CHEM 242 ANALYSIS
SPRING 2018
Lecture 8 am MWF, Lab 2 pm R
FSC 371 FSC 317

Instructor

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Office Hours: 1-2 MTWRF or by appointment

I believe the information in this syllabus is accurate, but reserve the right to make corrections as needed.

Class Schedule

Lecture - Discussion	8:00 - 8:50 MWF	FSC 371
Lab	2:00 - 5:50 M	FSC 317

Text and Supplies

Quantitative Chemical Analysis, 9th ed. by Daniel C. Harris, 2016 (ISBN: 13: 978-1-4641-3538-5)

Explorations in Analysis Lab Manual, by Duane E. Weisshaar (2018). Available from Marlys, Division Secretary, for $20. You will need it by the first lab period.

Permanently bound lab notebook with duplicate pages (carbon or carbonless) (available in the Bookstore). Unused pages in a notebook from a previous course can be used in this course.

Safety Goggles with complete splash guard (available in the Bookstore).

Scientific Calculator with log and 10^x (antilog) functions - **Programmable (graphing and/or alphanumeric) calculators and cell phone calculators are NOT allowed on exams.**

Grading Criteria

POSSIBLE POINTS		**GRADING CUTOFFS**	
3 Exams	300		
8 Labs	400	A - A-	930 - 900 + A candidacy
3 Computer Exercises	100	B+ - B - B-	870 - 830 - 800 + B candidacy
Candidacy Exam	50	C+ - C - C-	770 - 680 - 650
Final Exam	150	D+ - D - D-	620 - 580 - 550
TOTAL	**1000**		
Late assignments penalized 20%		Borderlines will be assessed on a case by case basis.	
No assignments accepted after 5 pm on the last day of classes. Last day to drop or change to S/U is Friday, April 6.			

Catalog Description

This course covers fundamental and applied topics of modern and classical analytical methods. Lecture emphasizes statistical analysis of data, method development, equilibrium, electrochemistry, and chromatography. The laboratory experience includes a mix of wet chemical and instrumental methods with an emphasis on careful and precise quantitative work. Three hours of lecture and four hours of laboratory per week. CHEM 242 is the analytical foundation requirement for the American Chemical Society Chemistry and Biochemistry majors.

Nature of the Course

The text for this course is entitled *Quantitative Chemical Analysis* which implies one must **measure** "how much" and then decide what that measurement means. The course places a significant emphasis on developing both practical and theoretical skills in what are known as "wet" methods in chemistry - gravimetric and volumetric techniques - with some emphasis on instrumental methods.

Student Outcomes (based on the Departmental Assessment Plan):

- Demonstrate a fundamental understanding of chemical concepts and calculations covered in this class:
  - Equilibrium and redox chemistry, quantitative analysis.
  - Use and interpretation of basic statistics when reporting scientific data.
- Demonstrate critical thinking and problem solving skills using the tools of chemistry:
  - Solve problems related to class discussion.
  - Appropriate use of computer software for chemical applications, e.g. Excel, TK Solver.
  - Design and execute experiments including assessment of safety.

- Demonstrate the ability to write in a professional chemistry style, evidenced in:
  - Lab reports.
  - Research project proposal, report, and presentation.
- Demonstrate the ability to communicate orally in a professional chemistry style, evidenced in:
  - Group work in class and lab.
  - Research project presentation.
- Demonstrate an ability to assess experimental procedures, identifying risks and appropriate methods for safe execution, evidenced in Safety Reports.
- Demonstrate an ability to search the chemical literature, evidenced in the research project.

Inherent in the Student Learning Outcomes but not explicitly stated:
- Development of team skills through cooperatively working together in small groups.
- Development of an ability to follow oral and written directions (lab and lecture).
- Refinement of basic laboratory skills for attaining the highest accuracy and precision a technique will allow.
- Development and refinement of the fundamentals for maintaining a proper laboratory notebook.

