AP Chemistry Summer Assignment/Review 2016

Welcome to the summer before AP Chemistry! This summer assignment is designed as a review of the big topics from Honors Chemistry so that we can efficiently complete the AP Chemistry curriculum. Please plan to work on this assignment throughout the summer – I've included a suggested time frame. When you return to school in August, we are picking up where this review leaves off. We will spend the first two weeks of school reviewing the most challenging aspects of the review topics, with our first unit test at the end of the two weeks. This assignment is a review – please take the time to carefully go through these topics, or you will not be prepared for this course. My goal for this course is two-fold: (1) prepare you for the AP Exam and (2) make sure you learn chemistry!

I will be checking email periodically (not daily) throughout the summer if you have questions – cphilpot@forsyth.k12.ga.us
Have a wonderful, safe summer! Mrs. Philpot

Supplies for the Summer Assignment:

- Honors Chemistry Notebook (for review of the summer assignment topics)
- Blank periodic table (here is a link, or you can search/use one of your own): http://www.csudh.edu/oliver/chemdata/periodic/periodic-1.htm

Supplies during the school year

- Student Lab Notebook (carbon copy/spiral binding)
  [I suggest a 100 page, spiral bound, with grids for graphing. Here is an example: ISBN-13: 978-1930882744]
- 1 ½ inch binder with 11 dividers (we will label them on day 1)
- scientific or graphing calculator
- Princeton AP Chemistry review book **OR** Barron's AP Chemsitry Review book OR another review book**.** Do not purchase one dated prior to 2014 because the exam was redesigned in 2014]

Timeline (tentative)

- June-July – complete the summer assignment; Formative quiz over this material the 2nd week of school
- 2nd week of school – 1st AP lab
- 3rd week of school - 1st test

Part I – Get Organized

- Organize your honors notebook by topic: measurement, atomic structure, electron configuration & periodicity, bonding, chemical reactions, moles and stoichiometry, thermochemistry, gas laws, solutions, acids and bases. Use this notebook as a reference for the summer assignment and during the school year.
- Use a blank periodic table to label the following information (if you already have a beautifully labeled table, please use this for review):
  - Lightly color code metals, nonmetals, metalloids
  - Outline and label the s, p, d, and f blocks. Also label the energy levels by row and electron # in each sublevel by column (ie, $3d^1$…. d block, 3 on the row of 3d's and d^1 on the d^1 column)
  - Family names
  - Valence electrons and oxidation #s
  - Trends for electronegativity, ionization energy, atomic radius
- You still need to know the element/symbols and polyatomic ions! See the last page for the requirements. You should know names and formulas of the polyatomic ions listed! Look up the names you do not know; make flash cards if necessary!

Part II – Review Problems

The Review Problems/definitions – all listed below – are intended to keep honors chemistry content fresh in your mind. We will not have class time to go over all of this. You are expected to be able to do all of this coming into class. Topics include: metrics, atomic structure, electron configurations, writing chemical formulas, predicting products, stoichiometry, solution and gas calculations. Solutions will be available to you – only with your work to check before or after school – no photos!

A few suggestions:

- Work in a study/review group – a **productive** study/review group! It's great to bounce ideas off each other.
- Kahn Academy videos[https://www.khanacademy.org/science/chemistry], Crash Course Videos [https://www.youtube.com/playlist?list=PL8dPuuaLjXtPHzzYuWy6fYEaX9mQQ8oGr], and Bozeman videos [https://www.youtube.com/results?search_query=bozeman+chemistry+videos] make great refreshers, as well as other tutorials out there – just make sure it's a reliable source!!

