Dear Honors Chemistry 2/AP Chemistry Students & Parents:

Welcome to Honors Chemistry 2 and/or AP Chemistry! I am excited that you have decided to take on the challenge of such a course and look forward to having you in our class. As you may already know, AP Chemistry is a year-long, 2-credit course that is listed as Honors Chemistry 2 in the fall and AP Chemistry in the spring. The two courses are designed to be the equivalent of a first-year general chemistry *college* course. As a result, they are only for high school students who are skilled and/or interested in chemistry, and are willing to demonstrate very high levels of commitment, motivation, and academic maturity. Chemistry 2/AP Chemistry may very well be one of the most intellectually challenging courses you will take in high school, but I think you will find it well worth the effort.

In order to prepare for one or both courses, you are expected to complete a Summer Assignment. Since students entering Honors Chemistry 2 have had a variety of Chemistry 1 experiences, completion of the summer assignment will help every student begin the year on equal footing as the assignment reviews Chemistry 1 topics and skills. A completed summer assignment is the key to success in this class, and is a demonstration that you have the work ethic required to do well. Enrollment in this course is a commitment to perform at the highest level and to display a positive attitude within the class. Seriousness in maximizing one's problem solving skills is expected. Due to the advanced level of the course, considerable time will be spent on mathematical calculations, both in lab and in class. Students will be expected to devote time in study of new material and in completion of practice problems, as well as developing quality laboratory skills and reporting practices. The College Board makes the following statement in the course description in relation to student commitment: **"It is assumed that the student will spend at least five hours a week in unsupervised individual study."** AP Chemistry is hard, and cannot by mastered by memorization alone; chemistry is a thinking discipline and students must demonstrate the maturity and self-discipline to approach it as such.

The goal of this course is to prepare each student for the Advanced Placement Chemistry Exam as well as enrollment in a second year chemistry course in college. Students who enroll in this course without an honors Chemistry background or who have received less than a 90% average in Chemistry 1 may not be prepared to deal with the volume of work, mathematical computations, and performance level required for above average grades in an accelerated program. Most can expect their average to be 5-10 percentage points lower than it was in Chemistry 1. It is imperative that students have achieved comparable grades in any Algebra course, AND successfully completed/be enrolled in Algebra 2 before beginning AP Chemistry in January. Students should plan on anywhere from 30-60 minutes of homework per night, and are expected to demonstrate a proactive approach to their work. Parents/guardians and students must understand that these requirements and time limits are not negotiable simply because this is what is required for success in this course. If you have concerns about this or the suggested course prerequisites, please feel free to email me (matthew.foust@knoxschools.org).

Thank you and enjoy your summer!

Matt Foust

Charges of Common Polyatomic Ions (AP)

(* indicates ions you need to memorize for 1st quiz)

1+

*Ammonium, NH_4^+
*Hydronium, H_3O^+
*Copper(I) or cuprous, Cu^+

2+

*Chromium(II) or chromous, Cr^{2+}
*Copper(II) or cupric, Cu^{2+}
*Iron(II) or ferrous, Fe^{2+}
*Lead(II) or plumbous
*Mercury(I) or mercurous, Hg_2^{2+}
*Mercury(II) or mercuric, Hg^{2+}
*Tin(II) or stannous, Sn^{2+}

3+

*Chromium(III) or chromic, Cr^{3+}

*Iron(III) or ferric, Fe^{3+}

4+

*Lead(IV) or plumbic, Pb^{4+}

*Tin(IV) or stannic, Sn^{4+}

1-

*Acetate, $C_2H_3O_2^-$
Amide, NH_2^-
Azide, N_3^-
Bromate, BrO_3^-
*Chlorate, ClO_3^-
*Chlorite, ClO_2^-
*Cyanide, CN^-
*Hydrogen Carbonate, HCO_3^-
(Bicarbonate)
Hydrogen Sulfate, HSO_4^-
(Bisulfate)
*Hydroxide, OH^-
*Hypochlorite, ClO^-
Iodate, IO_3^-
*Nitrate, NO_3^-
*Nitrite, NO_2^-
*Perchlorate, ClO_4^-
Periodate, IO_4^-
*Permanganate, MnO_4^-
Thiocyanate, SCN^-