Moodle
Syllabus, other handouts, any powerpoint presentations used in class, answer keys to exams, and other information files for this class will be posted on Moodle under Chem 242 Analysis. The gradebook will be updated after each exam so you can check that grades are recorded correctly and see how you stand. (See also Guide to Moodle Gradebook for Chem 242 on the course Moodle site). Moodle is also used for collection of electronic files when they are required. File names for any submitted files must include an assignment identifier and partners initials. All spreadsheets must be in Excel (.xls or .xlsx) format and other documents must be either .pdf or Word (.rtf, .doc or .docx). Use SaveAs or Export to generate these formats from other programs.

Course Policies
Attendance
Attendance is required for examinations and labs. For lecture, regular attendance is expected but not required. You are responsible for any announcements and material covered in class, whether you are present or not. If you are absent, it is up to you to find out what you missed. If you must miss a lab or exam, please notify the instructor as soon as possible, preferably before the absence. Lab is designed to let you work at your own pace with enough leeway to accommodate an absence or two, but an absence increases *your* need for organization and planning ahead. **Attendance for the research project is essential**. If you have to miss one of those lab periods, please come see me *beforehand*; this will also require coordination with your group. If you participate in sports, make sure I have a schedule that includes projected travel times.

Late Work Policy
Late work will be accepted at any time before 5 pm on the last day of classes. Late work will be docked 20%. Late carbon pages from lab will be penalized 10% for each occurrence.

Communications with the Class
The instructor will use your Augie email addresses (@ole) for general communication with the class and with individuals; check your email daily. Email is sometimes erratic, so I will respond to every message you send. If you don't get a response in a day or two, send your message again. **DON'T SEND MESSAGES THAT CONSIST OF *ONLY* A LINK OR ATTACHMENT; provide a line or two of context to distinguish them from spam.** See the Help Desk (Madsen Basement) for details on accessing your email. If you use another email account, put a forwarder in your @ole account (contact the Help Desk for help in setting up a forwarder).

General Guideline for All Work Submitted
- **NO WORK, NO CREDIT!!!**
- One of the goals of this course is to develop an analytical thinking **process**. So, give **evidence** of your thinking process on all work:
  - **show calculations in logical steps** that someone else can easily follow.
  - **explain your reasoning** on **all** questions.
- Strive for explanations and thinking that relates the observable to the characteristics and behavior of atoms and molecules, i.e. relate the macroscopic to the microscopic.
- Show the labels (units) on all numbers.
- When expressing decimal numbers that are less than one, include a zero before the decimal point (0.315 cm, not .315 cm or 0.315 with no label)

- Don't round off until the last step.
- Express answers to the correct number of significant digits.
- Show charges on all ions.

University Policies

Accessibility

Augustana welcomes students with disabilities to participate in all of its courses, programs, services, and activities. If you have a documented disability and are requesting accommodations, please contact Susan Bies, Director of Accessibility and Academic Support. Her office is located in the Student Success Center (Edith Mortenson Center, Suite 100) and she may be reached at 605-274-5503 or susan.bies@augie.edu.

Chemistry, by its very nature, involves handling of potentially hazardous substances. The labs in this course will teach you how to handle these substances properly while minimizing the range of exposure. However, exposure effects vary from person to person. So, if you have asthma, allergies, are pregnant, or have other special circumstances, please inform your lab instructor so we can plan appropriate accommodations for your safety.

Honor Code

As a community of scholars, the students and faculty at Augustana University commit to the highest standards of excellence by mutually embracing an Honor Code. The Honor Code requires that examinations and selected assignments contain the following pledge statement which students are expected to sign:

> "On my honor, I pledge that I have upheld the Honor Code, and that the work I have done on this assignment has been honest, and that the work of others in this class has, to the best of my knowledge, been honest as well."

Faculty members are responsible for investigating all instances involving any student who does not sign the Honor Pledge or who bring forward an academic integrity concern. The complete Honor Code can be found at www.augie.edu/honor.

What does this mean in this course?

- You do your own work on individual assignments (not copying others). On group assignments you contribute to the group effort and strive to understand all parts of the project, not just the part you do.
- In lab you are "true" to your data - your report reflects what *you* measured and observed; data is not changed or manufactured to fit expectations. If you missed collecting some data, see the instructor; don't copy someone else's data.
- Give credit where credit is due. When you gather data from the Web, books, magazines, etc. cite the reference (author, title, etc.).