Element Names/Symbols to Memorize

These are listed by atomic #: (no - you do not have to memorize the #s, just the name/symbol)
#1-38, #47-57, #78-89, #90-94

Polyatomic Ions to Memorize & Common Metallic Ion Charges (transition, Pb, Sn) to be familiar with

Common Metal Ion Charges (be familiar)			**-1 polyatomics**		**-2 polyatomics**	**-3 polyatomics**	**+1 polyatomics**
Cu^{+} Cu^{2+}	Mn^{2+} Mn^{3+}	As^{3+} As^{5+}	CH_3COO^{1-}	OH^{1-}	CO_3^{2-}	PO_4^{3-}	NH_4^{1+}
Hg_2^{2+} Hg^{2+}	Pb^{2+} Pb^{4+}	Bi^{3+} BI^{5+}	BrO_3^{1-}	IO_3^{1-}	CrO_4^{2-}		H_3O^{1+}
Au^{+} Au^{3+}	Pt^{2+} Pt^{4+}	P^{3+} P^{5+}	ClO_4^{1-}	NO_3^{1-}	$Cr_2O_7^{2-}$		
In^{+} In^{3+}	Sn^{2+} Sn^{4+}	Ir^{2+} Ir^{3+} Ir^{4+}	ClO_3^{1-}	NO_2^{1-}	$C_2O_4^{2-}$		
Tl^{+} Tl^{3+}	Zr^{2+} Zr^{4+}	Ti^{2+} Ti^{3+} Ti^{4+}	ClO_2^{1-}	MnO_4^{1-}	O_2^{2-}		
Cr^{2+} Cr^{3+}	Ce^{3+} Ce^{4+}	W^{2+} W^{4+} W^{5+}	ClO^{1-}	SCN^{1-}	SO_4^{2-}		
Co^{2+} Co^{3+}	Ce^{3+} Ce^{4+}	U^{3+} U^{4+} U^{5+}	CN^{1-}	MnO_4^{1-}	SO_3^{2-}		
Fe^{2+} Fe^{3+}	Sb^{3+} Sb^{5+}	V^{2+} V^{3+} V^{4+} V^{5+}	HCO_3^{1-}				

REVIEW PROBLEMS/DEFINITIONS

Conversion Practice

Use dimensional analysis in solving each of the following problems.

1. Convert 32.5 oz to its equivalent in cg.
2. Convert 3.55 yd to its equivalent in cm.
3. Convert 143.55 mL to its equivalent in pints.
4. Convert a speed of 35.8 mi/hr to its equivalent in m/s.
5. Convert a density of 13.6 g/mL to its equivalent in lb/ft3.
6. A mole of hydrogen atoms contains 6.02×10^{23} atoms and occupies 22.4 L. How many hydrogen atoms are contained in 25.00 mL of this gas?
7. What volume of hydrogen would contain 4.5×10^{18} hydrogen atoms? How many moles of hydrogen would this be?
8. A molecule of hydrogen moves at a speed of 115 cm/s. How long will it take to travel the length of a football field (100 yd long)?
9. The speed of light is 3.0×10^{10} cm/s. Express this in mi/hr.
10. A sample of sea water contains 0.075 g of sodium chloride per mL of solution. How many moles of sodium chloride are there per L of this solution? A mole of sodium chloride is equivalent to 58.5 g of sodium chloride.
11. A doctor orders that a patient recieve 1.5×10^{-3} mole of sodium chloride. The only solution available contains 1.00 g per 100 mL of solution. A mole of sodium chloride is equivalent to 58.5 g of sodium chloride. How much of this solution should the nurse give the patient?
12. A sample of air contains 2.33×10^{-4} mg of lead per mL of gas. This air passes through an office, the volume of which is 3.25×10^{4} L. Seven people normally work in this office. How many µg of lead will each person in the office recieve from this sample of air?

Atomic Structure

1. Define: atom, proton, neutron, electron, ion, isotope, relative atomic mass
2. Complete the table for electron configuration

Substance	Complete electron configuration	Noble Gas Notation	# of valence electrons
Mg			
Ni			
Pb			
W			
S^{2-}			
Ca^{2+}			
Zn^{2+}			

