

Chemistry 332W  
Analytical Chemistry  
Dr. Jeremy Ramsey  
Fall 2007

### Course Description

The material presented in this course covers the basic principles of analytical chemistry, including calibration methods, measurement statistics, equilibrium, acid-base chemistry, and buffer systems. Additionally, the course will cover an introduction to the major areas of chemical analysis (spectroscopy, separations, and electrochemistry).

This course will likely be different from the other courses that you will take in the Lycoming Chemistry department (or at Lycoming for that matter). The material lends itself nicely to a more active method of learning. By active, I mean that you will be doing instead of watching. We will spend significant amounts of time working problems and discussing the material as opposed to the traditional lecture format.

Chemistry 332 is also a writing intensive course and will count toward your writing across the curriculum requirements. The assignments will include a minimum of 10 pages of formal writing (formal research manuscript, instructions) and 15 pages of informal writing (notebook entries, laboratory reports).

### Philosophy of Instruction

Ultimately, the purpose of this course is for you to learn the fundamentals of analytical chemistry and to be exposed to the foundations of modern instrumental analysis. In my opinion, grades are secondary to your understanding of the subject, and ideally, I am willing to present each of you with an A. In reality, some students will be more/less motivated or be more/less inclined toward the material. These differences will lead to differences in performance. My goal is to see each student achieve mastery of the subject and I am dedicated to reaching this goal. The motivation, however, must begin with you. Please take advantage of your opportunities that you have and we will both achieve the goals that we have for the semester.

### Prerequisites

- Chemistry 111 or permission of instructor
- Knowledge of chemical reaction stoichiometry and equilibrium (Quiz/Pretest on Friday 9/31).

### Meeting Times

Lecture	MWF	10:15-11:05 am	215 Heim
Laboratory	T	1:00-3:50 pm	207 Heim
	Th	2:00-4:50 pm	207 Heim

### Required Course Materials

- Quantitative Chemical Analysis, 7<sup>th</sup> edition, Daniel Harris
- Bound laboratory notebook
- Safety Glasses
- Calculator capable of performing logarithmic, exponential, and statistical functions. If you have a programmable TI, be sure to bring it along for the ride—it will get a lot of use.

Moodle

This course utilizes a content management system (fancy name for a website) called Moodle. You will be **expected** to check this website frequently for announcements, course information, and scheduling. The web address for the site is

<http://moodle.lycoming.edu/moodle/course/view.php?id=64>

Grading

	<u>Points</u>
Examinations (4) and Quizzes	500
<i>Highest exam score</i>	125
<i>Second highest exam score</i>	115
<i>Third highest exam score</i>	105
<i>Lowest exam score</i>	95
<i>Quizzes</i>	60
Laboratory	125
<i>Performance and Reports</i>	100
<i>Cleanup and Safety</i>	25
Writing Project	100
<i>Drafts</i>	12.5
<i>Reviews</i>	25
<i>Final Manuscript</i>	62.5
Participation	25
	750

- Percentage grades will be scaled to the number of points indicated above.
- The grading scale will be as follows. Adjustments to this scale are possible, but unlikely.

≥ 90%	A range (A/A- cutoff: 92%)
80-89%	B range (B+/B cutoff: 88%, B/B- cutoff: 82%)
70-79%	C range (C+/C cutoff: 78%, C/C- cutoff: 72%)
60-69%	D range (D+/D cutoff: 68%, D/D- cutoff: 62%)
< 60%	Fail

- You must achieve at least 60% of the points in each portion of this course (lecture, laboratory, and writing) to earn a passing grade in this course.
- There will be no makeup examinations or quizzes. One legitimate exam absence (for instance, an illness or a funeral) can be replaced by the average exam score for the semester.
- Makeup laboratory experiments will be difficult, if not impossible, and will only be permitted for legitimate reasons. Attendance in laboratory is expected especially since we will often be working in groups.
- Participation grades are based on attendance at Chemistry Colloquium. You will be required to attend a minimum of 5 colloquia (5 points each). If you have a college sanctioned activity that prevents you from attending, please see me to discuss an alternative.
- Cleanup/Safety grades will be awarded based on the cleanliness of the laboratory (and especially the balances) as well as your safe laboratory practices.

