group IA, calcium, and barium

Table #5 – Molecular Geometry

Compound	Bonding Pairs	(Lone Pairs) Non-Bonding Pairs	Molecular Geometry	Hybridization	Angle
BeF_2	2	0	Linear	sp	180°
BF_3	3	0	Trigonal Planar	sp^2	120°
SO_2	2	1	Bent	sp^2	116°
CH_4	4	0	Tetrahedral	sp^3	109.5°
NH_3	3	1	Trigonal Pyramidal	sp^3	107°
H_2O	2	2	Bent	sp^3	105°
PF_3	5	0	Trigonal Bipyramidal	sp^3d	XXXXXX
SF_4	4	1	See-Saw	sp^3d	XXXXXX
ClF_3	3	2	T-shaped	sp^3d	XXXXXX
XeF_2	2	3	Linear	sp^3d	XXXXXX
SF_6	6	0	Octahedral	sp^3d^2	XXXXXX
BrF_3	5	1	Square Pyramidal	sp^3d^2	XXXXXX
XeF_4	4	2	Square Planar	sp^3d^2	XXXXXX

Name _____ Date _____ CUSUMANO

Part B- Nomenclature, Balancing Equations, Oxidation Numbers, Solubility Rules, and Problem Solving

1. Nomenclature – Naming Compounds

- **Forming binary ionic compounds** - In a binary ionic compound the total positive charges must equal the total negative charges. The best way to write correct formula units for ionic compounds is to use the "Criss Cross Method".

Example: What ionic compound would form when calcium ions combine with bromide ions?

Step One: Ca^{2+} and Br^{1-}

Step Two: Cross over the charges by using the absolute value of each ion's charge as the subscript for the other ion. So the absolute value of +2, (which is 2) of Ca becomes the subscript of Br and the absolute value of -1(which is 1) becomes the subscript of Ca.

Step Three: Check to make sure the subscripts are in the lowest whole number ratio possible. Then write the formula, $CaBr_2$

- **Naming binary ionic compounds (Ionic means that a metal and a nonmetal combine)**
    - Name $BaBr_2$
    - Combine the names of the cation (positive ion) and the anion (negative ion).
    - Ba is barium – the metal and makes the cation (Ba^{2+})
    - The metal's name is used first and is not changed in anyway
    - Br is bromine – the nonmetal and makes the anion (Br^{1-})
    - Notice that bromine is changed to brom**ide**
    - Hence $BaBr_2$ becomes barium bromide

    - Name $FeCl_2$
    - Notice that Fe is a transition element so it can produce more than one possible ion (Fe^{2+} or Fe^{3+})
    - Uncriss-cross $FeCl_2$ and you should see that iron is Fe^{2+} and chlorine is Cl^{1-}
    - Since the metal is a transition metal and has more than one choice, it must be distinguished by a Roman Numeral
    - So this compound is Iron (II) chloride

- **<u>Naming binary ionic compounds that contain polyatomic ions</u>**
  - The polyatomic ions on your common ions list (Tables 2, 3, and 4) should be memorized.
  - Naming compounds with polyatomics is the same as naming other compounds, just name the cation and then the anion. If there is a transition metal involved, be sure to check the charges to identify which ion (+1, +2, +3, +4....) it may be so that you can put the correct Roman numeral in the name. Name the following:

Example – Na_2SO_4

- Uncriss-cross the compound
- Na^{1+} and SO_4^{2-}
- Sodium sulfate (the metal's name stays the same and the polyatomic ion is what you know from mastering Tables 2, 3,and 4)

- **<u>Naming binary molecular compounds</u>(Molecular compounds are usually formed between two nonmetals<u>)</u>**

  - Molecular Compounds use a prefix system.

Mono -1	Hexa – 6	Undeca - 11
Di – 2	Hepta – 7	Dodeca - 12
Tri -3	Octa - 8	
Tetra -4	Nona - 9	
Penta – 5	Deca - 10	

  - The less electronegative element is always written first. It only gets a prefix if it has more than one atom in the molecule.
  - The second element also gets the prefix and the ending –ide.
  - The letter "O" or "A" at the end of the prefix is dropped when the word following the prefix begins with another vowel, for example monoxide or pentoxide.

