Tustin HS AP Chemistry
SUMMER ASSIGNMENT

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Textbook: *Chemistry: The Central Science*, Brown, LeMay, Bursten, 11th edition (2006).
Due Date: 2nd day of school (August 15th, 2018)

*In order to complete the summer assignment you will need to have access to the textbook. A copy of the **textbook** is available for **checkout** at the library.*

Assignment: The assignment is divided into 6 modules. Each module (except for Module A) will be collected on the second day of school. This assignment (Modules B-F) should average about an hour per module. You should have learned these topics in your first year chemistry class. If you are struggling with the assignment, email me as soon as possible.

******Failure to complete this assignment may result in removal from the course******

Module	Topic	Submit…	Point Value
A	POLYATOMIC ION Memorization	Nothing…you will be tested on the 2nd day of school	100 point test
B	Naming Ionic & Covalent Compounds	Module B Practice	20
C	Naming Acids	Module C Practice	20
D	Chapter 1: Matter & Measurements	Textbook Problems	20
E	Chapter 2: Atoms, Molecules & Ions	Textbook Problems	20
F	Chapter 3: Stoichiometry	Textbook Problems	20
		TOTAL	**100**

Modules:

- **For Module A:** Nothing to turn in, but TEST on POLYATOMIC IONS on 2nd day of School. DON'T PROCRASTINATE!! You must get 100% on the assessment. If you do not get 100%, you will retake it until you do—losing 5% each attempt. Example: 100% on 1st attempt, 95% on 2nd attempt, 90% on 3rd attempt, 85% on 4th attempt, etc.
- **For Modules B-C:** Module Worksheets will be collected
- **For Modules D-F:** You will need access the textbook--**checkout from the library**
    - You will be turning in Chapter 1-3 problems.
    - Title the assignment with Chapter # & problem numbers. Example: Chapter 1 #2, 5, etc.
    - SHOW ALL WORK, including units and dimensional analysis where appropriate
    - Refer to the examples within in the textbook for help
    - You may also email me for help; I will get back to you as soon as I can.
    - These topics should have been covered in your first year chemistry course and should be a review.

Scoring:

- Each question will be graded for accuracy and/or completion.
- To receive maximum score:
    - Show all work. No work = no credit. If you aren't sure what kind of work to show, view the examples.
    - All answers should be written with units (when given) and correct significant figures.
    - Submit on time on the second day of school.

MODULE A: Common Ions to KNOW!!

This part of the summer assignment is quite simple. Just give yourself enough time to master the formulas, charges and names of the common polyatomic ions. On the **2nd day of school**, you will be given a quiz on these ions. You will be asked to:

- Write the names of these ions given the formula and charge
- Write the formula and charge when given the names

TABLE 1: Ionic Charges of Representative Elements

Cations: Full Name					Anions: End in "-ide"			
1	2	3-11	12	13-14	15	16	17	18
Li^+	Be^{2+}				N^{3-}	O^{2-}	F^{1-}	
Na^+	Mg^{2+}			Al^{3+}	P^{3-}	S^{2-}	Cl^{1-}	
K^+	Ca^{2+}		Zn^{2+}			Se^{2-}	Br^{1-}	
Rb^+	Sr^{2+}	Ag^+	Cd^{2+}				I^{1-}	
Cs^+	Ba^{2+}							

"From the Table" Ions: For the ions in Table 1, their placement in the Periodic Table suggest the charge on the ion, since the neutral atom gains or loses a predictable number of electrons in order to obtain a noble gas configuration. This was a focus in first year chemistry, so if you are unsure what this means, get HELP BEFORE the start of the year. Three transition metals are also included (silver, cadmium and zinc). These three elements will always have the charge given in the table and should be also be memorized.

