

## Analytical Chemistry –CHEM 255

### Spring Semester 2009

Tues. 9:35-11:00/Thurs. 9:30-10:50 – RNS 310

Instructor: Dr. Douglas Beussman

Office: RNS 436 - Phone: 786-3429

Email: [beussmad@stolaf.edu](mailto:beussmad@stolaf.edu)

Office hours: M 2:00 –3:00, Th 1:30 –3:00 – RNS 436

**Objectives:** This course will introduce the fundamentals of analytical chemistry. Emphasis will be placed on chemical calculations as well as basic concepts of analytical chemistry. Analytical thinking and reasoning skills will also be developed in this course. Specific topics will include statistical treatment of data, chemical equilibrium, acid/base chemistry, spectroscopy, electrochemistry, and chemical separations. Concurrent registration in Chemistry 256 is required and will allow topics discussed in class to be further studied in the laboratory.

**Prerequisites:** CHEM 126, concurrent registration in CHEM 256

**Course web page:** The URL for CHEM 255 web page is:

<http://www.stolaf.edu/people/beussmad/Chem255/>

The web page will contain information about the course, a copy of the syllabus, class handouts, and announcements. Answer keys will be posted after 5:00 PM the evening the homework is due.

**Grading:** Grades will be assigned based on a straight scale from the results of eight problem sets (50 problems total), five group assignments, three regular exams, and one comprehensive final exam.

Exam 1	100 points
Exam 2	100 points
Exam 3	100 points
Problem Sets (8)	100 points total (50 problems @ 2 pts each)
Group Assignments	50 points total
Final Exam (cumulative)	<u>150 points</u>
TOTAL	600 points

#### Grades

>90%	A	(A+/A/A-)
>80%	B	(B+/B/B-)
>70%	C	(C+/C/C-)
>60%	D	(D+/D/D-)

**Problem Sets:** Eight problem sets will be given throughout the semester. Homework should be turned in during class, but will be accepted until 5:00 PM in RNS 436. Any homework turned in after 5:00 PM the day it is due will not be graded, unless previous arrangements have been made with the instructor. Students are allowed to work on the problems as a group, but each student must turn in their own work. Handing in photocopied or hand-copied answers constitutes academic dishonesty.

**Group Assignments:** There will be five group assignments over the course of the semester. These assignments may involve using computers to solve more complex problems than those dealt with in problem sets, literature reviews, short written assignments, or other projects related to Analytical Chemistry. One member of the group will be designated the Manager and will be responsible for turning in the final product, but all group members should participate in the assignment.

**Exams:** All exams will be closed book and closed notes. No make-up exams will be given unless prior arrangements have been made with the instructor (discussion of scheduled absence prior to exam, phone or email message if ill, etc.). Unless otherwise announced, calculators will be allowed, however, the use of programmable calculators to store information of any sort (definitions, equations, etc.) will constitute cheating. Calculators are subject to examination at any time. After graded exams are returned, students will have one week to turn exams in to be regraded. The reason for the regrade must be given in writing. Please place your name on each page of the exam in case the pages become separated.

**Textbook:** *Quantitative Chemical Analysis, Seventh Edition*  
Daniel C. Harris, W.H. Freeman  
New York, NY, 2003

Lecture Number	Date	Topic	Title	Reading	HW Due	Lab
1	2/10	Intro, Statistics	Precision, Accuracy, Significant Figures	3.1-3.5		
2	2/12	Statistics	Mean, Standard Deviation, Regression	4.1, 4.7-4.8		
3	2/17	Statistics	Confidence Intervals, Q-test	4.2-4.6		1-Basic Skills
4	2/19	Equilibrium	Equilibrium, Mass Balance, Charge Balance, Common Ion	6.1-6.4, 8.4-8.5	PS#1	
5	2/24	Equilibrium	Activities/Ionic Strength Considerations	8.1-8.2	GA #1	2-Glassware
6	2/26	Acid-Base	Strong and Weak Monoprotic Acids and Bases	6.5-6.7, 8.3,9.1-9.4	PS #2	
7	3/3	Acid-Base	Weak Diprotic Acids and Bases	10.1	PS #3	3-Oxalate 1
8	3/5	<i>EXAM</i>				
9	3/10	Acid-Base	Weak Polyprotic Acids and Bases	10.3-10.4		4-Oxalate 2
10	3/12	Acid-Base	Alpha Fractions	10.5-10.6	GA #2	
11	3/17	Acid-Base	Buffers	9.5, 10.2		5-Acid 1
12	3/19	Titrations	Titrations, Monoprotic Acid-Base Titrations	7.1-7.2, 7.4-7.5, 11.1-11.3	PS #4	
	3/24	<i>BREAK</i>				
	3/26	<i>BREAK</i>				
13	3/31	Titrations	Polyprotic Acid-Base Titrations	11.4-11.6		6-Acid 2
14	4/2	Spectroscopy	Introduction to Spectroscopy Concepts, Beer's Law	18.1-18.5, 5.3, 5.4	PS #5	
15	4/7	Spectroscopy	Survey Spectroscopic Methods-Absorbance, Fluorescence, Emission, Mixture Analysis	18.6, 19.1-19.2, 19.5		7-Mock Robot
16	4/9	<i>EXAM</i>				
17	4/14	Spectroscopy	Spectrometers	20.1-20.3		8- Easter Egg Grass
18	4/16	Spectroscopy	Atomic Absorption Spectroscopy	21.1-21.4	GA# 3	
19	4/21	Electrochemistry	Fundamentals, Nernst Equation	14.1-14.5	PS #6	9- Downsizing
20	4/23	Electrochemistry	Cell potentials, Electrodes	14.6, 15.1-15.6	GA #4	
21	4/28	Electrochemistry	Redox titrations	16.1-16.2, 16.7		10-Pill Machine
22	4/30	Separations	Mechanism of Chemical Separations	23.1-23.2	PS #7	
23	5/5	<i>EXAM</i>				11-HPLC
24	5/7	Separations	Resolution, Plate Height	23.3-23.5	GA #5	
25	5/12	Separations	Gas/Liquid Chromatography	24.1, 25.1	PS #8	
	5/15	<i>FINAL EXAM</i>				

Instructor reserves the right to make schedule changes throughout the semester as needed.