I presume we are in this class to help each other learn some chemistry (yes, instructors learn in this class too), so I trust you to turn in work that reflects your efforts and also, that as individuals and in your small groups, to help each other adhere to the **Honor Code**. The above statement will be appended to each exam and *you should add it to each assignment* (Word file on Moodle):

If you cannot, in good conscience, sign this pledge or if you have other concerns about academic integrity in this course, please come visit with me (in confidence of course) or send me an e-mail note. At a minimum, students caught violating this code will receive a zero (0) on the assignment or exam and the incident will be reported to the Academic Dean in accordance with the **Honor Code** procedures.

Commitment to Diversity

Augustana University is committed to creating and fostering a learning and working environment based on open communication and mutual respect. This is an integral part of the academic mission to enrich our students' educational experiences and prepare them to live in and contribute to a global society. If you encounter sexual harassment, sexual misconduct, sexual assault, or discrimination please contact the Title IX Coordinator at 605-274-4044 or belam@augie.edu. If you make a report of this nature to a faculty member, they must notify the Title IX Coordinator about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information about options at Augustana, please visit www.augie.edu/titleix.

Resources Beyond the Textbook

Department Safety Resources: The first lab will introduce you to some safety resources in the Department and on the Web available through links on Dr. Mays home page (http://faculty.augie.edu/~jmays/index.html under Departmental).

Class Website: (http://faculty.augie.edu/~dew/) provides the syllabus, a variety of course materials, exams from past semesters, and selected links to other sites with material related to this course. Other materials will be posted on Moodle including answers to recommended problems and Powerpoint files used in lecture.

Publisher's Website: http://www.macmillanlearning.com/Catalog/studentresources/qca9e devoted to this text where you can download a variety of resources. You may need to register online to get access to the site, but registration is free.

Chem 242 Study Guide accessible on Moodle and the class website outlines each chapter to be covered, highlighting the important material and concepts to help you focus your study time.

Computer Programs
Spreadsheets will be used extensively in this course for calculations and graphing. You may use any computer or program available to you to do the graphing and calculations, however,

- make sure you know what values are being calculated - function names can be deceptive.
- make sure the electronic files you send to the instructor are compatible with Excel.

TK Solver resides only on the Department's virtual machines. An introduction to TK solver is given as Appendix 2 in the lab manual. Appendix 10 in the lab manual is the guide for accessing the virtual machines.

Course Activities Details
Examinations
There will be **3 hour exams** (100 points each) consisting of multiple choice questions on "non-calculation topics of practical consideration" and problems. If you have to miss an exam, please notify the instructor as soon as possible, preferably before the absence. If you have an acceptable excuse for **missing an exam** and the exam cannot be rescheduled conveniently before the exam is returned to the class, more weight will be placed on your final exam to cover the missed exam. **No phones or programmable (graphing or alphanumeric) calculators are allowed during exams.**

Exams offer a periodic opportunity for you to demonstrate your understanding of the material. Consistent with the nature of chemistry, each exam will be somewhat comprehensive, with material taken from what has been covered to date, as well as lab and safety material. A **Study Guide** for each chapter is provided on Moodle and the class website. The table at the end of the **Study Guide** lists equations and constants that will be supplied on all exams. Before each hour exam, we will review the outline of the chapters to be covered on the exam so you can plan and focus your study time. In addition, examples of past exams are available on the class web site. NOTE: The multiple choice questions are not in all past exams.

Final Exam
The **final exam** (150 pts) is one last opportunity for you to demonstrate that you have mastered the material presented in this class. The ACS Analytical Chemistry Exam (standardized exam) will be given during the final exam period. The exam has a multiple choice format, a 110 minute time limit, and 50 questions. Points for the ACS Exams are scaled to the national norms.

As an added incentive, if you score a higher percentage on the final than on your lowest exam, or if you missed an exam, then the final exam percentage will also replace that exam score.