TABLE 2: Common Polyatomic Ions

1- charge		2- charge		3- charge	
Formula	**Name**	**Formula**	**Name**	**Formula**	**Name**
$H_2PO_4^{1-}$	Dihydrogen Phosphate	HPO_4^{2-}	Hydrogen Phosphate	PO_4^{3-}	Phosphate
$C_2H_3O_2^{1-}$	Acetate	$C_2O_4^{2-}$	Oxalate	PO_3^{3-}	Phosphite
HSO_3^{1-}	Hydrogen Sulfite	SO_3^{2-}	Sulfite		
HSO_4^{1-}	Hydrogen Sulfate	SO_4^{2-}	Sulfate		
HCO_3^{1-}	Hydrogen Carbonate	CO_3^{2-}	Carbonate		
NO_2^{1-}	Nitrite	CrO_4^{2-}	Chromate	**1+ charge**	
NO_3^{1-}	Nitrate	$Cr_2O_7^{2-}$	Dichromate	NH_4^{1+}	Ammonium
CN^{1-}	Cyanide	SiO_3^{2-}	Silicate	H_3O^{1+}	Hydronium
OH^{1-}	Hydroxide	O_2^{2-}	Peroxide		
MnO_4^{1-}	Permanganate	$S_2O_3^{2-}$	Thiosulfate		
ClO^{1-}	Hypochlorite				
ClO_2^{1-}	Chlorite				
ClO_3^{1-}	Chlorate				
ClO_4^{1-}	Perchlorate				
BrO_3^{1-}	Bromate				
SCN^{1-}	Thiocyanate				
IO_3^{1-}	Iodate				

Polyatomic Ions: The common ions in Table 2 need to be ***MEMORIZED.*** Below are a number of patterns that can be used to greatly reduced the amount of memorizing one must do.

Hint 1: "-ate" ions have *one more oxygen* that the corresponding "-ite" ions, but the same charge. If you memorize the "-ate" ions, then you should also be able to memorize the "-ite" ions quite easily, and vice versa.

Example: Sulf***ate*** is SO_4^{2-}, so sulf***ite*** is the same charge with one less oxygen (SO_3^{2-})

Example: Nitr***ate*** is NO_3^{1-}, so nitr***ite*** is the same charge with one less oxygen (NO_2^{1-})

Hint 2: If you know that a sulfate ion is SO_4^{2-}, then to get the formula for hydrogen sulfate, you add a hydrogen ion to the front of the formula. Since hydrogen has a 1+ charge, the net charge on the new ion is less negative by one.

Example:

PO_4^{3-}	→	HPO_4^{2-}	→	$H_2PO_4^{1-}$
phosphate		*hydrogen phosphate*		*dihydrogen phosphate*

Hint 3: Other prefixes: "Per-" indicates *one more oxygen* than the "–ate" form
"Hypo-" indicates *one less oxygen* than the "–ite" form

Example:

ClO_4^{1-}	→	ClO_3^{1-}	→	ClO_2^{1-}	→	ClO^{1-}
perchlorate		*chlorate*		*chlorite*		*hypochlorite*

- The Halogens are all the same: F, Cl, Br, I all behave the same, so if chlorate is ClO_3^{1-}, Bromate is …… BrO_3^{1-} !!!

Hint 4: Make ***FLASHCARDS*** to help with your memorization!

MODULE B: Naming & Writing Chemical Compounds

NOTES: Naming & Writing Ionic Compounds	
How do I know it is an ionic compound?	An ionic compound is formed between a metal and a nonmetal, or a cation ion (positive ion) and an anion (negative ion).
Naming Rule 1:	Look at the cation first. If the cation has ***only one*** possible charge (Group 1, Group 2, Al, Ag, Cd, Zn) • Write cation first • Write anion last ending in –ide Examples: 1) $CaCl_2$ • Look at Ca first! ← Ca is in group 2 (only can have a charge of 2+) • Chlorine become Chlor***ide*** = **Calcium Chlor*ide*** 2) Al_2O_3 = Aluminum Oxi*de*
Naming Rule 2:	Look at the cation first. If the cation has ***more than one*** possible charge (most transition metals, post-transition metals) • Write cation first, write cation charge (as Roman Numeral) in parentheses • Write anion last ending in –ide • Charge of cation is based on ***charge balance*** Examples: 1) $FeCl_3$ o Look at Fe first! ← Fe is a transition metal (can have a charge of 2+ or 3+) o To determine charge of Fe → look at Cl o Cl has a charge of 1- o There are 3 Cl^{1-} → overall negative charge of -3 o To balance a ***negative*** three, you must have a ***positive*** three o Fe must have a charge of 3+ →Iron(III) = **Iron (III) Chlor*ide*** 2) Cr_2S_3 o Look at Cr first! ← Cr is a transition metal (can have a charge of 2+ or 3+) o To determine charge of Cr → look at S o S has a charge of 2- o There are 3 S^{2-} → overall negative charge of -6 o To balance a ***negative*** six, you must have a ***positive*** six o The overall charge of Cr is +6, but there are 2 Cr's , so each Cr will have a charge of +3 o Cr has a charge of 3+ →Chromium(III) = **Chromium (III) Sulf*ide***
Naming Rule 3:	When **polyatomic ions** are involved, follow Rules 1 & 2. Write full polyatomic name in place of cation or anion. Examples: 1) K_2SO_4 o Look at K first! ← K is in group 1 (only can have a charge of 1+) o Need to recognize SO_4 as **sulfate** = **Potassium Sulfate**

