

Syllabus for Chem 215, Quantitative Analysis Fall Semester 2008

Quantitative Analysis, 4 credit hours; Prerequisite: Chem 106 or 102 and 112 and Chem 222 or Chem 224 and Chem 226 or permission of the instructor.

Instructor: Dr. Paul Chiarelli, Flanner Hall 102, phone 508-3106, E-mail: mchiare@luc.edu. Office hours Tuesday 1-2:30 PM and Wednesday/Friday 9:30-11 AM, or by appointment.

Books: 1) "Exploring Chemical Analysis" (4th edition), by Daniel C. Harris, ISBN 1-4292-1004-4

2) One **bound** laboratory notebook, such as a National-brand composition book sold in Barnes and Noble or Beck's bookstore.

Other Materials: You will need an inexpensive calculator having logarithmic (base 10 and base e), exponential, and trigonometric functions. Be sure you are familiar with your calculator and that it is in user-ready condition for quizzes and exams. **Calculators cannot be shared during exams and the covers must be removed while taking the exam.**

Objectives: 1) To acquaint the student with some of the fundamental techniques and state-of-the-art applications of quantitative analysis.

2) To teach laboratory techniques, particularly efficiency in planning and execution of experiments.

3) Critical evaluation of experimental results.

Class Procedures: The class will meet on Mondays, Wednesdays, and Fridays from 11:30 AM to 12:20 PM in Damen 733. The majority of the three MWF periods will be devoted to lecture, and a few classes will be devoted to discussion, i.e., going over homework and problem solving, and quizzes, most of the time the discussion periods will be prior to exams and quizzes. Class attendance is highly recommended and making up a laboratory period may be very difficult. The lab will be conducted in FH 313, Monday and Wednesday from 2:45 PM to 5:30 PM. Lab on Tuesday and Thursdays is from 2:30 to 5:15 PM in FH 313.

Grading: The total grade for the course will be 60% class and 40% Lab. Four 1-hour exams will be given over the course of the semester. Your 3 highest scores will be counted toward your final grade. The lowest exam score will be dropped. If you have to miss an exam due to illness or some other reason, this will be your dropped grade. If you miss a second exam, then must have a valid excuse (doctor's note) to have make-up arranged. There will be nine lab assignments; the percent grade for each is given below. You will be graded on your notebook as well

at the end of the semester this is worth a total of 3%. You need to be careful to record a complete and legible notebook. Academic dishonesty of any sort will not be tolerated. Students caught cheating on an exam or lab will receive an F grade for that assignment.

Grading: Class 60%

4 exams (13% each) – Drop Lowest
1 final (21%)

Lab 40%

Labs 1 - 7, 28% total (4.0% - each)
Labs 8 -10, 9% total (3.0% - each)
1 notebook – 3% total

Scale: A 100-93; A- 92-89; B+ 88-85; B 84-81; B- 80-77; C+ 76-73; C 72-69; C- 68-65; D 64-57; F <56.

Homework: Students are expected to do the assigned problems in the back of the chapters in the textbook and study the class notes. If you are good about this, you will do well on the exams.

TENTATIVE CLASS SCHEDULE

Date	Day	Topic	Chapter
Aug 25	Monday	Introduction	3
Aug 27	Wednesday	Stoichiometry Review	3
Aug 29	Friday	Error and Statistics	4
Sept 1	Monday	Labor Day; No class	
Sept 3	Wednesday	Sampling	4
Sept 5	Friday	Statistics	4
Sept 8	Monday	Stat. Analysis of Data	4
Sept 10	Wednesday	Stat. Analysis of Data	4
Sept 12	Friday	Exam 1 Statistics	3-4
Sept 15	Monday	Acids and Bases	8

