

Date: Summer 2011

Dear: Potential AP Chemistry Student

I sincerely hope that you are having a wonderful summer break, relaxing, recharging and expanding your intellectual spirit in preparation for your next year at Cornelia Connelly School and your Advanced Placement Chemistry Class.

As you probably know, there is a summer assignment for AP Chemistry. You will need your text to do the assignment. If you do not have a copy, it can be purchased through the school's online bookstore. It is also available at many used book websites (you should be able to get a used copy for a good price).

I have attached to this letter a copy of the summer assignment which includes reading the **first four chapters** of *Chemistry*, Sixth Edition, by Zumdahl and Zumdahl (ISBN 0618265058) and answering selected questions and exercises. Your completed summer assignment will be due the first day of class. In addition, there is a list of common ions attached. **These must be committed to memory.** A quiz on these ions will be given the first day of class – when a color is listed with a particular ion, you must also know the color. Begin working on this assignment early as it requires covering almost 200 pages of your textbook and it will take you some time to memorize the ions. A comprehensive test covering all four chapters of the summer assignment will be given during the second week of school.

Students taking AP Chemistry at Connelly over the past 20 years have experienced great success as measured by their success in college. I'm sure that working together, we will continue that tradition of accomplishment.

So, welcome to the world of Chemistry, and one of the most challenging courses at Connelly.

You may reach me at hwagner@connellyhs.org if you have any questions. I will periodically check my email over the summer.

Sincerely,

Helen R. Wagner

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AP (Advanced Placement) Chemistry Summer Assignment and Study Guide:

The first three chapters should be a review of topics taught in College Prep Chemistry and Honors Chemistry

Chapter 1 (Chemical Foundations)

Chapter 1 Overview: The first Chapter deals with the Scientific Method, Units of Measurement, Uncertainty and Conventions for Significant Numbers, Dimensional Analysis, Temperature, Density, and the Classification of Matter. Special attention should be paid to Uncertainty and the Conventions of Significant Numbers.

Expected Achievements and Concepts to be Mastered:

- (1) Know how to construct a flow diagram for the **Scientific Method**. Be able to describe the difference between a theory, hypothesis and a law in your own words. Be able to discuss the possible causes of failure of the Scientific Method to achieve a Law.
- (2) Be familiar with the fundamental **SI Units for Mass, Length, Time, Temperature, Electric Current and Amount (the Mole)**.
- (3) Be able to differentiate between **accuracy and precision**.
- (4) Know how to apply the rules of **significant numbers and rounding off** to calculations based on experimental measurements.
- (5) Be able to make **conversions between SI and other systems (i.e. English)**. Recognize the importance of carrying unit designations (units) through calculations.
- (6) Be familiar with the three most commonly used **temperature scales**.
- (7) Be able to define **density, specific gravity**. Be able to state why **density is an important physical characteristic**.
- (8) Be able to differentiate between **physical and chemical changes**.
- (9) Know the **characteristic states of matter**.
- (10) Be able to recreate **Figure 1.13** from the Text.
- (11) Be able to define and use the **Key Terms** found on pages 30 and 31 in your text.

Homework and Class Assignments: Requirements:

- (a) In the upper right corner of the first page of your assignment, put your **Name, Due Date, Chapter and Assignment and Problem Numbers**.
- (b) For "**Prose**" work use brief but complete sentences.
- (c) For "**Problems**" ***show setup and all work***, **box your answer**.
- (d) All assignments will help you master the concepts presented in the Chapter. Remember---Practice makes perfect. For Chapter 1, the following Questions and Exercises from the Text are assigned:
5, 16, 20, 25, 33, 34, 44, 45, 53, 65, 69, 74, 77, 82

Chapter 2 (Atoms, Molecules and Ions)

Chapter 2 Overview: Chapter 2 deals with the early history of Chemistry and some of the great contributors who took Chemistry from the age of alchemy and established the foundations of modern chemistry. The **Laws of Conservation of Mass, Definite Proportions, and Multiple Proportions** receive special emphasis. Dalton's original Atomic Theory and early experiments to characterize the atom are shown to lead directly to our modern view of basic atomic structure. The concept of ionic and covalent bonds is introduced in conjunction with solubility. The Periodic Table is introduced and the system for naming simple inorganic compounds is demonstrated.

