Hayfield Secondary AP Summer Assignment Cover Sheet

Hayfield Secondary
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Course	AP Chemistry
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Assignment Title	AP Chemistry
Date Assigned	June 2018
Date Due	2nd Class of AP Chemistry
Objective/Purpose of Assignment	To review and strengthen important concepts of Chemistry 1 which are essential to success in AP Chemistry
Description of how Assignment will be Assessed	Assignment completion will be a homework grade of 20 points and the information covered in this packet will be reviewed day 1&2 and assessed in the first test which will be the third class back to school.
Grade Value of Assignment	Homework grade of 20 points Not to exceed more than 10% of quarter grade
Tools/Resources Needed to Complete Assignment	**Chemistry 1 notes** **Additional internet resources on page 3**
Estimated Time Needed to Complete Assignment	4-5 hours

AP Chemistry Summer Packet 2018
Hayfield Secondary School

Supply List

1. 2-inch 3-ring binder with dividers
2. Composition book with grid/graph paper
3. Graphing calculator
4. It is suggested that you purchase a AP Chemistry **review book (est. cost $10-20)** and start working through it starting at the beginning of the year.

Summer Assignment

You must complete this review packet and turn it in on your second day of AP Chemistry. ***This is not optional. It is required and taken for your first grade. For students enrolled as of June 1st, the assignment will be assessed a late grade if turned in after the due date.***

The material is divided into eight weeks as provided. Should you choose to follow this pacing the workload will not feel daunting. If you choose to wait until the night before school starts to complete this packet, you may feel differently.

Assessment on Summer Material

You will have a test on this material the third class. This will cover:

- All Prior Knowledge that should be Memorized (see next pages)
- All General Chemistry content covered in this review packet

AP Chemistry is a difficult course and having the following pages of material memorized is **essential** for success in learning the concepts covered in the course. Make flashcards, have your friends and family quiz you, take 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.**

Internet Resources

https://www.khanacademy.org/science/ap-chemistry

https://apchemistrynmsi.wikispaces.com/AP+Chemistry+Class+Lecture+Notes+AND+instructional+videos

http://www.sciencegeek.net/APchemistry/index.shtml

Prior Knowledge that should be Memorized

The New York Chemistry Reference tables are a good resource to assist with your summer assignment. The tables can be found at
http://www.p12.nysed.gov/assessment/reftable/chemistry-rt/archive/chemref1-7.pdf
It is highly recommended that you memorize for understanding the following Tables:

Table E	Selected Polyatomic Ions
Table O	Symbols used in Nuclear Chemistry
Table P	Organic Prefixes
Table Q	Homologous Series of Hydrocarbons
Table R	Organic Functional Groups
Table T	Important Formulas and Equations

Oxidation Numbers

An oxidation number is 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 free, uncombined element is 0.
2. The oxidation number of a monatomic ion equals 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, in which case it is +2, or it is in a peroxide, in which case it is -1.
6. The oxidation state of hydrogen in most of its compounds is +1 unless it is combined with a metal, in which case it is -1.
7. In compounds, elements of Groups 1 and 2 as well as aluminum have oxidation numbers of +1, +2, and +3, respectively.
8. The sum of oxidation numbers of all atoms in a neutral compound is zero.
9. The sum of the oxidation number of all atoms in a polyatomic ion equals the charge of the ion.

Strong Acids and Bases

Acids	Bases
HF – weak	LiOH – strong
HCl – strong	NaOH– strong
HBr – strong	KOH – strong
HI – strong	RbOH– strong
H_2SO_4 – strong	CsOH– strong
HNO_3 – strong	$Ca(OH)_2$ – strong
$HClO_3$ – strong	$Ba(OH)_2$ – strong
$HClO_4$ – strong	$Sr(OH)_2$ – strong
	NH_3 – weak
All other acids are weak	

Polyatomic Ions – Cut These Out to Make Flashcards!

$H_2CO_3 \rightarrow H_2O + CO_2$ (very weak acid breaks down!)