	2) $CuCO_3$ o Look at Cu first! ← Cu is a transition metal (can have a charge of 1+ or 2+) o To determine charge of Cu → look at CO_3 o You need to recognize CO_3 as **carbonate** o CO_3 has a charge of 2- o There is one CO_3^{2-} → overall negative charge of -2 o To balance a ***negative*** two, you must have a ***positive*** two o So, the overall charge of Cu is +2 o Cu has a charge of 2+ → Copper(II) = **Copper (II) Carbonate**
Writing Rule 1:	1) ***Write the formulas*** for the cation and anion, ***<u>including charges</u>*** 2) Check to see if the ***charges are balanced*** o If balanced, just remove charges o If not balanced, continue with rule #3 3) Balance charges o ***Use parentheses*** if more than one polyatomic in is needed o ***Write subscripts*** if more than one ion is needed to balance o Use ***crisscross*** method to balance subscripts o ***Remove*** charges Example: 1) Barium nitrate • *Write the formulas:* Ba^{2+} NO_3^{1-} • *Think:* Do +2 and -1 balance each other? NO!.... • Ba^{2+} NO_3^{1-} → $Ba(NO_3)_2$

NOTES: Naming Molecular Compounds	
How do I know it is a molecular compound?	A molecular compound is formed between a two nonmetals. Also known as a covalent compound.
Rule:	For the 1st nonmetal: o Name the element o Use the prefix *if there is more than one* of that element For the 2nd nonmetal: o Name the element o ***Always*** include the prefix o Use –ide ending Example: NF_3 o Two nonmetals! = covalent o First element: o Nitrogen → only one = no prefix o Second element: o Fluorine = fluor***ide*** o 3 of them = prefix "tri-" = **nitrogen trifluoride**

Prefixes Used in Naming Molecular Compounds

Prefix	Number
mono-	1
di-	2
tri-	3
tetra-	4
penta-	5
hexa-	6
hepta-	7
octa-	8
nona-	9
deca-	10

MODULE C: Naming & Writing Acids

NOTES: Naming & Writing Acids	
What is an acid?	• A form of ionic compound • Hydrogen salt dissolved in water (aq)

Types of Acids	• Binary: contains two elements
	  o Hydrogen + nonmetal
	• Oxyacid: contains oxygen
	  o Hydrogen + polyatomic

Naming & Writing Binary Acids:	Use prefix " hydro" – *root of nonmetal* -- ic acid Example #1: **HCl** • Hydro – *Chlor*- ic Acid → **Hydrochloric Acid** Example #2: **Hydrofluoric Acid** • HF

Naming & Writing Oxyacids	Use root of anion (polyatomic) then check ending
	• Polyatomic ends in –ate
	  Root –ic acid
	• Polyatomic ends in –ite
	  Root –ous acid
	
	Example #1: **HNO_3**
	• HNO_3 →Nitrate→ ends in -ate→ *root*-ic
	  →**Nitric Acid**
	
	Example #2: **HNO_2**
	• HNO_2 →Nitrite→ ends in -ite→ *root*-ous
	  →**Nitrous Acid**
	
	Example #3: Sulfuric Acid
	• Sulfur*ic* → ends in –ic → polyatomic must end in –ate → sulf*ate*
	• Two H^+ must balance -2 charge on sulfate ion, SO_4^{2-}
	  →**H_2SO_4**

MODULE B: Naming & Writing Compounds Practice

Name the following compounds:	Answer
1) $NaBr$	
2) CaO	
3) CO_2	
4) $MgBr_2$	
5) $Be(OH)_2$	
6) N_2S	
7) $ZnSO_4$	
8) $AuBr_3$	
9) $CuC_2H_3O_2$	
10) $KMnO_4$	
11) $CaCO_3$	
12) NH_4NO_3	
13) CO	
14) Li_2S	
15) $MgCl_2$	
16) SF_6	
17) Fe_2O_3	
18) $PbSO_3$	
19) $Zn_3(PO_4)_2$	
20) NO_2	