### Quizzes

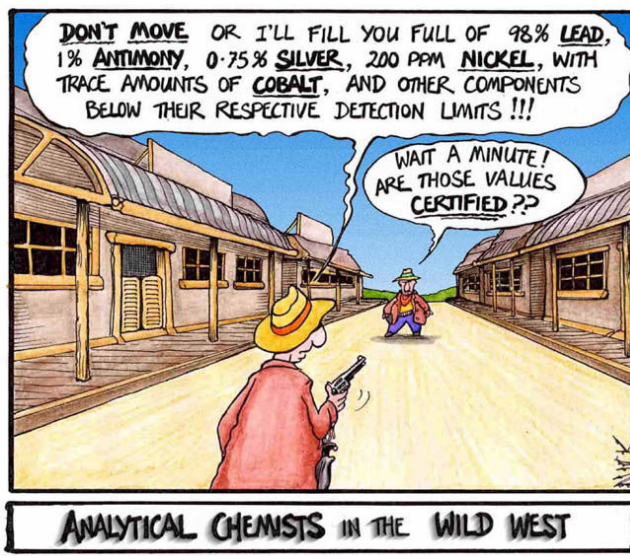
Although they will normally be announced, quizzes may be **unannounced** and can be given in either laboratory or lecture class periods. The purpose of these quizzes is to provide you with an opportunity to determine where your deficiencies may be and to provide a "gentle" reminder of how important it is to stay current with the progress of the course. As with the examinations, quizzes should be considered cumulative and may contain information from the laboratory or lecture portion of the course.

### Lab Reports

Lab reports are due one week (7 days) following completion of the experiment, unless otherwise informed by the instructor. Grades on late lab reports will be reduced by 10% plus 5% per calendar day beyond the due date. The format of the reports will be covered prior to the first, active laboratory period.

### Homework

In this course, homework assignments will not be collected, but it is strongly suggested that you attempt them. The selected homework problems provide an indication of the topics that I think are important. This makes solving them of utmost importance to your grade and your performance in the course will likely correlate with the amount of time spent solving problems. Answers can be checked with the solutions manual (a copy will be on reserve in the library). Because learning can be much more efficient through failure, I feel strongly that should be attempted individually before seeking help from others or checking the answer in the solutions manual. Please feel free to stop by my office to discuss any difficulties you may have with any of the suggested problems.



### Office Hours

I like a more open format for office hours. If you have questions, stop by when you have time. I do tend to be busy (especially as I teach General Chemistry during the same semester as this course) so you can always make an appointment. I really like to spend time with my students (and it can get lonely sitting alone in my office), so feel free to drop by anytime to chat. My door is (almost) always open.

### Examinations

Examinations will be given during laboratory sessions and will be administered on the following dates. Because the material presented later in the class builds upon concepts presented earlier, all exams should be considered cumulative. Changes to the exam schedule will be made only with unanimous consent of the class and must be made prior to September 8.

Examination 1	October 4
Examination 2	November 1
Examination 3	November 29
Final Examination	December 14

\*\* The final examination time and date is established by the registrar. It cannot be changed.