Example – N_2O_4 = Dinitrogen tetroxide

Exercise 1 - Nomenclature: Simple Inorganic Formulas

I. In the first column, classify each of the following as molecular (M) or ionic (I). In the second column, name each compound:

	M or I	Name		M or I	Name
1) CaF_2			**10) SrI_2**		
2) P_4O_{10}			**11) CO**		
3) K_2S			**12) Cs_2O**		
4) NaH			**13) ZnI_2**		
5) Al_2Se_3			**14) P_2S_3**		
6) N_2O			**15) AgCl**		
7) O_2F			**16) Na_3N**		
8) SBr_6			**17) Mg_3P_2**		
9) Li_2Te			**18) XeF_6**		

II. In the first column, write the chemical formula for the compound formed. In the second column, write the compound's name:

	Elements	Chemical Formula	Compound Name
1	magnesium and iodine		
2	potassium and sulfur		
3	chlorine and aluminum		
4	zinc and bromine		
5	strontium and oxygen		
6	calcium and nitrogen		
7	oxygen and calcium		
8	copper(I) and oxygen		
9	copper (II) and chlorine		
10	mercury (II) and oxygen		
11	nitrogen and aluminum		
12	sulfur and cesium		

Exercise 2 - Oxidation Numbers: Anions and Cations

Summary of Rules for Oxidation Numbers:

Rule 1: Atoms in a pure element have an oxidation number of zero.

Rule 2: The more electronegative element in a binary compound is assigned the number equal to the negative charge it would have as an anion. The less electronegative atom is assigned the number equal to the positive charge it would have as a cation.

Rule 3: Fluorine has an oxidation number of -1 in all of its compounds because it is the most electronegative element.

Rule 4:Oxygen has an oxidation number of -2 in almost all compounds.
Exceptions:

- Peroxides, such as H_2O_2, in which its oxidation # is -1
- When oxygen is in compounds with halogens, such as OF_2, its oxidation # is +2.

Rule 5: Hydrogen has an oxidation # of +1 in all compounds that are more electronegative than it; it has an oxidation # of -1 in compounds with metals.

Rule 6: The algebraic sum of the oxidation numbers of all atoms in a neutral compound is zero.

Rule 7: The algebraic sum of the oxidation numbers of all atoms in a polyatomic ion is equal to the charge of the ion.

Rule 8: Rules 1-7 apply to covalently bonded atoms; however, oxidation numbers can also be assigned to atoms in ionic compounds.

Determine the Oxidation Number of each underlined element in the table below

1) $K_2\underline{S}$	**6) $\underline{S_8}$**	**11) $\underline{C}_{60}$**
2) $Na\underline{Cl}O_4$	**7) $\underline{Mg}$**	**12) $\underline{Zr}O_2$**
3) $\underline{Br}Cl$	**8) $K_2\underline{W_4}O_{13}$**	**13) $K_2\underline{Cr_2}O_7$**
4) $Li_2\underline{C}O_3$	**9) $Mg(\underline{B}F_4)_2$**	**14) $Al_2(\underline{Cr}O_4)_3$**
5) $\underline{O}F_2$	**10) $\underline{Au_2}O_3$**	**15) $Cs_2\underline{Te}F_8$**

Exercise 3 – More Nomenclature Including Acids and Salts. If you are not provided with enough information, use the internet to search for information.

