Some Thoughts on the Reading Assignments

WEEK 1

For Day 1:

Well, you are probably behind already, but don't worry. You should already have seen the material in Chapters 1 and 2 a number of times in your career. Chapter 1 reviews some of the real basics of analytical chemistry. Chapter 2 reviews lab tools that you will be working with. You may want to read about the analytical balance (we will use some of this info in the computer lab on Day 2), the section on pipets (which you can probably write yourself after Day 1) and the section on volumetric glassware. Browse these chapters as they will provide some theoretical perspectives on things you use every day but do not often reflect upon.

For Day 2: Statistics & Error Propagation

Sorry about all of this reading on evening 1, but this material is the basis for what we will study most of the week. For the rest of the week the reading will be lighter. Good news: the reading is your only HW tonight.

Chapter 3: Pages 39-44 are a review of principles learned (and probably forgotten) in Chemistry 107 and 108. Pages 44-50 are probably new to you unless you did propagation of uncertainty in P Chem. You will have a number of chances throughout the class to practice propagation of error. It is something to do before an experiment rather than after it. If you do it before an experiment you will learn where you can afford to be a bit sloppy and where you cannot. If you do it after an experiment, you will learn what you just did wrong and why you probably need to repeat the experiment.

Chapter 4 (pp. 53-65): You have already seen most of this in Chemistry 107-108 (but probably have forgotten it is as well). You have definitely learned about means, standard deviations and the Q and t-tests. However, you will add a new test to your arsenal: the F-test. You will also learn how to use the F-test to help you decide which t-test to use and you will realize that there are actually three different types of t-tests. We will use all three in this class (as well as ANOVA). You may skip the part on spreadsheets. We will use spreadsheets extensively and so you will learn them by using them. However, Harris does use the same type of spreadsheet that we will use (Excel), so if you have time you may learn something here (perhaps Harris is better at explaining them than I am). This most important chapter also discusses the methods of calibration using linear regression. We will use calibration methods throughout the class.

3-19b, 20, 22; **4**-E, F, 1, 5, 8, 9, 13b, 14, 15, 16, 19, 20, 21.

For Day 3: The Analytical Process, Experimental Design and ANOVA

Chapter 0: will give you an overview of the analytical process. This will be important for your project designs.

Chapter 5: The methods of standard additions and internal standards that you will need to design your procedures for Project Lab 1 are described in this chapter. For standard additions, we will focus on the graphical method. You should also know when to use linear regression and non-linear regression and any assumptions implicit in the two methods.

Chapter 5 formalizes some of the material discussed in Chapter 0. These aspects should all be considered when designing your project laboratories. You can skim the section on control charts as we will not be covering them.

ANOVA

You should carefully review the Analysis of Variance (ANOVA) handout and understand how useful this method can be. We will apply ANOVA to the design of experiments (Project 3) and to instrumental and experimental optimization. A good background on ANOVA can be found at the following URL:

http://www.statsoft.com/textbook/stathome.html

Problems: **0**-2, 4, 5, 6; **5**-A, B, C, 1, 2, 3, 6, 7, 8, 12, 13, 15, 22, 28

Answer the first four questions on the following website for ANOVA:
http://www.webchem.science.ru.nl/cgi-bin/Stat/Anova/anova.pl

For Day 4: Regression

Chapter 4 (pp. 65-72): The method of least squares will be used extensively in the class. We will see how this method and ANOVA are really two ways of looking at data the same way.

Problems: 4 G, 34, 36

For Day 5: Acid-Base Chemistry & Chemical Activity

Chapter 6: Read Sections 6.1, 2, 5, 6, and 7 before we begin our discussion of acid-base chemistry. Because this is a review of equilibrium chemistry from Chemistry 108, I will assume that you already know the material.

Chapter 8: This short chapter has important implications that are often ignored by biochemists. Read pp. 140-147 paying particular emphasis on the effects on acid-base chemistry and pH. Activity will become more important when we discuss electrochemical applications as they measure activity directly.

Chapter 9: This should be a review of Chemistry 108.

Chapter 10: This also should be a review of Chemistry 108. I will briefly review this chapter by having you answer some problems on the board in front of the class to see that you understand them. We will spend almost all of our time developing the material in Section 10.4 at a much more sophisticated level. Section 10.6 is interesting and relevant to electroseparations, which are covered later in the class. I will supplement this chapter with a handout in your lab manual (A2).

Problems: **6**-I, J, 1, 2, 3, 47-52; **8**-A, B, D, 11, 12; **9**-A, B, H, I , J; **10**-F, 18, 23, 25, 32, 36, 37, 38, 39