2-

*Carbonate, CO_3^{2-}
*Chromate, CrO_4^{2-}
Dichromate, $Cr_2O_7^{2-}$
Hydrogen Phosphate, HPO_4^{2-}
Manganate, MnO_4^{2-}
Molybdate, MoO_4^{2-}
Oxalate, $C_2O_4^{2-}$
*Peroxide, O_2^{2-}
Selenate, SeO_4^{2-}
Silicate, SiO_3^{2-}
*Sulfate, SO_4^{2-}
*Sulfite, SO_3^{2-}
Tartrate, $C_4H_4O_6^{2-}$
Thiosulfate, $S_2O_3^{2-}$
Tungstate, WO_4^{2-}

3-

Arsenate, AsO_4^{3-}
Arsenite, AsO_3^{3-}
Citrate, $C_6H_5O_7^{3-}$
Hexacyanoferrate (III) $Fe(CN)_6^{3-}$
*Phosphate, PO_4^{3-}
*Phosphite, PO_3^{3-}

Review Questions from Brown and LeMay: Chemistry the Central Science, 11th edition

Chapter 1 "Introduction: Matter and Measurement" Assignments

Classification and Properties of Matter:

1. In the process of attempting to characterize a substance, a chemist makes the following observations: The substance is a silvery white, lustrous metal. It melts at 649°C and boils at 1105°C. Its density at 20°C is 1.738 g/cm^3. The substance burns in air, producing an intense white light. It reacts with chlorine to give a brittle white solid. The substance be pounded into thin sheets or drawn into wires. It is a good conductor of electricity. Which of these characteristics are physical properties, and which are chemical properties?

Units of Measurement:

2. What power do the following abbreviations represent?
   a) d
   b) c
   c) f
   d) μ
   d) M
   e) k
   f) n
   g) m
   h) p

3. a) A sample of carbon tetrachloride, a liquid once used in dry cleaning, has a mass of 39.73 g and a volume of 25.0 mL at 25°C. What is its density at this temperature? Will carbon tetrachloride float on water?
   b) The density of platinum is 21.45 g/cm^3 at 20°C. Calculate the mass of 75.00 cm^3 of platinum at this temperature.

Uncertainty in Measurement:

4. What is the number of significant figures in each of the following measured quantities:
   a. 358 kg
   b. 0.0054 s
   c. 6.3050 cm
   d. 0.0105 L
   e. 7.0500 x 10^{-3} m^3

5. Carry out the following operations, and express the answers with the appropriate numbers of significant figures:
   a. 12.0550 + 9.05
   b. 257.2 - 19.789
   c. (6.21 x 10^3)(0.1050)
   d. 0.0577/75.3

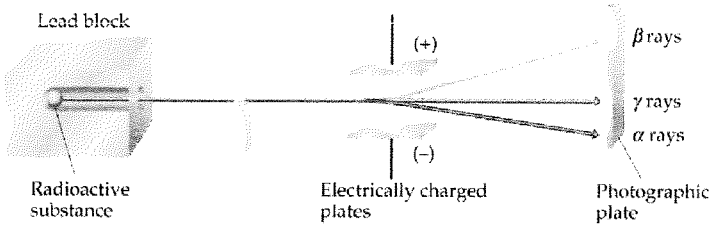
Dimensional Analysis:

6. The Morgan silver dollar has a mass of 26.73 g. By law, it was required to contain 90% silver, with the remainder being copper.
   a) When the coin was minted in the late 1800s, silver was worth $1.18 per troy ounce (31.1 g). At this price, what is the value of the silver in the silver dollar?
   b) Today, silver sells for $13.25 per troy ounce. How many Morgan silver dollars are required to obtain $25.00 worth of pure silver?

Chapter 2 "Atoms, Molecules and Ions" Assignments

The Atomic Theory and The Discovery of Atomic Structure:

7. A negatively charged particle is caused to move between two electrically charged plates, as illustrated below



   a) Why does the path of the charged particle bend?
   b) As the charge on the plates is increased, would you expect the bending to increase, decrease, or stay the same?
   c) As the mass of the particle is increased while the speed of the particles remains the same, would you expect the bending to increase, decrease, or stay the same?
   d) An unknown particle is sent through the apparatus. Its path is deflected in the opposite direction from the negatively-charged particle, and it is deflected by a smaller magnitude. What can you conclude about this unknown particle?

The Modern View of Atomic Structure and Atomic Weights:

8. Determine whether each of the following statements is true or false; if false, correct the statement to make it true:
   a) The nucleus has most of the mass and comprises most of the volume of an atom;
   b) Every atom of a given element has the same number of protons;
   c) The number of electrons in an atom equals the number of neutrons in the atom;
   d) The protons in the nucleus of the helium atom are held together by a force called the strong nuclear force.