I. Name the following substances:

Formula	Name	Formula	Name
$FeSO_4$		Fe_2O_3	
$Cu(NO_3)_2$		$(NH_4)_2SO_3$	
$HgCl$		$Ca(MnO_4)_2$	
$AgBr$		PF_5	
$KClO_3$		LiH	
$MgCO_3$		HIO_3	
BaO		$Ca_3(PO_4)_2$	
K_2O		HIO_4	
SnO_2		$NaBrO_2$	
$Ni_3(PO_4)_2$		$Fe(IO_2)_3$	
$Pb(OH)_2$		HAt	
$CuCH_3COO$		H_3PO_4	
N_2O_4		NH_4BrO_3	
Rb_3P		S_8	

II. Write the formula for the following substances:

Name	Formula	Name	Formula
Vanadium (V) oxide		**Francium dichromate**	
Dihydrogen monoxide		**Calcium carbide**	
Ammonium Oxalate		**Mercury (I) nitrate**	
Polonium (VI) thiocyanate		**Carbonic acid**	
Tetraphosphorus decoxide		**Calcium hypochlorite**	
Zinc hydroxide		**Copper (II) nitrite**	
Potassium cyanide		**Nitrous acid**	
Cesium thiosulfate		**Cyanic acid**	
Oxygen molecule		**Tin(IV) chromate**	
Mercury (II) acetate		**Manganese (VII) oxide**	
Silver chromate		**Sodium bicarbonate**	
Tin (II) carbonate		**Copper (II) dihydrogen phosphate**	

Exercise 4 – Balancing Equations

Balance the following equations by adding coefficients as needed.

1) _____C_6H_6 +_____ O_2 → _____H_2O + _____ CO_2

2) _____ NaI + _____$Pb(SO_4)_2$ → _____PbI_4 + _____Na_2SO_4

3) _____NH_3 + ___O_2 → _____NO + _____H_2O

4) _____HNO_3 + _____$Mg(OH)_2$ → _____H_2O + _____$Mg(NO_3)_2$

5) _____ H_3PO_4 + _____ NaBr → _____HBr + _____Na_3 PO_4

6) _____ CaO + _____ MnI_4 → _____ MnO_2 + _____CaI_2

7) _____ C_2H_2 + _____H_2 → _____C_2H_6

8) _____OsO_4 + _____$PtCl_4$ → _____PtO_2 + _____$OsCl_8$

9) _____Hg_2I_2 +_____ O_2 → _____Hg_2O + _____I_2

Exercise 5 – Solubility Rules –See Table #4 in Part A to help you answer the following questions.

I. **For the compounds in the table, write the formula for each compound in the first column and then use the solubility rules on the previous page to determine if each compound is soluble or insoluble in water. In the second column write an (S) for those that are soluble and an (I) for those that are insoluble in water. Remember soluble means dissolves and is aqueous (aq) and insoluble forms a ppt and is given the symbol of (s).**

Name	Formula	(S) or (I)
Silver nitrate		
Cobalt (II) sulfate		
Zinc hydroxide		
Iron (III) iodide		
Nickel (II) chloride		
Lead (II) iodide		
Sodium carbonate		
Barium sulfate		
Lead (II) sulfide		
Silver phosphate		
Lithium phosphate		
Nickel (II) carbonate		
Copper (II) hydroxide		
Tin(IV) sulfate		
Lead (II) nitrate		

Exercise 6 – Reaction Prediction Practice

All chemical reactions can be placed into 5 categories.

1) **Combustion**: A combustion reaction is when oxygen combines with another compound to form water and carbon dioxide. These reactions are exothermic, meaning they produce heat. An example of this kind of reaction is the burning of naphthalene:

$$C_{10}H_8 + 12\ O_2 \text{ ---> } 10\ CO_2 + 4\ H_2O$$

2) **Synthesis**: A synthesis reaction is when two or more simple compounds combine to form a more complicated one. These reactions come in the general form of:

A + B ---> AB

One example of a synthesis reaction is the combination of iron and sulfur to form iron (II) sulfide:

$$8\ Fe + S_8 \text{ ---> } 8\ FeS$$

3) **Decomposition**: A decomposition reaction is the opposite of a synthesis reaction - a complex molecule breaks down to make simpler ones. These reactions come in the general form:

AB ---> A + B

One example of a decomposition reaction is the electrolysis of water to make oxygen and hydrogen gas:

$$2\ H_2O \text{ ---> } 2\ H_2 + O_2$$

4) **Single displacement**: This is when one element trades places with another element in a compound. These reactions come in the general form of:

A + BC ---> AC + B

One example of a single displacement reaction is when magnesium replaces hydrogen in water to make magnesium hydroxide and hydrogen gas:

$$Mg + 2\ H_2O \text{ ---> } Mg(OH)_2 + H_2$$

5) **Double displacement**: This is when the anions and cations of two different molecules switch places, forming two entirely different compounds. These reactions are in the general form:

AB + CD ---> AD + CB

One example of a double displacement reaction is the reaction of lead (II) nitrate with potassium iodide to form lead (II) iodide and potassium nitrate:

$Pb(NO_3)_2$ + 2 KI ---> PbI_2 + 2 KNO_3

In the following reactions below:

- **Write the products in words.**
- **Then below that write the equation with the correct formulas**
- **Then balance the equation.**

<u>COMBUSTION</u>

1. C_4H_9OH + oxygen →

2. C_7H_{14} + oxygen →

SYNTHESIS

1. Sodium + oxygen →

2. Calcium + nitrogen →

3. Potassium + bromine →

DECOMPOSITION

1. Strontium carbonate →

2. Mercury(II) oxide →

3. Aluminum carbonate→

DOUBLE REPLACEMENT (Note that the reactants in these problems are aqueous – so use the solubility rules table provided in Table #4 in Part A to determine which products are soluble and which are insoluble)

1. Iron (III) sulfate + calcium hydroxide →

2. Sodium hydroxide + sulfuric acid →

3. Sodium sulfide + manganese (VI) acetate →

4. Chromium (III) bromide + sodium sulfite →

5. Barium hydroxide + chlorous acid →

SINGLE REPLACEMENT

1. Chlorine gas + aluminum iodide →

2. Potassium metal + water→

3. Zinc + hydrochloric acid →

Exercise 7 – Significant Figures

(1) After solving the problems, express the answer with the correct significant figures AND in scientific notation.

a. $(5.03 \times 10^{-8})(3.05 \times 10^{7}) =$

b. $(5.5 \times 10^{7})(6.7435 \times 10^{3}) =$

c. $\dfrac{(4.871 \times 10^{4})(7.53 \times 10^{6})}{(7.4 \times 10^{-9})(2.982 \times 10^{7})} =$

(2) Identify the # of sig figs in the following

(a) 15.12 _____

(b) 0.0155_____

(c) 5,677,000._____

(d) 0.0005976_____

(e) 345,690,000,000_____

(f) 0.088809_____

(g) 505_____

(h) 0.005_____

(i) 500.0_____

(j) 0.050_____

(k) 50_____

(l) 0.00881_____

(m)0.05500_____

(n) 0.0224_____

(o) 66.22_____

(3) Solve in the correct number of significant figures

(a) (15.470) (370) =

(b) (510.0) (32) =

(c) (325) (5.44562) =

(4) Express the following in the correct number of significant figures:

