

CHM 321L Quantitative Analysis Lab

Instructor: Christopher M. Bender

Phone: 503-5755

e-mail: cbender@uscupstate.edu

Office: Smith 415

Web page: <http://faculty.uscupstate.edu/cbender>

Office hours: M 1:00-3:00, TTh 9:15-10:45, and by appointment

Lab time: Tuesdays from 1:40-5:00 in Smith 411

Text: Harris, Daniel; Quantitative Chemical Analysis, 7th ed., W.H. Freeman, New York, 2007

Course Description: One credit hour lab course designed to introduce the principles of wet chemical techniques (gravimetric and volumetric procedures) and basic instrumental analysis *via* experimentation. Co- or prerequisite: CHM 321. CHM 321L is a separate course and a separate credit than lecture. You may be enrolled in the lecture and lab concomitantly, or take just the lecture, but you cannot be in the lab if you are not in, or have not taken, CHM 321 lecture. If you are enrolled in the lab and drop the lecture midsemester, it is up to the discretion of the instructor as to whether you may stay enrolled in the lab.



Course Objectives: After completion of this course the successful student will be able to:

- properly handle and dispose of chemicals
- create standard solutions using analytical glassware
- record procedures, data, and observations in a laboratory notebook
- calibrate, use, and maintenance of analytical glassware and equipment
- understand procedures important to gravimetric, volumetric, and spectrophotometric analyses
- demonstrate quantitative transfers
- perform calculations essential to elemental analysis
- collect data and organize into report form utilizing a computer spreadsheet

Attendance: Weekly attendance in lab is expected of the student. It is vitally important that you do not fall behind in lab since it is difficult to catch up later.

Grades: Points will be distributed as follows:

Unknowns	50%
Final Exam	20%
Notebook, spreadsheets, and outlines/prelab exercises	30%

The grading scale is as follows:

A	90-100
B+/B	87-89/80-86
C+/C	77-79/70-76
D+/D	67-69/60-66
F	59

Students who admit responsibility or who are found responsible through the Student Code of Conduct will receive the appropriate grade determined by the professor, which may include an X to signify academic dishonesty. Grades with an X are not subject to grade forgiveness.

Preparation before class: Since the allotted time for this class is only three hours a week, it is imperative that you be ready to start lab the moment you walk in the room. Before coming to lab, become thoroughly familiar with the experiments to be performed. **For each new experiment, complete a Prelab exercise which will consist of an outline of steps for completion of the lab and answering prelab questions.**

Reports: Reports are due a week after the lab has been finished. In general, the report will include pertinent chemical reactions for the experiment, the raw data for the experiment, the average and standard deviation of your trials, and a statistical basis for the discarding of any outlying data. To address the concerns of having computer literate chemistry majors, calculations will be performed on spreadsheets.

Safety: Know the location of safety showers, fire extinguishers, eye washes, and first aid supplies. You are required to wear eye protection with the OSHA Z-87 designation at all times in lab, whether you are doing lab work or not. Lab aprons or lab coats will be provided in room 411 and you will be expected to wear them. These items are not optional. Neither food nor smoking are permitted in the laboratory. Open-toed shoes (e.g., sandals) are not permitted in the laboratory. If you arrive with inadequate foot protection, you will not be allowed to do laboratory work. If you have not been enrolled at USC-Upstate in the past, please ask for and review a copy of the general chemistry safety lab handout and the safety video, *Safety in the Laboratory*.

In the past, students have been allowed access to the laboratory after-hours in order to wash glassware, weigh samples, calibrate volumetric glassware, etc. If this plan is adopted, **you must have a partner** with you at all times. That is, you may not work in lab alone. The lab will be unavailable for "after-hours" work if another class is using the room.

Notebooks: You are expected to record procedures, data, and observations in a laboratory notebook. These are available in the bookstore and must have the following characteristics: (a) they must be bound (loose-leaf and spiral-bound notebooks are not permitted), (b) they should have consecutive numbered pages, and (c) they should have the ability to make carbon copies. Use blue or black ink when recording in a notebook... **DO NOT RECORD DATA ON SCRATCH PAPER AND TRANSFER IT LATER.** At times throughout the course, you may be required to use a computer spreadsheet to manipulate data during the lab period. Copies of the printouts should be taped or pasted into the lab notebooks, both on the original and carbon copy pages.

Integrity: It is expected that you will do all of your own experimental work, this includes, but is not limited to, stirring solutions, weighing crucibles, drying unknowns, etc. You should not borrow equipment/glassware from other students, nor open their drawers since contamination is possible and that could directly affect the results of an unknown.

Important University-wide Dates:

January 11 (Monday)—Classes Start

January 18 (Monday)—Martin Luther King, Jr. Day (no classes)

March 8-12 (Monday-Friday)—Spring Break (no classes)

March 29 (Monday)—Last day to withdraw from class without academic penalty

April 26 (Monday)—Last day of classes (classes ARE held)

Final Exam: April 20 (Tuesday)—this is the LAST lab period, not during exam week

The Final Exam is cumulative.

Students with disabilities: In keeping with University policy, any student with a disability who requests academic accommodations should contact Disability Services at 503-5199 to arrange a confidential appointment with the Disability Services Coordinator. Students are encouraged to seek an appointment as early in the semester as possible, as accommodations are not provided retroactively. Letters of accommodation must be signed and printed on letterhead from the Disability Services office. It is the student's responsibility to provide these letters to professors in a timely manner so that accommodations may be put in place.

Students with disabilities should notify me of special needs during the first day of class.

Disclaimer: This is a tentative syllabus and the instructor reserves the right to make adjustments as necessary.

Tentative list of experiments

Depending on the date of the lab tour and availability of some lab equipment, experiment order may be modified near the end of the term.

Date (Tuesdays)	Lab Experiment
January 12	Check-in, safety, solubility checks, weighing exercises
January 19	Gravimetric determination of chloride in a soluble salt (week 1)
January 26	Gravimetric determination of chloride in a soluble salt (week 2)
February 2	Acid/base neutralization (KHP standardization) (week 1)
February 9	Acid/base neutralization (KHP analysis) (week 2)
February 16	Analysis of vinegar
February 23	Complexometric titration of Mg with EDTA
March 2	Spectrophotometric titration of permanganate
March 9	<i>Spring Break</i>
March 16	Analysis of a pH titration curve with a pH meter
March 23	Spectrophotometric determination of trace Fe (Solution prep) (week 1)
<i>Last Day to Withdraw is Monday March 29</i>	
March 30	Spectrophotometric determination of trace Fe (Solution analysis)(week 2)
April 6	Analytical chemistry lab tour
April 13	Carbonate analysis
April 20	Final Exam, check-out