9. Fill in the gaps in the following table assuming each column represents a neutral atom:

Symbol	^{52}Cr				
Protons		25			82
Neutrons		30	64		
Electrons			48	86	
Mass number				222	207

10. Only two isotopes of copper occur naturally, ^{63}Cu (atomic mass = 62.9296 amu; abundance 69.17%) and ^{65}Cu (atomic mass = 64.9278; abundance 30.83%). Calculate the atomic weight (average atomic mass) of copper.

The Periodic Table and Molecules and Molecular Compounds:

11. Locate each of the following elements in the periodic table; indicate whether it is a metal, metalloid, or non-metal; and give the name of the element:
    a) Ti
    b) Se
    c) Kr

12. Each of the following elements is capable of forming an ion in chemical reactions. By referring to the periodic table, predict the charge of the most stable ion of each:
    a) Mg
    b) Al
    c) F

Ions and Ionic Compounds:

13. Using the periodic table to guide you, predict the formula and name of the compound formed by the following elements:
    a) Ga and F
    b) Li and H
    c) Al and I

14. Predict the empirical formula for the ionic compound formed by
    a) Ca^{2+} and Br^-
    b) K^+ and CO_3^{2-}
    c) Al^{3+} and $C_2H_3O_2^-$

15. Predict whether each of the following compounds is molecular or ionic:
    a. B_2H_6
    b. CH_3OH
    c. $LiNO_3$

Naming Inorganic Compounds and Some Simple Organic Compounds:

16. Give the chemical formula for each of the following compounds:
    a) aluminum hydroxide
    b) potassium sulfate
    c) copper(I) oxide
    d) hydrobromic acid
    e) phosphoric acid
    f) hypochlorous acid

17. Write the chemical formula for each substance mentioned in the following word descriptions.

    a) Zinc carbonate can be heated to form zinc oxide and carbon dioxide.
    b) On treatment with hydrofluoric acid, silicon dioxide forms silicon tetrafluoride and water.
    c) Sulfur dioxide reacts with water to form sulfurous acid.

Chapter 3 "Stoichiometry: Calculations with Chemical Formulas and Equations" Assignments

Some Simple Patterns of Chemical Reactivity:

18. Write a balanced chemical equation for the reaction that occurs when
    a) solid magnesium reacts with chlorine gas;
    b) barium carbonate decomposes into barium oxide and carbon dioxide gas when heated;
    c) the hydrocarbon styrene, $C_8H_{8(l)}$, is combusted in air;

Indicate whether they are combination (synthesis, decomposition, or combustion reactions)

Formula Weights:

19. Calculate the percentage by mass of the indicated element in the following compounds:
    a) carbon in acetylene, C_2H_2, a gas used in welding
    b) hydrogen in ascorbic acid, $HC_6H_7O_6$, also known as vitamin C

The Mole:

20. a) What is the mass, in grams, of 2.50×10^{-3} mol of ammonium phosphate?
    b) How many moles of chloride ions are in 0.2550 g of aluminum chloride?
    c) What is the mass, in grams, of 7.70×10^{20} molecules of caffeine, $C_8H_{10}N_4O_2$?
    d) What is the molar mass of cholesterol if 0.00105 mol weighs 0.406 g?

Empirical Formulas from Analysis:

21. Give the empirical formula of each of the following compounds if a sample contains
    a) 0.0130 mol C, 0.0390 mol H, and 0.0065 mol O
    b) 11.66 g iron and 5.01 g oxygen

22. What is the molecular formula of each of the following compounds?
    a) empirical formula CH_2, molar mass = 84 g/mol
    b) empirical formula NH_2Cl, molar mass = 51.5 g/mol

Quantitative Information from Balanced Equations:

23. Hydrofluoric acid, $HF_{(aq)}$, cannot be stored in glass bottles because compounds called silicates in the glass are attacked by the $HF_{(aq)}$. Sodium silicate (Na_2SiO_3), for example, reacts as follows:

$$Na_2SiO_{3\,(s)} + 8\,HF_{(aq)} \rightarrow H_2SiF_{6(aq)} + 2\,NaF_{(aq)} + 3\,H_2O_{(l)}$$

    a) How many moles of HF are needed to react with 0.300 mol of Na_2SiO_3?
    b) How many grams of NaF form when 0.500 mol of HF reacts with excess Na_2SiO_3?
    c) How many grams of Na_2SiO_3 can react with 0.800 g of HF?