Write the formula for the following compounds:	**Answer**
21)Potassium iodide	
22)Magnesium oxide	
23)Nitrogen monoxide	
24)Ammonium chloride	
25)Iron (III) oxide	
26)Magnesium phosphate	
27)Iron(II) sulfate	
28)Calcium chromate	
29)Silver bromide	
30)Cooper (I) chloride	
31)Silver carbonate	
32)Nitrogen trichloride	
33)Aluminum chloride	
34)Sodium Cyanide	
35)Nickel (II)Phosphate	
36)Chromium (III) Hydroxide	
37)Zinc nitrate	
38)Barium Acetate	
39)Calcium sulfide	
40)Sodium phosphate	

MODULE C: Naming & Writing Acids Practice

Name the following compounds:	Answer
1) HF	
2) $HClO_3$	
3) H_2CO_3	
4) HCl	
5) H_2S	
6) $HClO$	
7) H_2SO_4	
8) H_2SO_3	
9) H_3PO_4	
10) HI	
11) Hydrobromic acid	
12) Nitric acid	
13) Acetic acid	
14) Phosphorous acid	
15) Hydrocyanic acid	
16) Carbonic acid	
17) Phosphoric acid	
18) Sulfurous acid	
19) Hydrochloric acid	
20) Sulfuric acid	

MODULE D: Chapter 1 in Textbook

Chapter 1: Matter and Measurements

This chapter should be a review of states of matter, physical & chemical properties, physical & chemical changes, and converting units. Some new topics might be significant figures.

Complete the following problems from the textbook. If you come across a problem you are not sure of, read through the corresponding section in the textbook for help.

I. End of Chapter Problems –Starting on page 30

A. Title of segment #1: *Visualizing Concepts*

Problems submitted by the student: 2, 5

B. Title of segment #2: *Classification and Properties of Matter*

Problems submitted by the student: 20, 22

C. Title of segment #3: *Units and Measurement*

Problems submitted by the student: 27

D. Title of segment #4: *Uncertainty in Measurement*

Problems submitted by the student: 36, 37

E. Title of segment #5: *Dimensional Analysis*

Problems submitted by the student: 53

MODULE E: Chapter 2 in Textbook

Chapter 2: Atoms, Molecules & Ions

This chapter should be a review of atoms, subatomic particles, atomic number, atomic mass, isotopes, and ions, It also covers naming of both ionic (metal & nonmetal) and molecular (nonmetal & nonmetal) compounds. Some new topics are naming of acids.

Complete the following problems from the textbook. If you come across a problem you are not sure of, read through the corresponding section in the textbook for help.

I. End of Chapter Problems—Starting on page 70

A. Title of segment #1: *Visualizing Concepts*

Problems submitted by the student: 1, 2, 4, 5, 7, 8

B. Title of segment #2: *Atomic Theory and the Discovery of Atomic Structure*

Problems submitted by the student: 12

C. Title of segment #3: *Modern View of Atomic Structure: Atomic Weights*

Problems submitted by the student: 26, 29, 35

D. Title of segment #4: *The Periodic Table; Molecules and Ions*

Problems submitted by the student: 47, 51, 53, 56, 60

E. Title of segment #5: *Naming Inorganic Compounds; Organic Molecules*

Problems submitted by the student: 64, 68, 72, 73

MODULE F: Chapter 3 in Textbook

Chapter 3: Stoichiometry

This chapter should be a review of balancing equations, types of reactions, Avogadro's number, the mole, molar mass, and stoichiometry conversions. We will go back and look at empirical formulas and limiting reactants in the first unit.

Complete the following problems from the textbook. If you come across a problem you are not sure of, read through the corresponding section in the textbook for help.

I. End of Chapter Problems—Starting on Page 108

A. Title of segment #1: *Visualizing Concepts*

Problems submitted by the student: 1, 7

B. Title of segment #2: *Balancing Chemical Equations*

Problems submitted by the student: 10, 12, 14

C. Title of segment #3: *Patterns of Chemical Reactivity*

Problems submitted by the student: 17, 20

D. Title of segment #4: *Formula Weights*

Problems submitted by the student: 21a-d, 25

E. Title of segment #5: *Avogadro's Number and the Mole*

Problems submitted by the student: 28, 33, 36

F. Title of segment #6: *Calculations Based on Chemical Equations*

Problems submitted by the student: 57, 59, 63, 64

G. Title of segment #7: *Limiting Reactants; Theoretical Yields*

Problems submitted by the student: 67, 68, 69