Bromide	Br^{1-}	Dichromate	$Cr_2O_7^{2-}$	Iodate (VII) (Periodate)	IO_4^{1-}
Bromate (I) (Hypobromite)	BrO^{1-}	Dihydrogen Phosphate	$H_2PO_4^{1-}$	Manganate (VII) (Permanganate)	MnO_4^{1-}
Bromate (III) (Bromite)	BrO_2^{1-}	Ethanoate (Acetate)	$C_2H_3O_2^{1-}$	Nitrate	NO_3^{1-}
Bromate (V) (Bromate)	BrO_3^{1-}	Hydrogen Carbonate (Bicarbonate)	HCO_3^{1-}	Nitrite	NO_2^{1-}
Bromate (VII) (Perbromate)	BrO_4^{1-}	Hydrogen Phosphate	HPO_4^{2-}	Oxalate	$C_2O_4^{2-}$
Carbonate	CO_3^{2-}	Hydrogen Sulfate (Bisulfate)	HSO_4^{1-}	Peroxide	O_2^{2-}
Chlorate (I) (Hypochlorite)	ClO^{1-}	Hydrogen Sulfide (Bisulfide)	HS^{1-}	Phosphate	PO_4^{3-}
Chlorate (III) (Chlorite)	ClO_2^{1-}	Hydrogen Sulfite (Bisulfite)	HSO_3^{1-}	Phosphite	PO_3^{3-}
Chlorate (V) (Chlorate)	ClO_3^{1-}	Hydroxide	OH^{1-}	Sulfate	SO_4^{2-}
Chlorate (VII) (Perchlorate)	ClO_4^{1-}	Iodate (I) (Hypoiodite)	IO^{1-}	Sulfite	SO_3^{2-}
Chromate	CrO_4^{2-}	Iodate (III) (Iodite)	IO_2^{1-}	Thiosulfate	$S_20_3^{2-}$

Cyanide	CN^{1-}	Iodate (V) (Iodate)	IO_3^{1-}	Thiocyanate	SCN^{1-}

Week #1

Significant Figures

1. Give the number of sig figs in each of the following numbers:

a. 123
b. 0.078
c. 89007
d. 12,000
e. 1,000,000,000.0
f. 0.009
g. 23,000.
h. 34,000
i. 34.89
j. 101

2. Do the following calculations giving the answer in the appropriate number of sig figs:

a. 1.23 + 75
b. 1.89 - .20
c. 45.6 x 8.2
d. 234/0.298
e. 0.887 + 0.3
f. 2340 - 100
g. 12.45 x 3
h. 25,600/ 3.0

3. Do the following calculations giving the answer in the appropriate number of sig figs:

a. 45.0 x 9.0 + 89.22/ 75
b. (2.88 + .5) x (23,000 - 0.11)
c. 0.8897 x 2.15 + 0.002/.1
d. (8 + 9)/(34.0 – 20.)

Dimensional Analysis

4. Convert the following measurements to the desired unit:

a. 0.050 cm = _____ mm
b. 1872 mg = _____ kg
c. 1.9 dL = _____ cL
d. 3.4×10^{-3} ks = _____ cs

5. An aluminum block has a density of 2.70 g/mL. If the mass of the block is 24.60 g, find the volume of the substance.

6. A student can eat 4.0 M&Ms every 1.00 seconds. If an M&M has a mass of 63 mg, determine how many kilograms of M&Ms can be eaten by a class of 20 students in 3.75 hours.

Week #2

Naming Compounds– Using your memorized ions!

Formula	*Name*
1. P4O10	_____
2. $ZnBr_2$	_____
3. SBr_6	_____
4. CaF_2	_____
5. P_2S_3	_____
6. _____	carbon monoxide
7. _____	sodium hydride
8. _____	aluminum selenide
9. _____	xenon hexafluoride
10. _____	dinitrogen monoxide
11. $KClO_3$	_____
12. $Pb(OH)_2$	_____
13. $Ca(MnO_4)_2$	_____
14. N_2O_4	_____
15. $FeCl_2$	_____
16. _____	manganese (VII) oxide
17. _____	francium dichromate
18. _____	copper (II) phosphide
19. _____	silver nitrate
20. _____	ammonium oxalate
21. $(NH_4)_2SO_3$	_____
22. $Ni_3(PO_4)_2$	_____
23. $Fe(ClO_2)_3$	_____
24. $NaBrO_3$	_____
25. H_3PO_4	_____
26. _____	sulfurous acid
27. _____	hydroiodic acid
28. _____	mercury (I) nitrate
29. _____	vanadium (V) oxide

30._____ tetraphosphorous decoxide

Electron Configuration & Periodicity

1. Draw the orbital notation for nickel.

2. How many unpaired electrons are in arsenic?

3. Write the electron configuration for palladium.

4. How many valence electrons are in mercury?

5. Write the electron configuration for uranium.

6. Write the noble gas electron configuration for lead.

7. Which is more electronegative, sulfur or chlorine, and why?

8. Which has a larger atomic radius, potassium or bromine, and why?

9. Which has the smaller ionization energy, nitrogen or phosphorus, and why?

10. Write the noble gas electron configuration for copper.

Lewis Structures and VSEPR Theory

For the following questions, draw the Lewis Structure and the name of the shape the molecule will form.

