AP Chemistry 2015 Summer Assignment

Welcome to AP Chemistry! There are 2 parts to your summer assignment:

1. Problem sets chapters 1-3
2. At-home Lab: **Complete the At Home Summer Experiment: "What a Gas!" - due 1st day of school**
   - Obtain a lab notebook – do this early in the summer so that you have it available when you do your at home lab. See gas lab summer assignment for more details about recommended lab notebooks.
   - At-home Lab – write in lab notebook – turn in on first day of school

During the school year, we will use WebAssign, an online homework system. You will submit your homework get immediate feedback.

Problem Sets:

Textbook – Chemistry: The Central Science (11th edition) by Brown, LeMay, Bursten, and Murphy ISBN: 0-13-601879-3

1. Read chapters 1-3 in your textbook.

   Particularly emphasize the following sections: 1.4-1.6, 2.6-2.9, 3.1, and 3.3-3.7.
   Be sure to include the "A Closer Look," "Chemistry at Work" and "Strategies in Chemistry" sections.
   Use the *Give It Some Thought* questions and *Visualizing Concepts* exercises to check yourself as you read.
2. Complete the following problem sets. This material should be largely review; refer to your textbook as needed. Answers to certain problems can be found in the back of the textbook. Some problems are more challenging, but they are all solvable. Bring all summer work to me on the first day of class! Success in chemistry is directly related to problem solving. The more problems you do, the more you will learn! You are encouraged to set up a study group!

a) Chapter 1 problems (pp. 30-35) Required text problems 1.1-1.8, 1.16, 1.24, 1.29, 1.31, 1.39, 1.43, 1.45, 1.49, 1.63, 1.70, 1.77

b) Chapter 2 problems (pp. 69-77)
   i) Carefully read " *The Mass Spectrometer*" on p. 48 (a new emphasis in the updated AP curriculum)
   ii) Required text problems: 2.1-2.9, 2.33, 2.34, 2.35, 2.36, 2.48, 2.50, 2.53, 2.60, 2.65, 2.69- 2.73, 2.78, 2.93

c) Chapter 3 problems (pp. 107-117) Required text problems: 3.1, 3.4, 3.7, 3.14, 3.25, 3.34, 3.38, 3.50, 3.52, 3.54, 3.58, 3.72, 3.75, 3.81, 3.87, 3.90, 3.98

Tips on How to Study:

The Brown & LeMay WebAssignments correspond with chapters 1, 2, 3, and a small portion of chapter 25 in your text. Please read and briefly summarize each chapter before doing the problems. Also, do the boxed Sample Exercises that the book works out for you. You'll be amazed at how simple the concepts become! There are additional practice exercises listed at the end of each Sample Exercise if you feel you need more practice on the concept! Also, answers to the blue questions in the back of each chapter are in the back of the book starting on page A1. (I will not be teaching these chapters since they are review; if you skip reading them you may miss information that is very important in your fundamental understanding of chemistry.)

Quiz 1 (Mon, 8/11)

- Naming compounds & Writing formulas– ionic, covalent, acids
- Completing and balancing reactions

Quiz 2 (Tues, 8/12)

- Stoichiometry – including limiting reagent and percent yield
- Empirical formulas – simple ones (not the combustion analysis kind)

****Your test on all of the summer material will be on Friday, August 15.**

You must memorize the following information:

1. SI base units and prefixes
2. Element Names & Symbols (Elements 1 to 38 and Y, Zr, Pd, Ag, Cd, Sn, Te, I, Xe, Cs, Ba, W, Pt, Au, Hg, Pb, Rn, Fr, Ra, U, and Th), please note that the periodic table on the AP exam has only symbols, no names
3. Monatomic Ions
   a. Ions with (usually) one oxidation state: Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Ag^+, Zn^{2+}, Cd^{2+}, Al^{3+}

      N3-, O2-, S2-, F-, Cl-, Br-, I-

   b. Ions with more than one oxidation state:

Cu^+	Copper (I) or cuprous ion	Mn^{2+}	Manganese (II) or manganous ion
Cu^{2+}	Copper (II) or cupric ion	Mn^{3+}	Manganese (III) or manganic
Hg22+	Mercury (I) or mercurous ion	Co^{2+}	Cobalt (II) or cobaltous ion
Hg^{2+}	Mercury (II) or mercuric ion	Co^{3+}	Cobalt (III) or cobaltic ion
Fe^{2+}	Iron (II) or ferrous ion	Sn^{2+}	Tin (II) or stannous ion
Fe^{3+}	Iron (III) or ferric ion	Sn^{4+}	Tin (IV) or stannic ion
Cr^{2+}	Chromium (II) or chromous ion	Pb^{2+}	Lead (II) or plumbous ion
Cr^{3+}	Chromium (III) or chromic ion	Pb^{4+}	Lead (IV) or plumbic ion