Naming/Formulas

1. Define: compound, ionic compound, covalent compound, cation, anion

Monatomic Ions

Write the Ion		Write the Name
caclium ion	_____	Sr^{2+} _____
gallium ion	_____	In^{3+} _____
Selenide ion	_____	O^{2-} _____
zinc ion	_____	Ag^{+} _____
sulfide ion	_____	N^{3-} _____
copper (II) ion	_____	Fe^{2+} _____
lead (IV) ion	_____	Pb^{2+} _____
plumbic ion	_____	As^{3-} _____
stannous ion	_____	Sn^{2+} _____
barium ion	_____	Pt^{+} _____
Nickel (I) ion	_____	Mn^{2+} _____

Binary Ionic Compounds

Write the formula

1) calcium bromide _____
2) sodium nitride _____
3) barium oxide _____
4) lithium oxide _____
5) francium phosphide _____
6)calcium fluoride _____
7) gallium nitride _____
8) indium iodide _____
9) Zinc chloride _____
10) rubidium selenide _____

Polyatomic Ions

Write the formula

1) potassium sulfate _____
2) aluminum acetate _____
3) calcium hydroxide _____
4) calcium carbonate _____
5) magnesium chlorate _____
6) ammonium carbonate _____
7) silver nitrate _____
8) tin (IV) phosphate _____
9) sodium hydroxide _____
10)potassium permanganate _____

Binary Ionic Compounds

Write the name

1) $CaBr_2$ _____
2) Na_2O _____
3) Al_2O_3 _____
4) Mg_3N_2 _____
5) Li_2S _____
6) KCl _____
7) Cs_2S _____

Binary Ionic Compounds

Write the formula

1) iron (III) sulfide _____
2) nickel (II) fluoride _____
3) cupric oxide _____
4) plumbous nitride _____
5) tin (IV) selenide _____
6) platinum (I) oxide _____
7) copper (I) phosphide _____

Polyatomic Ions

Write the name

1) Na_2SiO_3 _____
2) $K_2S_2O_3$ _____
3) $Pb(NO_3)_2$ _____
4) CaC_2O_4 _____
5) $Al(C_2H_3O_2)_3$ _____
6) NH_4NO_3 _____
7) $(NH_4)_3PO_4$ _____
8) $Pb(CrO_4)_2$ _____
9) $NaHCO_3$ _____
10) $Al_2(SO_3)_3$ _____

Binary Ionic Compounds (special)

Write the name

1) $CuCl_2$ _____
2) CuCl _____
3) Co_3N2 _____
4) PbO _____
5) PbO_2 _____
6) $NiBr_3$ _____

Binary Ionic Compounds

Write the formula

1) lead (IV) oxide _____
2) zinc iodide _____
3) iron (III) oxide _____
4) magnesium nitride _____
5) strontium sulfide _____
6) cuprous chloride _____

Reaction Prediction

Look at the reactants and decide which type of reaction you are dealing with, then write a balanced chemical reaction.

1) aluminum plus hydrochloric acid
2) calcium hydroxide plus nitric acid
3) magnesium plus zinc nitrate
4) zinc chloride plus hydrosulfuric acid
5) silver chloride plus sodium nitrate
6) sodium chlorate (heated)
7) barium nitrate plus sodium chromate
8) sodium bromide plus silver nitrate
9) calcium phosphate plus aluminum sulfate
10) zinc carbonate (heated)
11) iron (III) hydroxide plus phosphoric acid
12) hydrogen peroxide decomposes
13) C_2H_5OH + oxygen
14) calcium and oxygen
15) iron (III) chloride and ammonium hydroxide