1. $SeCl_2$

2. OF_2

3. BF_3

4. CO_2

5. CH_3NH_2

6. HCOOH

7. HCN

Week #3

Atomic Structure

1. Fill in the table below based on the given isotopes.

Isotope	Protons	Neutrons	Electrons
^{13}C			
^{31}P			
^{232}U			

Average Atomic Mass

2. Given the data below determine the average atomic mass

	Isotope % Abundance	Isotopic Mass	Average Atomic Mass
Question A.	Sb-121 57.25%	120.9038 amu	
	Sb-123 42.75%	122.0041 amu	
Question B.	Ag-107 51.82%	106.90509 amu	
	Ag-109 48.18%	108.9047 amu	

The Mole

3. Convert each of the following to moles.
   a. 12.64 g NaOH
   b. 3.00×10^{24} atoms Au
   c. 40.0 L of Ne gas
   d. 800. g $CaBr_2$
   e. 3.011×10^{22} molecules H_2O
   f. 6.78 L of Ar gas

4. Given 0.250 moles of krypton determine:
   a. the mass
   b. the number of atoms
   c. the volume at STP

5. Given 0.750 moles of oxygen determine”
   a. the mass
   b. the number of atoms
   c. the volume at STP

Percent Composition

6. Calculate the percent composition by mass of each element in K_2CrO_4.

Empirical and Molecular Formulas

7. Find the empirical and molecular formulas for a compound containing 11.66 g iron and 5.01 g oxygen if the molar mass of the compound is 320 g/mol.

8. Find the empirical and molecular formulas for a compound containing 5.28 g of tin and 3.37 g of fluorine if the molar mass of the compound is 584.1 g/mol.

Week #4

Balancing Chemical Equations

1. Balance the following equations:

   a. ____$Cu_{(s)}$ + ____$HNO_{3\,(aq)}$ → ____$NO_{2\,(g)}$ + ____$Cu(NO_3)_{2\,(aq)}$ + 2 $H_2O_{(l)}$

   b. ____$Fe_{(s)}$ + ____$H_2O_{(l)}$ → ____$Fe_3O_{4\,(s)}$ + ____$H_{2\,(g)}$

   c. ____$C_2H_{6\,(g)}$ + ____$O_{2\,(g)}$ → ____$CO_{2\,(g)}$ + ____$H_2O_{(l)}$

2. Write and balance the following equations:
   a. Iron metal reacts with oxygen to form solid rust, iron (III) oxide.

   b. Calcium metal reacts with water to produce aqueous calcium hydroxide and hydrogen gas.

   c. Aqueous barium hydroxide reacts with aqueous sulfuric acid to produce solid barium sulfate and water.

Stoichiometry

3. 30.5 g of sodium metal reacts with a solution of excess lithium bromide. How many grams of lithium metal are produced?

   ____$Na_{(s)}$ + ____$LiBr_{(aq)}$ → ____$Li_{(s)}$ + ____$NaBr_{(aq)}$

4. Propane, C_3H_8, undergoes combustion. How many grams of propane are needed to produce 45.9 g of water?

   ____$C_3H_{8\,(g)}$ + ____$O_{2\,(g)}$ → ____$CO_{2\,(g)}$ + ____$H_2O_{(l)}$

5. A solution of 3.50 g of sodium phosphate is mixed with a solution containing 6.40 g of barium nitrate. How many grams of barium phosphate can be formed?

$$____ Na_3PO_{4\,(aq)} + ____ Ba(NO_3)_{2\,(aq)} \rightarrow ____ Ba_3(PO_4)_{2\,(s)} + ____ NaNO_{3\,(aq)}$$

6. Octane, C_8H_{18}, undergoes combustion. How many grams of oxygen are needed to burn 10.0 g of octane?

7. Sodium azide, NaN_3, decomposes into its elements. How many grams of sodium azide are required to form 34.8 g of nitrogen gas?