### Safety

Safe laboratory practices, including proper attire, will be expected at all times. Long pants are required as well as closed toe shoes (no sandals). Wearing contact lenses during laboratory session is strongly discouraged, but may be tolerated with prior approval. You will not be permitted to begin any experimental procedures until all safety concerns have been addressed. **Repeated safety violations will cause a zero to be awarded for the experiment.**

### Writing/Laboratory Project

I have completely revamped the writing projects for this semester in an effort to teach you more about the analytical process. In the process, there will actually be less writing for this semester than in semesters past. However, the writing that you do submit will be more heavily evaluated and directed toward the writing that you will have to do as a chemists/scientist. The assignment will involve choosing a laboratory experiment (from a list of pre-approved experiments), performing the experiment (with a partner), and reporting the results in a manuscript format (individually; *Analytical Chemistry* style). You will be given enough laboratory time to prove that the experiment does work and to analyze an unknown sample. The culmination will be a manuscript that describes the procedure used, the results achieved, and the errors observed. Success in this project will involve skills in both laboratory and writing techniques.

A draft of the manuscript components will be submitted (in parts) and will be reviewed by a fellow student and myself. This is meant to simulate the process used for the submittal of a manuscript to a professional journal. Using the reviewer comments, you will revise the individual components and combine them into a manuscript prior to submitting it for a final project grade. As always, I will be available to help you with any portion of this project. Likewise, the staff at the Academic Resource Center (ARC) is available to help you with your writing. You should seriously consider beginning the library research NOW!. Late assignments will be penalized 10% plus 5% from each day past the due date. The schedule of due dates is listed later in this syllabus.

Laboratory Topic Schedule

The laboratory schedule presented here is tentative and can (will!) change during the semester.

<b>Week Beginning</b>	<b>Laboratory Topic</b>
August 27	Check-in, Excel
September 3	Glassware Calibration, Statistics
September 10	Instrument Calibration, Gravimetric Analysis
September 17	Gravimetric Analysis
September 24	NaOH Standard
October 1	HCl Standardization, <b>Exam 1</b>
October 8	Diprotic Acid Titration, Vinegar Titration
October 15	Vinegar Titration
October 22	Spectrophotometry
October 29	Spectrophotometry, <b>Exam 2</b>
November 5	Lab Project
November 12	Lab Project
November 19	Thanksgiving Break
November 26	Lab Project, <b>Exam 3</b>
December 3	Lab Project, Check Out
December 10	Final Exam Week

**Laboratory Experiments for Fall 2007**

While Results and Sample Calculations will be due for each experiment completed, only portions of lab reports will normally be due.

Introduction to Microsoft Excel for Data Analysis: How much copper is in a penny?  
 Calibration of Volumetric Glassware and Instruments (Procedure)  
 Introduction to Statistics: How much zinc is used to coat a galvanized nail? (Introduction)  
 Introduction to Calibration: Measurements using a pH electrode and meter (Procedure)  
 Gravimetric Analysis for Determining Calcium Composition (Discussion)  
 Preparation and Standardization of a Sodium Hydroxide Solution (Introduction)  
 Preparation and Standardization of Hydrochloric Acid Solutions (Discussion)  
 Titration of a Diprotic Acid (Actually, a Triprotic Acid) (Full Report)  
 Titrimetric Determination of the Acetic Acid Content of Vinegars (Full Report)  
 Introduction to Ultraviolet/Visible Spectroscopy: Determination of the Concentration of Dyes in Kool Aid (Full Report)

**Approved Laboratory Projects for Chemistry 332W-- Fall 2007**

Gravimetric Titration Techniques  
 Back-Titration for the Analysis of Antacids  
 Determination of Aspirin in Pharmaceutical Tablets  
 Determination of Vitamin C in Fruit Juice  
 Olfactory Detection of Titration Endpoints  
 Determination of the Salt Content of Potato Chips  
 Determination of Zinc in Cold Lozenges  
 Determination of Calcium in Milk  
 Determination of the Copper Content of a Penny  
 Determination of the Caffeine Content of Soda

**Laboratory Project Assignment Schedule**

<b><u>Date</u></b>	<b><u>Assignment</u></b>
September 14	Project Selection Due
September 28	Procedure Draft Due
October 12	Introduction Draft Due
October 17	Procedure Review Due
October 26	Revised Procedure Due
December 7	Final Project Report Due