(a) 37.28 + 14.5 =

(b) 8000 – 3370 =

(c) 450.044 + 660 =

(d)12,310 + 23.5 =

(e) 4129 + 200 =

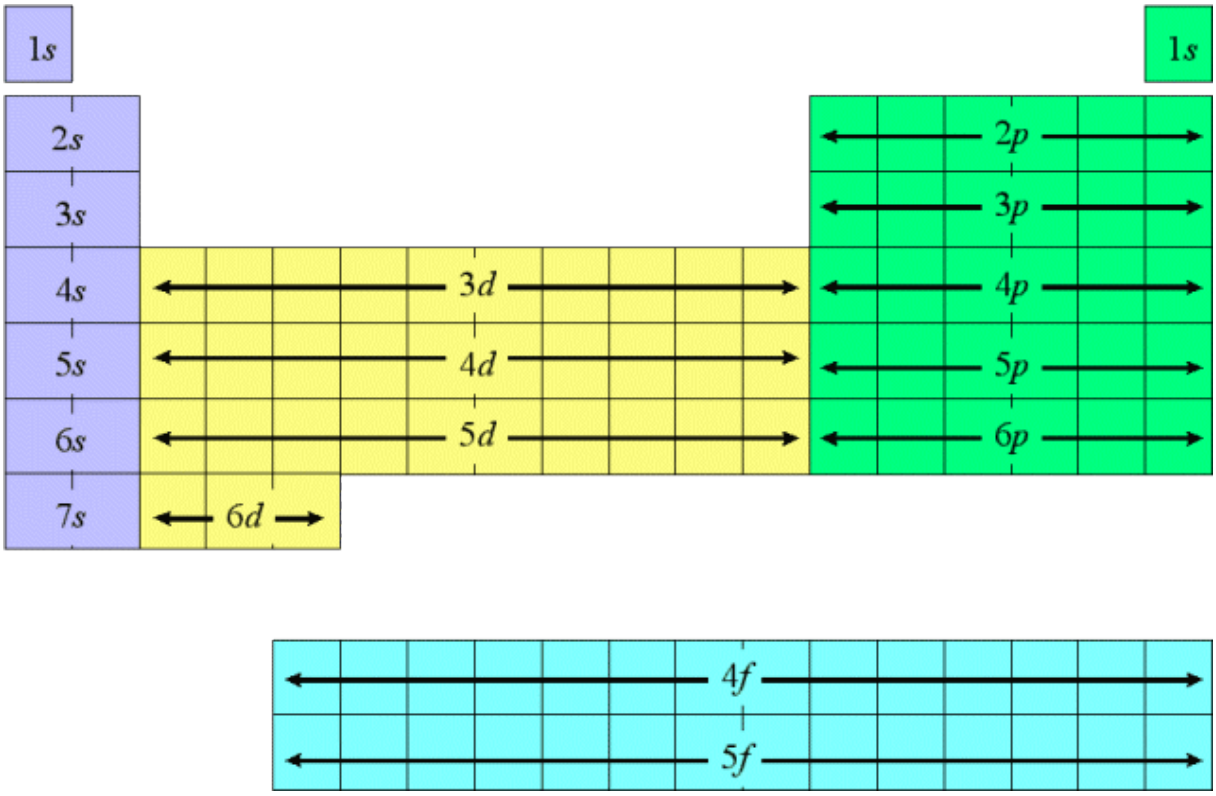
Exercise 8: Atomic Theory, Electron Configuration, Periodicity

Fill in the following table:

Element/Ion	# of protons	# of neutrons	# of electrons
Fe			
Na^{+}			
F			
	27		25
S^{2-}			
Cr^{+3}			

Exercise 9: Electron Configuration

Write the electron configuration for the following : Think of the periodic table in terms of s, p, d, and f orbitals and you will not go wrong



a) Li _____

b) Ca _____

c) Ca^{2+} _____

d) F _____

e) F^{1-} _____

f) Al _____

Exercise 10 – Lewis Dot Diagrams and Valance Electrons

Fill in the table below:

	Li	Be	B	C	N	O	F	Ne
Valence Electrons								
Lewis Dot Diagram								

Exercise 11 – Periodic Trends

Place the following elements (S, Se, I, Ca, and Be) in order of

a) Increasing atomic radius

b) Decreasing ionization

c) Increasing electronegativity

d) Define ionization energy

e) Define electronegativity

Exercise 12 – Average Atomic Mass

Find the mass of an element and identify this element by symbol and name?

5% have a mass of 176

19% have a mass of 177

27% have a mass of 178

14% have a mass of 179

35% have a mass of 180

Exercise 13 – Bonding and Lewis Dot Structures

Use Table #6 from Part A and the table below to answer the following questions ***WHEN ANSWERING THE QUESTIONS WATCH OUT FOR SOME RESONANCE STRUCTURES.***

	Lewis Dot	Bonding Pairs	(Lone Pairs) Non-Bonding Pairs	Molecular Geometry	Hybridization	Angle
$BeCl_2$						
CO_2						
HCN						
BF_3						