8. Ammonia reacts with oxygen gas to form nitrogen monoxide and water. How many grams of nitrogen monoxide are formed when 1.50 g of ammonia react with 2.75 g of oxygen gas?

Week #5

Reactions

Please review the following material:

- There are three main classifications of reactions: precipitation, acid-base, or redox (reduction-oxidation…like, synthesis, decomposition, and single displacement).

- Any ion has an aqueous state of matter.

- For acid-base reactions, strong acids (HCl, HBr, HI, H_2SO_4, $HClO_3$, $HClO_4$, and HNO_3) and strong bases (metal ions in Groups 1 and 2 paired with hydroxide) completely dissociate. Weak acids and bases do not.

- For precipitation (and some redox) reactions, use the solubility rules in your memorization material to determine which salts are soluble (aqueous) or insoluble (solid). Only aqueous solutions can dissociate…solids, liquids, and gases cannot.

Acid-Base Example: *Hydrochloric acid is added to a solution of zinc hydroxide.*

*First, write a molecular equation.

$HCl + Zn(OH)_2 \rightarrow ZnCl_2 + H_2O$

Acid Base Salt Water

*Next, you need to see what dissociates and what does not. Hydrochloric acid is a strong acid, so it will completely dissociate into its ions while zinc hydroxide is a weak base, so it will not dissociate. Zinc chloride is a soluble salt according to the solubility rules above, so it will also dissociate into its ions.

*Wait to balance the reaction until the end.

$H^+ + Cl^- + Zn(OH)_2 \rightarrow Zn^{+2} + Cl^- + H_2O$

*Last, you need to see what can be cancelled out. Species that are identical on both sides of the reaction, called spectator ions, can be cancelled out. Cl^- is present on both sides of the reaction and therefore can be cancelled out…giving you your net ionic reaction that you'll now balance and put back on states of matter.

$2\ H^+ (aq) + Zn(OH)_2 (aq) \rightarrow Zn^{+2} (aq) + 2\ H_2O (l)$

Redox Example: *Silver metal reacts with a solution of sodium nitrate.*

$Ag + NaNO_3 \rightarrow Na + AgNO_3$

*Ag is a solid. $NaNO_3$ is a soluble salt according to the solubility rules above, so it will dissociate into its ions. Na is a solid. $AgNO_3$ is also a soluble salt and will dissociate.

$Ag + Na^+ + NO_3^- \rightarrow Na + Ag^+ + NO_3^-$

*NO_3^- is a spectator ion.

$Ag\ (s) + Na^{+}\ (aq) \rightarrow Na\ (s) + Ag^{+}\ (aq)$

Precipitation Example: *Barium acetate is mixed with potassium sulfate.*

$Ba(C_2H_3O_2)_2 + K_2SO_4 \rightarrow BaSO_4 + KC_2H_3O_2$

*According to the solubility rules, barium sulfate is the only insoluble salt. So, everything else will dissociate.

$Ba^{+2} + C_2H_3O_2^{-} + K^{+} + SO_4^{-2} \rightarrow BaSO_4 + K^{+} + C_2H_3O_2^{-}$

*The potassium ions and acetate ions can be cancelled out.

$Ba^{+2}\ (aq) + SO_4^{-2}\ (aq) \rightarrow BaSO_4\ (s)$

Please write net ionic balanced reactions (with states of matter included) for the following questions. It may be helpful to first identify the type of reaction.

1. Solid sodium bicarbonate is mixed with copper (II) nitrate.

2. Magnesium oxide is heated.

3. Acetic acid is added to a solution of ammonia.

4. Iron (III) chloride is mixed with silver sulfite.

5. A solid piece of aluminum is put into a solution of nickel (II) chloride.

6. A solution of lithium chloride is added to a solution of lead (IV) nitrite.

7. Sulfuric acid is added to a solution of aluminum hydroxide.

8. Cadmium nitrate is added to sodium sulfide.

9. Chromium (III) sulfate is added to ammonium carbonate.

10. Methane combusts in air.

Week #6

More Reactions

In each of the equations below, the reactants are written correctly. You must write the correct products and then balance the equation. It might be useful to identify the type of chemical reaction before writing the products.