4. **Strong Acids**: HCl, HBr, HI, H_2SO_4, HNO_3, $HClO_3$, $HClO_4$ (weak acids are those not listed here.)
5. **Strong Bases**: Group I hydroxides and Group II hydroxides (except $Be(OH)_2$ and $Mg(OH)_2$) Weak bases are those not listed here. 6. **Polyatomic Ions**

-1	-2	-3
$C_2H_3O_2^-$ (or $CH_3CO_2^-$) acetate	SO_4^{2-} sulfate	PO_4^{3-} phosphate
NO_3^- nitrate	SO_3^{2-} sulfite	AsO_4^{3-} arsenate
NO_2^- nitrite	CO_3^{2-} carbonate	AsO_3^{3-} arsenite
CN^- cyanide	$C_2O_4^{2-}$ oxalate	
OCN^- cyanate	CrO_4^{2-} chromate	
SCN^- thiocyanate	$Cr_2O_7^{2-}$ dichromate	
MnO_4^- permanganate	$S_2O_3^{2-}$ thiosulfate	
OH^- hydroxide	O_2^{2-} peroxide	
HSO_4^- bisulfate	SeO_4^{2-} selenate	
HCO_3^- bicarbonate	HPO_4^{2-} hydrogen phosphate	+1
$H_2PO_4^-$ dihydrogen phosphate		NH_4^+ ammonium
ClO_4^- perchlorate *		
ClO_3^- chlorate *		
ClO_2^- chlorite *		
ClO^- hypochlorite *		

* Br, I and F may be substituted

7. **Solubility Rules**

   All sodium, potassium, ammonium, and nitrate salts are soluble in water.

Have a great summer!

Ms. Gwaltney

On first day of school, please remember to bring your Lab Notebook AND your summer work. No need to bring your textbook to class….ever!

AP Chemistry – At Home Summer Experiment- What a Gas!

In order to complete this experiment, you need to purchase a lab notebook. This is a notebook that will be used only for AP Chemistry labs – not for other classes, and not for notes.

A carbon-copy lab notebook is recommended (search a website like amazon.com for carbon copy lab notebook and you will find them from companies like Hayden-McNeil - http://www.amazon.com/Student-Lab-Notebook-Spiralduplicate/dp/1930882742/ref=sr_1_1?ie=UTF8&qid=1431385727&sr=8-1&keywords=carbon+copy+lab+notebook - and Barbakam - http://www.amazon.com/Notebook-CarbonlessPages-Spiral-Perforated/dp/0978534425/ref=sr_1_2?ie=UTF8&qid=1431385727&sr=82&keywords=carbon+copy+lab+notebook).

You may use a composition book (with graph paper/graphing grids) instead.

Leave the first two pages of your lab notebook blank to set up a table of contents later. Your lab book has sets of pages (an original and a duplicate). **Place the flap between sets of pages so you don't copy your work on several pages.** Your lab notebook entry should be organized as follows (this is how we set up all labs). Underline all section titles. You should only write in **blue or black ink** in your lab notebook. If you make a mistake, simply draw one or two lines through it (**do not** scribble, use white-out, or obliterate it) and continue below it.

Title: What a Gas: Stoichiometry & Gas Lab
Objective: To determine the starting amounts of baking soda and vinegar required to fill up a Ziploc bag.
Safety: Don't eat☺
Background Info:

- Look up the chemical formula for baking soda and vinegar (look online, in your kitchen cabinet, in your textbook, etc) and write them here.
- Write the balanced chemical equation for the reaction that takes place between baking soda and vinegar. (There are 3 products produced – one of them is a common gas.)
- Discuss briefly how stoichiometry works and give a simple mole to mole example. ˇ Give the Ideal Gas Law and the value of R (0.0821 L atm/K mol) ˇ Write the formula to convert ←C to Kelvin.
- For extra credit, look up the molecular structure of the pigment in red cabbage and draw it.

Prelab Questions (show all work, box answers):

1. How many moles of hydrogen gas can be produced when 10.0 g of Zn react with excess HCl? [Hint: you must write a balanced chemical reaction first.]
2. If the pressure is 1.2 atm and the temperature is 20.0ºC, what volume of hydrogen is produced in prelab question #1? [Hint: need to use Ideal Gas Law and R from background info.]
3. How many moles of hydrogen gas can be produced when 10.0 g of Zn react with 50.0mL of 2.0M HCl? [Hint: M is molarity which is #moles/L. Also this is a limiting reactant problem.]
4. If the pressure is 1.2 atm and the temperature is 20.0ºC, what volume of hydrogen is produced in prelab question #3?