	Lewis Dot	Bonding Pairs	(Lone Pairs) Non-Bonding Pairs	Molecular Geometry	Hybridization	Angle
NO_3^{-1}						
SO_3						
CO_3^{2-}						
SO_2						

	Lewis Dot	Bonding Pairs	(Lone Pairs) Non-Bonding Pairs	Molecular Geometry	Hybridization	Angle
O_3						
CH_4						
$SiCl_4$						
NH_4^+						

	Lewis Dot	Bonding Pairs	(Lone Pairs) Non-Bonding Pairs	Molecular Geometry	Hybridization	Angle
NH_3						
PF_3						
H_2O						
OF_2						

Exercise 14 – Stoichiometry

1) Suppose a solution containing 4.50 grams of sodium phosphate is mixed with a solution containing 3.75 grams of barium nitrate.
   a. Write the balanced equation (Note this is a double replacement reaction).
   b. How many grams of barium phosphate can be produced?
   c. Which of the reactants is a limiting reagent?

Exercise 15 – Gas Laws

1. Convert the following to temperatures to Kelvin. (Kelvin = 273 + Celsius)
   a. 300 ˚C _____

   b. 0 ˚C _____

   c. -200 ˚C _____

2. Pressure should be expressed in atm (atmospheres). Convert the following pressures to atm. Note 1 atm =760 torr

   a. 380 torr _____

   b. 1520 torr _____

3. With what you learned about temperature and pressure above apply to the problem below and use the combined gas law ($\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$)

   A gas has a pressure of 345 torr at a temperature of -15 ˚C and a volume of 3.48 L. If conditions are changed so that the temperature is 36 ˚C and the pressure is 268 torr, what will be the volume of the sample?

4. Calculate the number of moles of an ideal gas if the gas is a 25 ˚C at a pressure of 750 torr at 2 liters. Use the ideal gas law to solve (PV = nRT). Remember that R = .0821).

5. Take the ideal gas law and manipulate the variables so that you can solve for molar mass and for density. Note that n = mass/molar mass

6. The mean molar mass of the atmosphere at the surface of Titan, Saturn's largest moon is 28.6 g/mol. Titan's surface temperature is 95 K and its pressure is 1.6 atm. Assuming ideal behavior, calculate the density of Titan's atmosphere under these conditions.

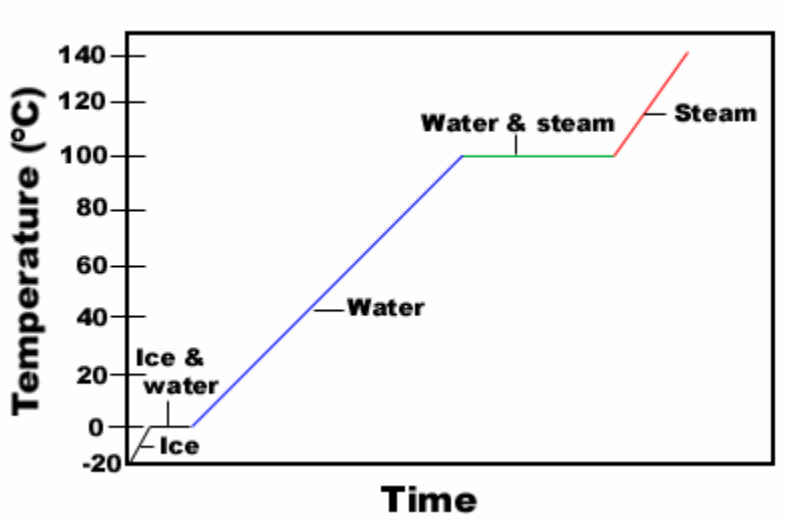
7. A 250 mL sample of oxygen is collected over water at 25°C and 760.0 torr pressure. Remember that $P_{gas} = P_{atmosphere} - P_{H2O}$
   (a) What is the pressure of the dry gas alone if the vapor pressure of water at 25°C = 23.8 torr).
   (b) How many moles of oxygen are collected?
   (c) How much Oxygen was collected?