Date	Day	Topic	Chapter
Sept 17	Wednesday	Acids and Bases	8
Sept 19	Friday	Acid and Bases	8
Sept 22	Monday	Buffers	9
Sept 24	Wednesday	Buffers	9
Sept 26	Friday	Titrations	10
Sept 29	Monday	Polyprotic acids	10,11
Oct 1	Wednesday	Polyprotic acids	11
Oct 3	Friday	Exam 2	8-11
Oct 6	Monday	Midterm break; no class	
Oct 8	Wednesday	Complex Equilibrium	12
Oct 10	Friday	Complex Equilibrium	12
Oct 13	Monday	Complex Equilibrium and EDTA	12,13
Oct 15	Wednesday	EDTA and Chelation	13
Oct 17	Friday	EDTA and Chelation	13
Oct 20	Monday	Test 3; Ch 12-13	
Oct 22	Wednesday	Electrochemistry	14
Oct 24	Friday	Electrochemistry; Cell Potentials	14
Oct 27	Monday	Electrochemistry; Ref Electrodes	14
Oct 29	Wednesday	Spectrophotometry	18,19
Oct 31	Friday	Electrode Measurements	15
Nov 3	Monday	Electrode Measurements	15
Nov 5	Wednesday	Electrode Measurements	15

Date	Day	Topic	Chapter
Nov 7	Friday	Test 4: Ch 14,15	
Nov 10	Monday	The electromagnetic spectrum	18
Nov 12	Wednesday	Absorption spectrometry	18,19
Nov 14	Friday	IR and X-ray spec	19
Nov 17	Monday	Luminescence	19
Nov 19	Wednesday	Immunoassays	19
Nov 21	Friday	Chromatography	22
Nov 24	Monday	Chromatography	22
Nov 26-28	Wednesday – Friday	Thanksgiving Break	
Dec 1	Monday	Mass Spectrometry	23
Dec 3	Wednesday	GC/MS	23
Dec 5	Friday	LC/MS	
Dec 8	Monday	Final Exam 1:00 – 3:00 PM	Damen 733

Laboratory Assignments

1. Preparation of Standard Acid and Base
 - A. HCl/NaOH preparation-Determination of Acid/Base Ratio
 - B. NaOH standardization against KHP (monopotassium phthalate)
 - C. Determination of Na_2CO_3 unknown
2. Determination of Oxalate
 - A. Preparation of KMnO_4 standard solution
 - B. Standardization of KMnO_4 solution
 - C. Determination of Oxalate unknown
3. Colormetric Determination of Iron
4. Determination of Calcium and Magnesium by EDTA titration

5. Gravimetric Determination of Sulfate
6. Determination of Cl^- ion by AgNO_3 titration
7. Determination of Zn, Cu, and Pb in a Brass Alloy by Atomic Absorption Spectrometry.
8. Determination of Halomethanes in water by GC/MS.
9. Determination of polychlorobiphenyls (PCBs) in Nutritional Supplements by solid phase extraction and Gas Chromatography Mass Spectrometry (GC/MS).
10. Determination of Haloacetic Acids in Water by LC/MS/MS.

Notes concerning laboratory assignments: **We will be collecting and grading laboratory notebooks periodically. Please come to lab prepared. You should have a brief outline of your procedure for that period written in lab notebook prior to class and we have discussed in lecture.** Due to limitations with regard to space the order of experiments is not necessarily chronological, but it is close. When you first go to lab you will be issued a manual outlining the procedures associated with these lab assignments and you are to follow those instructions unless instructed otherwise by your TA. We will pass out procedures for individual lab assignments when the time arises. Your grades in lab will be based on the precision and accuracy with which you perform your determinations, so be very careful. In particular you should pay close attention to the proscribed uses of the buret and analytical balance. These two items are involved in almost every determination you perform so learning their proper use at the beginning of the semester is absolutely critical.

The majority of students require two lab periods a week to finish all the assignments for the semester. You will be assigned priority use of an analytical balance two periods a week (corresponding to the section of lab for which you registered). You may work on other days as you see fit. However, you must allow those people who are assigned priority use of an analytical balance during a given time to use it first.