Expected Achievements and Concepts to be Mastered:

- (1) Be able to give examples of the **Law of Conservation of Mass, Law of Definite Proportions, and the Law of Multiple Proportions**.
- (2) Be aware of the limitations of the **Law of Conservation of Mass**.
- (3) Appreciate and be able to describe the **contributions of Dalton, Gay-Lussac, and Avogadro** to the early development of atomic theory.
- (4) Describe the features of the most basic atomic particles and the meaning of **atomic mass and atomic number**.
- (5) In your own words, be able to describe an **ion** and differentiate between **covalent and ionic bonding**.
- (6) Have a basic understanding of the **Periodic Table of Elements**. Recognize the "**periodicity**" within the Table. Know why families of elements have similar reactivities. You should be able to locate and place the individual alkali metals, alkaline earth metals, halogens, and noble gases as well as N, C, O, B, Be, Si, P, and S.
- (7) Become **more than familiar** with the naming conventions for binary ionic compounds and simple polyatomic ions. See especially Section 2.8 of the Text.
- (8) Know how to **name simple oxygen containing acids** and their related salts.
- (9) Understand the **Arrhenius** definition of an **acid**.
- (10) Be able to define and use the Key Terms found on pages 72 and 73 in the Text.

Homework and Class Assignments:

For Chapter 2, the following Questions and Exercises from the Text are assigned:

3, 15, 17, 19, 20, 21, 22, 26, 29, 31, 33, 34, 36, 43, 58, 61, 62, 73, 74, 77, 79.

Chapter 3 (Stoichiometry)

Chapter 3 Overview: Chapter 3 deals with the quantities of materials consumed and produced in chemical reactions and has its roots in the Law of Conservation of Mass. The area of study is referred to as Stoichiometry. To help us understand this area, the Text reviews atomic masses, the mole, molar masses and the percent elemental composition of compounds. The chemical equation is introduced and calculations used to balance equations are demonstrated. Calculations of theoretical yields are demonstrated under maximum and limited stoichiometric conditions.

Expected Achievements and Concepts to be Mastered:

- (1) The concept of average atomic weight and the role of naturally occurring isotopes in the calculation of this number should be understood.
- (2) An understanding of what a **mass spectrophotometer** accomplishes is very helpful to understanding how average molecular weights are obtained experimentally.
- (3) Should be familiar with the **significance of Avogadro's number** and its connection to the mole.
- (4) Be able to calculate the percent composition by mass of elements in a compound.
- (5) Determine the **empirical formula** from mass percentages of elements in a compound.
- (6) Determine the **molecular formula** of a compound from the **empirical formula** and the **approximate molecular weight**.
- (7) Know what is meant by a **chemical reaction, reactants, products, and a chemical equation**.
- (8) Explain what is meant by a "**balanced**" chemical equation.
- (9) Calculate the **moles or mass of products** of a chemical reaction given the **mass of reactants**.
- (10) Be familiar with the reactions involved in the **production of sulfuric acid**.
- (11) Be able to calculate **theoretical yields**.
- (12) Be able to define and use the Key Terms found on page 121 in your text.

Homework and Class Assignments:

For Chapter 3, the following Questions and Exercises from the Text are assigned:

4, 5, 7, 11, 12, 27, 28, 32, 36, 50, 58, 63, 64, 66, 70, 71, 78, 81, 82, 83, 99, 107, 112, 122.

