

UNIVERSITY OF DETROIT MERCY
Department of Chemistry and Biochemistry
CHEMISTRY 387 - 01: Quantitative Analysis
Term II, Winter 2005

Instructor: Dr. Katherine Lanigan **Office:** C215c
Phone: (313) 993-1569 **e-mail:** lanigakc@udmercy.edu
Office Hours: Mon. and Wed. 11:00 – 1:30 p.m. or by appointment
Lecture: 10:00 – 10:50 a.m. M, W, F - Rm. C209
Problem session: 5:00 – 6:00 p.m. Thursdays - location TBA
Text: Harris, D. *Quantitative Chemical Analysis*, 6th Ed.; W.H. Freeman: New York, 2003.

Prerequisites: CHM 108: General Chemistry II and CHM 111: Chemistry Lab II

Course Description:

Analytical applications of statistical evaluation, complex acid-base titrations, multi-step equilibria, electrochemistry, spectrophotometry, and modern chemical separation techniques.

Course Objectives:

The course objective is to provide students with an understanding of the chemistry, mathematics, and instrumentation involved in analytical methods. The application of these principles to related disciplines, such as environmental studies, biology, and medicine, manufacturing, and quality control, will be examined. In addition, students will learn to critically examine data and improve problem-solving skills. These objectives will be met via classroom lectures and discussions, handouts, quizzes, exams, homework problems, and an oral presentation.

Quizzes: There will be 9 weekly quizzes worth 10 points each. The lowest 3 quiz grades will be dropped. If you need to miss a quiz, that quiz will count as a drop. You will be given 5 - 10 minutes (depending on the material) at the beginning of class to take the quiz. No copies of quizzes will be handed out to students who miss them. See calendar below for dates and times.

Exams: There will be 3 exams worth 100 points each. You will be given 50 minutes to take the exam. You will be allowed to use a non-graphics calculator and one 3" x 5" index card, on which to write formulas, etc. Use of more than one card will result in a zero for the exam. If you miss one exam, you will not be given a make-up, but your final exam grade will be counted as the missed exam plus the final. If you miss a second exam, no make up of the points will be offered to you.

Oral Presentation: You will present, using PowerPoint®, a journal article written on a Quantitative Analysis experiment. The presentations will be done at the end of the semester. Dates will be assigned after midterm. More details will be given below.

Final Examination: The final exam is scheduled for **Monday, April 25th** from 11:00 a.m. to 12:50 p.m. You will be allowed to use a calculator and three 3" x 5" index cards, on which to write formulas, etc. No make-up finals will be allowed. It will be comprehensive.

Grading:	9 Quizzes (10 points each – drop 3):	60
	3 Exams (100 points each):	300
	Presentation:	25
	Final Exam:	<u>150</u>
		535 points total

Grading Scale based on percentages:

A 100 - 92.5	B+ 89.9 - 87.5	C+ 79.9 - 77.5	D+ 69.9 - 67.5
A- 92.4 - 90.0	B 87.4 - 82.5	C 77.4 - 72.5	D 67.4 - 60.0
	B- 82.4 - 80.0	C- 72.4 - 70.0	F 59.9 -

Homework and Attendance Policy:

Homework will not be graded and attendance will not be taken. It is in your best interest to attend every class, and to do the homework sets. Handouts and notes will not be available later.

Recommended Study Habits

- 1) **Utilize the textbook.** At the end of each chapter, there are "Terms to Understand," a Summary, Exercises, and Problems of which you are responsible for. The Exercises have complete step-by-step solutions at the end of the book; therefore, you should work all of these before working the assigned homework Problems.
- 2) **Keep up with the class.** The class will move quickly, nearly a chapter per lecture. Some sections may be assigned that will not be covered in the lecture. Be prepared. Looking at the chapter ahead of time will help you during class.
- 3) **Work in a study group.** Work with classmates, but be sure to understand all of the material yourself.
- 4) **Come see me with questions. Attend problem sessions.**

Important University Dates

Jan. 17	Monday	Martin Luther King, Jr. Holiday (No Classes/Offices Closed)
Feb. 4	Friday	Last day to withdraw without a "W"
Mar. 7-12	M - F	Mid-Winter/Spring Break (No Classes/Offices Open)
Mar. 25	Friday	Easter Recess (No Classes/University Closed)
Apr. 1	Friday	Last day to WITHDRAW from class
Apr. 25-30	M – F	Final Exam Week

Class Cancellation Policy:

If the class is canceled due to weather or instructor's absence, anything planned for that class (test, etc.) will occur during the next class session.