Procedure (Write "refer to the What a Gas lab handout and then only copy the underlined parts in your lab notebook – we typically only write summaries of procedures in the lab notebook.

1. Measure the volume of your Ziploc bag. Fill your Ziploc bag with water and pour into a measuring cup. Convert from cups to mL and then to L.(½ cup = 123 mL).You will need this volume in your calculations in #3. Put in data table. [Why is this important? Remember that gases, like CO_2, fill up their space, so…you've just figured out the maximum liters of CO_2 you can produce.]
2. Record barometric pressure for that day - look up on the weather channel or website (they usually measure in inches of Hg, so you'll have to convert from inches to mm of Hg [25.4 mm = 1 in] and then to atm [760 mmHg = 1 atm]). Record the temperature – look on your indoor thermostat in Celsius and convert to Kelvin (see your formula from background info).

3. Now you're ready for calculations. Using the Ideal Gas Law, calculate the # of moles of gas product from the volume, temperature, and pressure you figured out in #1-3.
4. Use stoichiometry to convert from moles of gas to moles of each reactant.
5. Using the chemical formulas and the periodic table, convert from moles of baking soda to grams of baking soda and from moles of vinegar to mL of vinegar.
6. Using the following conversions, calculate the amount of baking soda and vinegar you need using common measuring cups & spoons in the kitchen (1 tsp of baking soda has a mass of 6.80 g, ½ cup vinegar = 123 mL, and the Molarity of vinegar is 0.80M).
7. Once you calculate the amounts of reactants, try it! Experiment with different amounts of baking soda and vinegar needed to react to fill up the bag (tight) with gas if needed. Record amounts used in each trial in your data table.
8. For extra credit, chop some red cabbage and boil it in enough water to cover the cabbage, and use the cabbage juice as an indicator. [Hint: What did you use indicators for in chem 1?] Put a spoonful of red cabbage juice into the Ziploc bag along with the baking soda and vinegar and note the color before the reaction, during the reaction, and after the reaction.

Data Tables (use a ruler to create these data tables in your lab notebook):

Chemical	Chemical Formula	Balanced Chemical Equation (there will be 3 products)
Baking soda		
Vinegar		

Ziploc Baggie (snack, sandwich, quart, gallon?)	Volume (cups)	Volume (mL)	Volume (L)
Barometric Pressure	Pressure (inches Hg)	Pressure (mmHg)	Pressure (atm)
Temperature	←C	K	

Chemical	Trial 1	Trial 2	Trial 3
Baking soda			
Amount measured	g	g	g
Vinegar			
Amount measured	mL	mL	mL
Success? (Did the bag fill with gas?)			

Reb Cabbage juice	Trial 1	Trial 2	Trial 3
Color before reaction			
Color during reaction			
Color after reaction			

Calculations (Show all your work for calculations above, use units, box answers)**:**

1. Ziploc Baggie volume calculations:
2. Gas volume (same as volume of baggie):
3. Gas pressure conversions:
4. Gas temperature conversions:
5. Solving for Moles of gas (using Ideal Gas Law):
6. Solving for Moles of Baking Soda needed (stoichiometry):
7. Amount of Baking Soda (in grams) needed (conversion):

8. Solving for Moles of Vinegar needed (stoichiometry):
9. Amount of Vinegar (in mL) needed (vinegar is 0.80M):

Post Lab Questions:

1. If the vinegar was watered down and had a molarity of 0.40M instead of 0.80M, would the bag have filled up totally? Why or why not?
2. If the pressure in the room was greater, would the bag have filled up to the same volume?
3. Red cabbage juice could have been used as in indicator in this lab.
    a. What type of indicator is it?
    b. What type of chemical is vinegar?
    c. What type of chemical is baking soda?
    d. Why does the indicator change color?

Conclusion: Using ____g of baking soda and ____mL of vinegar was the best combination to fill a Ziploc baggie with a volume of _____ mL of gas.

Error Analysis: In this section we usually calculate a % error, but in this case explain why the results you got differed from what you expected (i.e. what you calculated). (2-3 sentences)

Discussion of Theory: This lab reviewed the concept of gas laws, stoichiometry, indicators, and conversions. Write a 3-5 sentence paragraph discussing these concepts and what you learned through this lab or how you saw new connections in chemistry.