

## Syllabus for Chem 214, Quantitative Analysis Laboratory Fall Semester 2009

Quantitative Analysis Laboratory, 1 credit hour; 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](mailto: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 to do routine mole-mass and volumetric calculations associated with this lab.

Objectives: 1) To acquaint students with some of the classical and modern techniques in analytical chemistry.

2) To teach wet chemical lab skills, efficiency, and planning of experiments.

3) Teach critical evaluation of experimental results.

Laboratory Procedures: Each section meets twice a week. 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. The instructor will explain the procedures and goals for each assignment prior to its execution. You will be given handouts that are pertinent to each lab assignment beforehand. The instructor will explain during the first lab period of the semester how the notebook is to be written. In most cases, you will be assigned a standard unknown sample whose composition is known to at least to four significant figures. You will determine the composition of your unknown sample and be graded on how accurately your determinations reflect its true composition. For each assignment, you will report the values of your individual determinations, the mean concentration or percent composition values, and the standard deviation associated with the overall determination. There are no lab reports to write, but you will have to develop your lab skills in order to get a good grade. If you wish to repeat a lab in order to get a better grade, you will need to analyze a new unknown sample.

Grading: The total grade for the course is based on nine lab assignments and your notebook. Labs 1-5 are worth 60% of your grade (12% each). Labs 6-9 are worth 36% of your grade (9% each). The notebook is worth 4% of your grade. Note that it is not set in stone but may be curved somewhat over the course of the semester.

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.

### **Laboratory Assignments (in chronological order)**

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  $\text{Na}_2\text{CO}_3$  unknown
2. Determination of Oxalate
  - A. Preparation of  $\text{KMnO}_4$  standard solution
  - B. Standardization of  $\text{KMnO}_4$  solution
  - C. Determination of Oxalate unknown
3. Colorimetric Determination of Iron
4. Determination of Calcium and Magnesium by EDTA titration
5. Gravimetric Determination of Sulfate
6. Determination of Zn, Cu, and Pb in a Brass Alloy by Atomic Absorption Spectrometry.
7. Determination of Halomethanes in water by GC/MS.
8. Determination of Resveratrol in Nutritional supplements by Isotope dilution and GC/MS.
9. 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 as discussed in an earlier lab period.** 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. 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 volumetric devices 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.