Welcome to AP Chemistry

I'm very excited for the upcoming year in AP Chemistry. It is going to be an endurance race (sprinting at times), so in preparation, I have some things for you to work on over the summer. We are going to start out the year with by covering the first 3 chapters in about a week with labs included. While this will be almost all review material, it can still be a bit overwhelming, especially with the labs thrown in. Many AP Chem teachers give the first three chapters as a summer assignment and then give an exam the first day of class. I prefer, however, to give you the opportunity to review and ask me questions before giving you an exam over the material, which means the exam will likely occur during the second week of school. So, in order to make the first couple weeks of your senior year a little more survivable I am (HIGHLY) recommending that you complete the following:

* ***Memorize*** the enclosed list of polyatomic ions and solubility rules
* ***Read*** chapters 1-2 in your textbook
* ***Read and Outline*** chapters 3-4 in your textbook
* ***Begin doing*** the homework that pertains to those chapters found on the Performances of Understanding for each chapter.
* ***Purchase*** an AP Chem review book. This will be useful in helping you study for your unit exams. It has the material broken down by topic.
  - Previous classes recommend: 5 Steps to a 5 or Princeton Review AP Chemistry or Dingle's Crash Course Chemistry
  -NOT recommended: Kaplan's – does not have the rigor necessary for the AP exam

Next September: On the first (or second) day of school you (should) will receive from me the following:

* Semester calendar with all homework assignments, exam & lab dates
* Lab notebook (most likely)
* Lab Handouts for some of the labs to be completed during the semester
* Syllabus & lab rubric
* A quiz over the polyatomic ions & solubility rules. ☺

I will be checking my email periodically (ha ha) over the summer. Feel free to email (ebell@tbcs.org) if you have any questions, but you may have to be patient for a response! Be sure to relax, refresh, and have fun. See you in late August. Have a GREAT summer! (and don't work TOO hard! ☺)

~Ms. Bell

Homework: What's the point?

A question often asked by students, especially seniors, as the year goes on. So, what is the purpose behind homework? Homework is an opportunity for you to practice linking the concepts and skills we learn in class on new problems. It gives you the opportunity to assess your proficiency at performing the skill and determine where you have questions either conceptually or in the mathematical representation of the concept.

As you likely remember, chemistry is a highly conceptual science that is very abstract in nature. Most of the concepts we will talk about are not ones you can actually see. We may be able to see the effects of the topic, but not how the atoms actually work together. In order to have truly mastered a topic you should be able to explain what is happening on the molecular (or atomic) level, what the visible results are, and often, represent the process using a (set of) mathematical equation(s) that you are able to solve to get information about the system.

The primary focus of the assigned homework problems will be a demonstration of the skills that come out of the theory, whether that be solving equations for some property or showing the application of a concept on a molecule. Rarely will there be any essay style questions on the homework. To help you sort through the large quantities of information to focus on the main theories, concepts and applications I will be giving you Performances of Understanding (similar to Learning Objectives). I will not be collecting these from you at any time, but they are a tool for you to use to self-assess your progress through the material.

So, what will you collect, Ms. Bell? Well, that is an excellent question; all homework will be submitted electronically. You should still write out the work to practice the important skill of being able to communicate your thoughts/process, which is vital on the AP exam. I will not be checking the answers, you are responsible for checking your answers. I also have solutions manuals that you may use in the classroom.

You should acquire a notebook (not a binder with loose pages!) to complete your homework in. Each assignment should have the following format:

Date
Chapter:Sections (2.1-2.7)
Problem #s (23,29,35*,44,47,53*,55)

Then number and complete each problem, clearly marking your final answer.

Performances of Understanding

What they are:

- A set of objectives that clarify what the skills and concepts that you are expected to be able to explain and apply
- A brief summary of the types of questions that may be asked

What they are not:

- An exhaustive list of every type of problem that could potentially be seen for a topic
- A guarantee of how a question will be asked on a test

What they contain:

- A list of ways that you should be able to demonstrate your understanding of the concepts and skills of a unit
- Assigned homework problems are directly linked to the PoUs to demonstrate how the problems help you become proficient in the material

FORMULA	NAME
PO_4^{3-}	phosphate
PO_3^{3-}	phosphite
HPO_4^{2-}	hydrogen phosphate
$H_2PO_4^-$	dihydrogen phosphate
SO_4^{2-}	sulfate
SO_3^{2-}	sulfite
$S_2O_3^{2-}$	thiosulfate
$S_2O_8^{2-}$	persulfate
HSO_4^-	bisulfate (or hydrogen sulfate)
HSO_3^-	bisulfite (or hydrogen sulfite)
CrO_4^{2-}	chromate
$Cr_2O_7^{2-}$	dichromate
MnO_4^-	permanganate
Hg_2^{2+}	mercury(I) or mercurous
NO_3^-	nitrate
NO_2^-	nitrite
N_3^-	azide
BO_3^{3-}	borate
ClO_4^-	perchlorate
ClO_3^-	chlorate
ClO_2^-	chlorite
ClO^-	hypochlorite
CN^-	cyanide
CNO^-	cyanate
CNS^-	thiocyanate
OH^-	hydroxide
O_2^{2-}	peroxide
CO_3^{2-}	carbonate
HCO_3^-	bicarbonate (hydrogen carbonate)
$C_2H_3O_2^-$ (CH_3COO^-)	acetate
$C_2O_4^{2-}$	oxalate
NH_4^+	ammonium
H_3O^+	hydronium