Chapter 4 (Types of Reactions and Solution Stoichiometry)

Chapter 4 Overview: This Chapter will contain many things that will be review for the AP Chemistry student. There are, however, several topics that will be new or covered in greater depth than previous Chemistry course offerings. Chapter 4 begins with a discussion of **water**. The concept of solvents, electrolytes, and the characteristics of solutions are discussed. Chemical reactions are classified into general categories such as **neutralizations, oxidation-reductions, precipitation, double replacements** etc. The **balancing of oxidation-reduction reactions** is given special attention.

Expected Achievements and Concepts to be Mastered:

- (1) Know what is meant by a **strong electrolyte** and be able to discuss the relationship between molecular bonding and electrolytic strength.
- (2) Be able to calculate the molarity of solutions and be able to apply molarity to calculate concentrations of reactants required to take reactions to completion. (**Acid/Base, and Oxidation-Reduction Reactions**)
- (3) Know what is meant by **oxidation-reduction**.
- (4) Be able to calculate the oxidation numbers of elements in compounds or ions.
- (5) **Balance oxidation-reduction equations**, in acidic or basic solutions. You should be a master at this. Sample exercises 4.19 and 4.20 should be given special attention
- (6) Be able to explain the difference between "concentration", "concentrated" and "acid strength" as these terms apply to sulfuric acid.
- (8) Be able to define and use the Key Terms found on page 179 and 180 in the Text.

Homework and Class Assignments: For Chapter 4, the following Questions and Exercises from the Text are assigned: 3, 4, 14, 18, 19, 20, 25, 26, 29, 33, 34, 37, 48, 57, 63, 65, 76, 77, 82

Commit the following Ions to memory (including colors of ions when listed):

acetate $C_2H_3O_2^-$ or CH_3COO^-	oxalate $C_2O_4^{2-}$
aluminum Al^{3+}	oxide O^{2-}
ammonium NH_4^+	perbromate BrO_4^-
barium Ba^{2+}	perchlorate ClO_4^-
bicarbonate or hydrogen carbonate HCO_3^-	periodate IO_4^-
bisulfate or hydrogen sulfate HSO_4^-	permanganate MnO_4^- (<i>purple</i>)
bisulfide or hydrogen sulfide HS^-	peroxide O_2^{2-}
bisulfite or hydrogen sulfite HSO_3^-	phosphate PO_4^{3-}
bromate BrO_3^-	phosphide P^{3-}
bromide Br^-	phosphite PO_3^{3-}
bromite BrO_2^-	potassium K^+
calcium Ca^{2+}	silver Ag^+
carbonate CO_3^{2-}	sodium Na^+
chlorate ClO_3^-	stannic – tin (IV) Sn^{4+}
chloride Cl^-	stannous – tin (II) Sn^{2+}
chlorite ClO_2^-	strontium Sr^{2+}
chromate CrO_4^{2-} (yellow)	sulfate SO_4^{2-}
chromium Cr^{3+}	sulfide S^{2-}
cupric – copper (II) Cu^{2+} (blue)	sulfite SO_3^{2-}
cuprous – copper (I) Cu^+ (green)	thiocyanate SCN^-
cyanide CN^-	thiosulfate $S_2O_3^{2-}$
dichromate $Cr_2O_7^{2-}$ (orange)	zinc Zn^{2+}
ferric – iron (III) Fe^{3+} (yellow)	
ferrous – iron (II) Fe^{2+} (green)	
fluoride F^-	
hydrogen H^+	
hydronium H_3O^+	
hydroxide OH^-	
hypobromite BrO^-	
hypochlorite ClO^-	
hypoiodite IO^-	
iodate IO_3^-	
iodide I^-	
iodite IO_2^-	
lead – lead (II) Pb^{2+}	
lithium Li^+	
magnesium Mg^{2+}	
manganese Mn^{2+}	
mercuric – mercury (II) Hg^{2+}	
mercurous – mercury (I) Hg_2^{2+}	
nickel Ni^{2+} (green)	
nitrate NO_3^-	
nitride N^{3-}	
nitrite NO_2^-	