Stoichiometry

Define: liming reactant, excess reactant, percent yield

1) A standard laboratory preparation of iodine is the following reaction:
   $2NaI + MnO_2 + 2H_2SO_4 \rightarrow Na_2SO_4 + MnSO_4 + 2H_2O + I_2$
   If the amount of NaI used was 62.55 g, what mass of I_2 will be produced?
2.) How many grams of sodium hydroxide are needed to completely react with 25.0 g of sulfuric acid?
   $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$.
3) What volume of hydrogen gas is produced at STP if 20.0 g of sodium metal are reacted with excess water.
   $2Na + 2H_2O \rightarrow 2NaOH + H_2$
4) 100. g of benzene (C_6H_6) reacts with 21.0L chlorine gas at STP. How many grams of chlorobenzene (C_6H_5Cl) are produced? $2C_6H_6 + Cl_2 \rightarrow 2C_6H_5Cl + H_2$
5) If 500. g of N_2 reacts with excess H_2, what volume of ammonia should be produced? $N_2 + 3H_2 \rightarrow 2NH_3$
6) According to prelab theoretical yield calculations, a student's experiment should have produced 1.44g of magnesium oxide. When he weighed his product after the reaction, only 1.23g of magnesium oxide was present. What is the student's percent yield?
7) 3.2g of Aluminum reacts with 5.4g of chlorine to produce aluminum chloride.
   $2Al_{(s)} + 3Cl_{2(g)} \rightarrow 2AlCl_{3(s)}$
   a) What is the limiting reactant? Your work must justify your answer.
   b) How many grams of aluminum chloride will be formed?
   c) How many grams of the excess reactant were required/used in the reaction?
   d) How many grams of the excess reactant were left over?
8) Determine the percent yield for the reaction between 98.7g of Sb_2S_3 and excess oxygen if 72.4g of Sb_4O_6 is recovered.
   $2Sb_2S_3 + 9O_2 \rightarrow Sb_4O_6 + 6SO_2$

Solutions & Gases Review Calculations

I – Formulas – Match the correct formulas to the concentration unit

1) _____ mole fraction	a) (solute/solution) x 100
2) _____percent solution	b) moles solute/total moles
3) _____Molarity (M)	c) moles solute/kg solvent
4) _____molality (*m*)	d) moles solute/L solution
5) _____Dilution	e) M1V1=M2V2

II. Calculations – make sure to think through sig figs and units

1) What is the molarity of the solution formed by mixing 4.0 g of NaOH with enough water to make a 150 mL solution?
2) How many grams of KBr should be added to water to prepare 0.050 L of a 0.125M solution?
3) What is the molality of a solution containing 10.0g of Na_2SO_4 dissolved in 1000.0g of water?
4) A gas mixture contains 26.3 g of NO (nitric oxide) and 36.2 g if oxygen gas (O_2). What is the mole fraction of nitric oxide?
5) a) How much of a .500M solution is needed to make 100.0 mL of a .250M solution?
   b) How much water is required for this dilution?
6) What is the % volume of ethanol in a soln that contains 35 mL of ethanol dissolved in 155 mL of water?

III-Gas Law Practice – again… sig figs and units

#1 A weather balloon with a volume of 425L leaves from the ground under 1.00atm at 20.0°C. What will its volume be when it has ascended to a height where the pressure is 200.mmHg and the temperature is -50.0°C?	**#6** Two mischievous Chemistry students throw a 450. g block of dry ice (CO_2) into a swimming pool. When the ice sublimes, what volume of the gas will be produced if the pressure is 775 mmHg and the temperature is 28°C?
#2 A gas has a volume of 275 mL when first measured at a pressure of 98.0kPa. If the temperature is left unchanged, what would the gas volume be at standard pressure?	**#7** [insert increase, decrease] As temperature decreases, volume _____. As temperature decreases, pressure _____. As volume increases, pressure _____.

#3 If a gas occupies a volume of 733 mL at 10.0^{o}C, at what temperature (in Celcius) will it occupy a volume of 1225 mL if the pressure remains constant?	**#8** A gas has a pressure of 2.22 atm at 90.0^{o}C in a constant volume container. What temperature (K is fine) is required to reduce the pressure of the gas by 32.7%?
#4 An automobile tire has a pressure of 210 kPa at 20.0^{o}C. What will be the tire pressure after driving for some time if the temperature rises to 35.0^{o}C?	**#9** A spherical balloon occupies 22.4cm^{3} at 25^{o}C. By how much must the temperature decrease for the balloon's volume to decrease by 40.0%?
#5 How many grams of $N_{2(g)}$ are present in a 25.0L container at STP?	**#10** Determine the pressure (in atm) that 0.42g of carbon monoxide produces when it occupies 40.0mL at 1.0atm and 25^{o}C.