Solubility Rules for Ionic Compounds

Substances	Solubility	Common Exceptions
Alkali metals and Ammonium compounds	Soluble	None
Nitrates, Acetates, Chlorates, and Perchlorates	Soluble	None
Chlorides, Bromides, and Iodides	Soluble	Ag^+ and Hg_2^{2+} halides and Hg^{2+} iodides are insoluble. $PbCl_2$, $PbBr_2$, PbI_2 and $HgBr_2$ are slightly soluble.
Sulfates	Soluble	Sr^{2+}, Ba^{2+}, Pb^{2+} and Hg_2^{2+} sulfates are insoluble. $CaSO_4$ and Ag_2SO_4 sulfate are slightly soluble.
Hydroxides	Insoluble	Alkali metal and Ba^{2+} hydroxides are soluble. $Sr(OH)_2$ and $Ca(OH)_2$ are slightly soluble.
Sulfides, Carbonates, Phosphates	Insoluble	Alkali metal and NH_4^+ compounds are soluble. CaS, SrS and BaS are soluble.

AP Chemistry - Performances of Understanding

Chapter 1

- Explain the similarities and differences between the three phases of matter
- Explain the similarities and differences between the types of mixtures and pure substances (14,17,21)
- Describe how physical properties can be used to separate mixtures
- Use density as a conversion factor between volume and mass (35,61)
- Convert between different metric prefixes for the main units of measure (25,31)
- Use dimensional analysis to complete conversions between different units (57)
- Explain why dimensional analysis allows you to change the units on a measurement
- Perform metric volume conversions (57,61)
- Explain the importance of significant figures and why they are useful (45)
- Correctly apply significant figures to calculations (49,50)
- Explain the difference between precision and accuracy and relate these concepts to significant figures

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Metric Prefixes: from nano- → giga- from memory

TABLE 5

MULTIPLICATION FACTOR		PREFIX	SYMBOL
1000 000 000 000 000 000	= 10^{18}	exa	E
1000 000 000 000 000	= 10^{15}	peta	P
1000 000 000 000	= 10^{12}	tera	T
1000 000 000	= 10^{9}	giga	G
1000 000	= 10^{6}	mega	M
1000	= 10^{3}	kilo	k
100	= 10^{2}	hecto	h
10	= 10^{1}	deka	da
0.1	= 10^{-1}	deci	d
0.01	= 10^{-2}	centi	c
0.001	= 10^{-3}	milli	m
0.000 001	= 10^{-6}	micro	μ
0.000 000 001	= 10^{-9}	nano	n
0.000 000 000 001	= 10^{-12}	pico	p
0.000 000 000 000 001	= 10^{-15}	femto	f
0.000 000 000 000 000 001	= 10^{-18}	atto	a

AP Chemistry – Performances of Understanding

Chapter 2

- Explain the postulates of Dalton's Atomic Theory including which have been shown to be not true under all conditions and how the current understanding varies from the original postulate
- Explain what makes each element unique
- Describe what is an isotope
- Write the isotope form for any element (29)
- Explain the concept of atomic mass
- Calculate the atomic mass for an isotope (35)
- Explain the basic configuration of the periodic table on the basis of:
    - Metals/non-metals
    - Periods
    - Families/groups
    - Where applicable – be able to give the names for any special sections
- Identify spatially on the periodic table where the different regions are located
- Articulate the difference between an empirical formula and a molecular formula
- Understand the relationship between a chemical formula and the individual atoms (52)
- Explain the difference between an ionic compound and a covalent compound (including bonds and types of elements) (65)
- Using a periodic table, predict the charge of an ion (55)
- Predict the formula of an ionic compound (62,63)
- Explain the concept of a polyatomic ion
- Write the names and formulas for the common polyatomic ions
- Given the formula of a compound, write the name using only a periodic table. (ionic, covalent, acids and simple alkanes) (71,74,76,77)
- Given the name of a compound, write the formula of the compound (73,76,77)

AP Chemistry – Performances of Understanding

Chapter 3

- Explain how the law of conservation of mass is relevant to chemical reactions and writing chemical equations
- Balance chemical equations (13, 19,21)
- Identify patterns to determine reaction types for simple chemical reactions (combustion, decomposition, combustion) (21)
- Determine a pattern to predict the products of simple chemical reactions
- Explain the difference between formula weight, molecular mass and molar mass (23)
- Calculate the percent composition of a substance in a mixture/element in a compound (25)
- Explain the concept of and utility of the mole as a unit
- Perform conversions between atoms, molecules, moles and mass (35,38)
- Explain the lack of direct correlation between percent composition and empirical formula
- Explain how to calculate empirical formula from percent composition
- Demonstrate the skill of calculating empirical formula from percent composition (54)
- Demonstrate the method for converting an empirical formula to a molecular formula (54)
- Explain how to use a balanced chemical equation to predict:
    - The amount of product that can be formed
    - The amount of another reactant needed
    - The amount of reactants used to make a given amount of product
- Demonstrate the ability to determine: (61,68)
    - The amount of product that can be formed
    - The amount of another reactant needed
    - The amount of reactants used to make a given amount of product
- Explain the concept of limiting reactants and theoretical yield (79)
- Determine the limiting reactant and theoretical yield from a set of calculations (79,80)

<u>To be covered completely in class:</u>

- *Explain the concept behind combustion analysis to determine empirical formula*
- *Demonstrate the calculation of empirical formula by combustion analysis (55,56)*