Chemistry 365
Analytical Chemistry
Syllabus—Winter 2010

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OFFICE HOURS: T 11:15-12:10, W 9:00-11:00 AM, F 9:00-12:00 PM or by appointment

Textbook/Reading Materials:
Quantitative Chemical Analysis, by D.C. Harris, 7th edition. Freeman (the publisher) has supplemental information regarding Analytical Chemistry on their web site: http://www.whfreeman.com/qca7e. I encourage you to visit the site for sample online quizzes "Chemical Analysis on the Web", spreadsheets, living graphs as well as additional exercises.

There is no lab manual for this course. However, you will need a bound lab notebook, a set of 3x5 index cards, and a scientific calculator. You will be responsible for downloading labs from the publisher's web site as indicated on the lab syllabus.

Grading

| | | |
|---|---|---|
| Review quiz and unannounced quiz(es) | 100 | |
| Four Exams (4 @ 100 points) | 400 | **no** |
| On-line quizzes (from Harris' website) | 150 | **make-ups** |
| ACS Standardized Final Exam | 100 | **will be** |
| Laboratory | 550 | **given!** |
| TOTAL | 1300 | |

Hour exams will be given on or near the dates shown in the syllabus, depending on how much or how little time we spend on each topic. The final is the multiple choice, standardized, ACS Analytical exam. Most of the labs are graded based on accuracy!

Answers to all quizzes and exams will be posted in the glass cabinet outside my office

**I WILL POST, ON MY WEB SITE, A SAMPLE COPY OF AN EXAM FROM A PREVIOUS ANALYTICAL CLASS ONE WEEK BEFORE EACH EXAM.**

The lecture schedule on the following page is only an outline of the material that we MAY cover during the semester. Exams, problems sets, etc. will be assigned based on the amount of material that we cover during each time period. The course is flexible enough that we can add or delete material depending on the time it takes to cover each topic.

| **Week beginning** | **Topic** | **Reading** |
|---|---|---|
| January 11th | What is Analytical Chemistry? | Harris 0 |
| | *Measurements - Review on your own* | Harris 1 |
| | Analytical Figures of Merit & Statistics | Harris 3-4 |
| | • *On line quiz assignment(s)* | |
| January 18th | Calibration Methods | Harris 4-5 |
| | Review of Chemical Equilibrium | Harris 6 |
| January 25th | Volumetric analysis | Harris 7 |
| | Activity and the systematic treatment of equilibrium | Harris 8 |
| February 1st | Monoprotic Acid-Base equilibria | Harris 9 |
| | **FIRST HOUR EXAM (excluding chapter 9)** | |
| February 8th | Polyoprotic Acid-Base Equilibria | Harris 10 |
| | • *On line quiz assignment(s)* | |
| Febryary 15th | Acid-Base Titrations | Harris 11 |
| February 22nd | Chelating ligands and their prey | Harris 12 |
| March 1st | Fundamentals of Electrochemistry | Harris 14 |
| | **SECOND HOUR EXAM (excluding chapter 14)** | |
| March 8th | *Spring Break!* | |
| March 15th | Potentiometric measurements: ISEs | Harris 15 |
| March 22nd | Fundamentals of and Instruments for Spectroscopy | Harris 18, 20 |
| March 29th | Atomic and Molecular spectroscopy | Harris 19, 21 |
| | **THIRD EXAM** | |
| April 5th | Introduction to Analytical Separations | Harris 23 |
| April 12th | Gas and liquid chromatography | Harris 24-25 |
| | Mass Spectrometry | Harris 22 |
| | • *On line quiz assignment(s)* | |
| April 19th | Ion Chromatography and Electrophoresis | Harris 26 |
| | **FOURTH EXAM** | |
| April 26th | **FINAL EXAM WEDNESDAY APRIL 28TH 6:45 – 8:45 PM** | |

You are required to keep a bound laboratory notebook for all your experimental data. Harris gives some suggestions on notebook keeping and basic good lab practices in Chapter 2 (sec 2-2). You should be well organized, careful, and detailed in keeping your notebook. You may find it useful to use the first few pages as a "Table of Contents" so that you can easily find lab data. All entries and all reports MUST BE MADE IN INK. Never erase or cross out recorded data. A simple slash through an entry will allow you to read it at a later time, in case your original value was the correct one! Data should never be recorded on scrap pieces of paper, or torn out of your bound record book.

**Your lab notebook must be turned in along with a 3x5 index card that summarizes your analytical results for each experiment**. The following information should be included on your index card: name, date, experiment performed, unknown number, quantitative result, and an estimation of error. Your grade will depend on the accuracy of your result, but sloppy notebooks will lower your lab grade. Errors in analytical results are often caused by calculation errors. Therefore, a set of clear sample calculations in your notebook can help me find and correct errors (and help your grade).

Experiments are due on the dates indicated on the lab schedule. **Late labs will be penalized ten points per day**. Weekends and holidays count the same as weekdays. **YOU WILL RECEIVE NEGATIVE POINTS ON LABS THAT ARE MORE THAN FIVE DAYS LATE!** If you are having difficulty with calculations, please come see me BEFORE the due date! **Points for accuracy vary with each lab – I will provide you with more information on this prior to each exercise.**

You are required to attend lab at the time that you registered for it. During this time period, we will be discussing techniques, equipment, calculations, safety precautions, and we will point out the location of all reagents, etc.

**Academic Integrity and Dishonesty**:
Academic honesty and integrity are essential to the existence and mission of an academic community. Academic dishonesty in any form (i.e. cheating, aiding in cheating, plagiarism) will not be tolerated because such dishonesty undermines the entire academic endeavor. Any act of academic dishonesty will result in a "grade of zero" for the assignment (if this is an exam the grade will not be dropped). A second infraction will result in an "F" in the course. Such an action may warrant referral to the Academic Standards Committee, and possible dismissal from the College

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Laboratory Schedule

| **Week Beginning** | **Exercise** | **Reading** |
|---|---|---|
| January 18 | Statistical evaluation of Acid-base Indicators<br>Results due January 29 | Exp. 5 - download PDF file from the Harris web site<br>also, read Harris 3-4 |
| January 25 | Gravimetric Determination of Calcium as $CaC_2O_4 \cdot H_2O$<br>Results due February 5 | Exp. 2 – download PDF file from the Harris web site |
| February 1 | Sulfate in Water by Turbidity<br>Results due February 12 | supplemental and<br>Harris 19 (skim) and<br>Harris Table 7.1, 131m |
| February 8 | Analysis of an Acid-Base Titration Curve: The Gran Plot<br>Results due February 19 | Exp. 9 - download PDF file from the Harris web site and supplemental |
| February 15 | Carbonate Determination using an Automated Titrator<br>Results due February 26 | supplemental and<br>Exp. 8 – download PDF file from the Harris web site |
| February 22 | $Ca^{2+}$ and $Mg^{2+}$ in Natural Waters<br>Results due March 5 | Exp. 11 – download PDF file from the Harris web site |
| March 1 | Spectrophotometric Determination of Mn<br>Results due March 19 | Exp. 24 download PDF file the Harris web site |
| March 15 | relax and catch up! | |
| March 22 | ISE vs. UV absorbance for nitrate<br>Results due April 2 | supplemental |
| March 29 | Atomic Absorption Spectroscopy<br>Results due April 9 | Exp. 25 – download PDF file from the Harris web site |
| April 5 | Gas Chromatography<br>Results due April 16 | supplemental |
| April 12 | HPLC<br>Results due April 23 | Exp. 31 – download PDF file from the Harris web site |