1. $CaCO_3$ →
2. $Al + O_2$ →
3. $Fe + CuSO_4$ →
4. $C_6H_{12} + O_2$ →
5. $Zn + H_2SO_4$ →
6. $Cl_2 + MgI_2$ →
7. $NaOH$ →
8. $Fe + HCl$ →
9. $NaOH + H_3PO_4$ →
10. $(NH_4)_2SO_4 + Ca(OH)_2$ →
11. $AgNO_3 + K_2SO_4$ →
12. $Mg(OH)_2 + H_3PO_4$ →
13. $KClO_3$ →
14. $Al_2(SO_4)_3 + Ca_3(PO_4)_2$ →
15. $(NH_4)_3PO_4 + Ba(OH)_2$ →
16. $Ca(OH)_2 + HNO_3$ →
17. $C_3H_8 + O_2$ →
18. $Li + S$ →

Week #7

Short Answer AP Questions

1. The reaction between silver ion and solid zinc is represented by the following equation:

$$2Ag^{+}_{(aq)} + Zn_{(s)} \rightarrow Zn^{+2}_{(aq)} + 2Ag_{(s)}$$

A 1.50 g sample of Zn is combined with 250 mL of 0.110 M $AgNO_3$ at 25°C.

e. Identify the limiting reagent. Show calculations to support your answer.

f. On the basis of the limiting reactant that you identified in part (i), determine the concentration of Zn^{+2} after the reaction is complete.

2. Consider the hydrocarbon pentane, C_5H_{12} (molar mass 72.15 g/mol).

a. Write the balanced equation for the combustion of pentane to yield carbon dioxide and water.

b. What volume of dry carbon dioxide, measured at 25°C and 785 mmHg, will result from the complete combustion of 2.50 g pentane?

3. Find the mass percent of nitrogen in each of the following compounds:

a. NO

b. NO_2

c. N_2O_4

d. N_2O

4. Benzene contains only carbon and hydrogen and has a molar mass of 78.1 g/mol. Analysis shows the compound to be 7.74% H by mass. Find the empirical and molecular formulas of benzene.

5. Calcium carbonate decomposes upon heating, producing calcium oxide and carbon dioxide gas.

   a. Write a balanced chemical equation for this reaction.

   b. How many grams of calcium oxide will be produced after 12.25 g of calcium carbonate is completely decomposed?

   c. What volume of carbon dioxide gas is produced from this amount of calcium carbonate, at STP?

Week #8

More Short Answer AP Questions

1. Hydrogen gas and bromine gas react to form hydrogen bromide gas.

   a. Write a balanced chemical equation for this reaction.

   b. 3.2 g of hydrogen gas and 9.5 g of bromine gas react. Which is the limiting reagent?

   c. How many grams of hydrogen bromide gas can be produced using the amounts in (b)?

   d. How many grams of the excess reactant is left unreacted?

   e. What volume of HBr, measured at STP, is produced in (b)?

2. When ammonia gas, oxygen gas and methane gas (CH_4) are combined, the products are hydrogen cyanide gas and water.

   a. Write a balanced chemical equation for this reaction.

   b. Calculate the mass of each product produced when 225 g of oxygen gas is reacted with an excess of the other two reactants.

   c. If the actual yield of the experiment in (b) is 105 g of HCN, calculate the percent yield.

3. When solutions of potassium iodide and lead (II) nitrate are combined, the products are potassium nitrate and lead (II) iodide.

a. Write a balanced equation for this reaction, including (aq) and (s).

b. Calculate the mass of precipitate produced when 50.0mL of 0.45M potassium iodide solution and 75mL of 0.55M lead (II) nitrate solution are mixed.

c. Calculate the volume of 0.50M potassium iodide required to react completely with 50.0mL of 0.50M lead (II) nitrate.

DO NOT DETACH FROM BOOK.

PERIODIC TABLE OF THE ELEMENTS

1 **H** 1.0079																	2 **He** 4.0026
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.179
11 **Na** 22.99	12 **Mg** 24.30											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.974	16 **S** 32.06	17 **Cl** 35.453	18 **Ar** 39.948
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.938	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.75	52 **Te** 127.60	53 **I** 126.91	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57 ***La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.85	75 **Re** 186.21	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.02	89 **†Ac** 227.03	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)	110 **§** (269)	111 **§** (272)	112 **§** (277)						

§Not yet named

*Lanthanide Series	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 151.97	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04	71 **Lu** 174.97
†Actinide Series	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** 237.05	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)