Academic Integrity:

Students are expected to conform to a high standard of honesty and integrity in this course. Refer to the University Catalog (p. 285) and Student Handbook for further explanation. Everything submitted for grading (quizzes, exams, and presentation) is expected to be a student's own work.

Tentative Course Outline

<u>Chapter</u>	<u>Topic</u>
0	The Analytical Process
1	Measurement
3	Experimental Error
4	Statistics and Spreadsheets
5	Calibration Methods
6	Chemical Equilibrium
7	Let the Titrations Begin
8	Activity
19	Fundamentals of Spectrophotometry
20	Applications of Spectrophotometry
9	Systematic Treatment of Equilibrium
10	Monoprotic Acid-Base Equilibria
11	Polyprotic Acid-Base Equilibria
23	Introduction to Analytical Separations
24	Gas Chromatography
14	Fundamentals of Electrochemistry
15	Electrodes and Potentiometry
12	Acid-Base Titrations
13	EDTA Titrations
16	Redox Titrations

Quiz and Exam Calendar

Jan. 14	Quiz 1	Friday 10:00 – 10:10 am
Jan. 21	Quiz 2	Friday 10:00 – 10:10 am
Jan. 28	Quiz 3	Friday 10:00 – 10:10 am
Feb. 4	Exam 1	Friday 10:00 – 10:50 am
Feb. 11	Quiz 4	Friday 10:00 – 10:10 am
Feb. 18	Quiz 5	Friday 10:00 – 10:10 am
Feb. 25	Quiz 6	Friday 10:00 – 10:10 am
Mar. 4	Exam 2	Friday 10:00 – 10:50 am
Mar. 11	no quiz	Spring Break
Mar. 18	Quiz 7	Friday 10:00 – 10:10 am
Mar. 25	no quiz	Easter Break
Apr. 1	Quiz 8	Friday 10:00 – 10:10 am
Apr. 8	Quiz 9	Friday 10:00 – 10:10 am
Apr. 15	Exam 3	Friday 10:00 – 10:50 am
Apr. 22	no quiz	dead week
Apr. 25	Final Exam	Monday 11:00 a.m. to 12:50 p.m.

The presentation

You will present, using PowerPoint®, a journal article written on a Quantitative Analysis experiment. You

will be allowed no more than 15 minutes. Dr. Lanigan must approve the article. Each student's article is to be different from any other student's. The presentations will be given during the last two weeks of class. The schedule will be given after the midterm

The Journal of Chemical Education is a good place to begin looking, however articles from other journals (Analytical Chemistry) may be used, based on approval. Your article should entail the use of an instrument or an analytical method for quantitative analysis. Example topics: Quantitative Analysis using GC/MS, LC/MS, UV-vis, AA, titration, gravimetric analysis, etc. (See your text for acronym definition).

Outline of Presentation:

- I. Concept
- II. Basic Principles of Method or Instrument
- III. Experimental Procedures (Chemicals, Instrumentation, Sample preparation)
- IV. Results
 - Description of Figures
 - Discussion of Results
- IV. References in proper ACS style – see ACS Style Guide available in library or online

Extra Credit Opportunities

- 1) **Bonus Board Points** – 1 point each time - student goes to board at problem session and presents the solution to the class.
- 2) **Environmental Sustainability Presentation** – 5 points maximum
Research and present a general description of an environmental study, which has tested and quantified pollution (atmospheric, water, or soil) at an interesting location such as local, national, or international parks. Other locations are welcome. All topics require instructor approval.

You may use the Internet, but in order to provide enough information you will likely need to reference at least one published article. However, if you can't find the work published but can show me a substantial amount of material from a different type of source, I will accept it.

Overhead transparencies can be provided. The general outline should be as follows.

- I. Who was doing the work?
- II. What was being tested for?
- III. What types of quantitative methods were used?
- IV. What were the results?
- V. Reference (correct format – see ACS Style Guide in the front office)