8. Equal numbers of moles of He, Ar , and Ne are placed in a glass vessel at room temperature. If the vessel has a pinhole-sized leak, which of the following will be true regarding the relative values of the partial pressures of the gas remaining in the vessel after some of the gas mixture has effused?
   A) $P_{He} < P_{Ne} < P_{Ar}$
   B) $P_{He} < P_{Ar} < P_{Ne}$
   C) $P_{Ne} < P_{Ar} < P_{He}$
   D) $P_{Ar} < P_{He} < P_{Ne}$
   E) $P_{He} = P_{Ar} = P_{Ne}$

Exercise 16 – Q=mc∆T

Use the formulas, table, and heating curve below to solve the following questions.

Heating Curve



Important Formulas and Information

$Q = mc\Delta T$ Formula to solve for solid (ice in the heating curve above), liquid **(**water in the heating curve above), or gas (steam in the heating curve above)

$Q = m\Delta H_{vap}$ Formula to solve solids melting or liquids freezing

$Q = m\Delta H_{fusion}$ Formula to solve for liquids evaporating or gases condensing

Note :

m = mass in grams
C = specific heat in J/g°C
ΔT = Temperature (T_{final}- $T_{imitial}$)
Q= Heat in Joules
ΔH_{fusion} = use the table on the next page
$\Delta H_{vaporization}$ = use the table on the next page

Note:

- As one progresses on the heating curve from a solid to a gas, energy is absorbed and is expressed with a positive number
- As one progress on the heating curve from gas to solid, energy is released and is expressed with a negative number.

Some values for specific latent heats of fusion and vaporization:

Substance	latent heat of fusion J/g	°C Melting Temp.	latent heat of vaporization J/g	°C Boiling Temp.
Water	334	0	2260	100
Ethanol	109	-114	838	78
Ethanoic acid	192	17	395	118
Chlorofo	74	-64	254	62
Mercury	11	-39	294	357
Sulphur	54	115	1406	445
Hydroge	60	-259	449	-253
Oxygen	14	-219	213	-183
Nitrogen	25	-210	199	-196

(1) Look at the table above – what are the units for:
   (a) Mass
   (b) Heat of Fusion
   (c) Heat of Vaporization

(2) Calculate the energy transferred when 4.6 grams of ice is melted at 0 ˚C. Is energy absorbed or released?

(3) Calculate the energy transferred when 9.8 g of water vapor condenses on a soda can at 100.0°C. Is energy absorbed or released?

(4) Mercury is a neurotoxin that when inhaled can be highly dangerous. Calculate the amount of energy required to change 14 g of liquid mercury into a gas at 357°C? See the values in the table. Is energy absorbed or released?

(5) Calculate the energy transferred in joules when 29. 5g of liquid water decreases from 14.0°C to 0.0°C. Is the energy absorbed or released?

Supplies for AP Chemistry:

1. **A sturdy three ring binder (3 inch)** to keep at home placing each unit's notes in **after** we have completed that unit in class. (Hence do not have to lug the entire curriculum to school each day)

2. **A sturdy 1 inch binder** to bring back and forth each day to keep the current units notes and assignments in

3. **Wide Ruled Loose-leaf paper** - easy to take notes on.

4. **Reinforcements** – the little circles that you place over the ripped holes on the loose-leaf paper.

5. **Tab Dividers** – you decide on how many to make your notebook work for you. Leave a section for vocabulary.

6. **Pencils with great erasers** - bring everyday

7. **Scientific Calculator** – bring everyday – you will lose credit if you do not bring every day. You need to be so comfortable with your calculator that its buttons and functions are second nature to you prior to taking the AP exam.

8. A bound **Graph Composition Book** (9.75 x 7.5 in) for your lab notebook. Please do not get the spiral bound graphing notebooks. There will be lots of labs in this course. Some will be require a full blown formal lab report and some will be activities to clarify material. We will fill the lab book with lots of hands on experiences.

9. A **valid student e-mail address** that is checked frequently. As I communicate frequently with students through email. When I send an email, please respond that you have received it. Communication is paramount.