Homework
Working problems, not just watching someone else do it, is essential for learning chemistry, so problem solving should be a regular and significant part of your study time for this course. To help you focus on appropriate problems, a set of recommended problems for each chapter is included in the Study Guide. These problem "assignments" are for your benefit and will **NOT be collected or graded**. Some of the problems will relate directly to the lab and some of the problems on each hour exam will be based on assigned problems. The worked out solutions for the problem sets will be posted on Moodle. Take good advantage of these opportunities to **think chemistry**.

Computer Exercises:
There will be **3 computer exercises** (33 pt each) to introduce you to the use of computers in analytical chemistry and to further develop your critical thinking skills. You may work in small groups (up to 3) on these exercises. The exercises are posted on Moodle and the due dates are listed with the lecture and lab schedule on the last page of the syllabus.

Lab Safety
Safety is a primary concern in the laboratory; we must work together to ensure a safe working environment in the lab. Start by reading pages 5-15 in the lab manual and pay particular attention to the sections on EMERGENCY PROCEDURES, LABORATORY SAFETY, and STANDARD PROCEDURES AND HELPFUL HINTS. Abide by these guidelines and safety rules while you are in the laboratory. During the check-in laboratory, we will spend time on general lab safety and the safety equipment in the lab will be pointed out.

Safety must also be intentional so we will ask each of you to signify your willingness to join your instructor, assistants, and fellow students in following these rules and developing safe habits in the lab. You will be asked to sign this statement and abide by that commitment.

I have read and understand the LABORATORY SAFETY AND PRECAUTIONS and the EMERGENCY PROCEDURES sections of the Chem 242 lab manual. They have also been discussed in lab and/or lecture. I agree to abide by them and to work cooperatively with my instructor, assistants, and fellow students to ensure this lab is a safe place to work and learn.
Name _____ Date _____

Lab

There are 6 labs worth 50 points each and a Research Project worth 100 pts. On the 6 labs the points are distributed between notebook, calculations, accuracy, and precision; point distributions are specified for each lab in the lab schedule on the last page of this syllabus. Calculation points will be assigned according to the following formula:

Correct on 1st attempt	full credit
Correct on 2nd attempt	2/3 credit
Correct on 3rd attempt	1/3 credit
Not correct after 3rd try	no credit
Recalculations are due one week after the lab is returned.	

Criteria for precision and accuracy will vary for each experiment and will be based on the precision and accuracy obtainable by that method and also on this class's and past class's distributions. Grading schemes from past semesters are accessible on the course website (http://faculty.augie.edu/~dew/ under 242 Course Materials and on Moodle). Precision and accuracy points will be determined from the **CORRECTLY CALCULATED RESULTS**. You will be issued plenty of unknown for each experiment. More unknown may be issued at a penalty of 10% on the lab grade.

On the 6 labs you will be allowed to work at your own rate; when you finish an experiment, move to the next one. Complete and submit the Safety and Reactions at least by the day before lab so there is time for me to review it and you to revise it if necessary. Plan ahead by starting solution prep and sample drying the week before so things are ready when you are. Remember you must have an approved Safety and Reactions Report before you can obtain standards and unknowns. As you plan, note that at times groups of labs are run in tandem to provide adequate access to equipment, and that some of these labs require a partner. If you plan to start an experiment ahead of schedule, let me know a day or two before lab so I can make sure everything is ready.

Carbon copies of notebook pages are to be turned in at the end of the period in which they are recorded (at least one page each period). Due dates for the Final Report for each lab are one week after the scheduled completion of that lab. If you have not completed the lab by the due date, consult with the instructor to adjust the due date, i.e., labs will not be due before you have completed it.

If you have completed all the scheduled labs and have time before the research project begins, you may repeat any lab with a **new** unknown to improve your **accuracy and precision** points on that lab (Safety & Reactions, notebook, and calculation points remain the same). The full report from the first attempt must be submitted with the calculations and Data Analysis & Stats report for the second attempt. The higher grade from your two attempts will be recorded.

Research Project

The last three lab periods will be devoted to a Research Project focusing on developing a method to determine thermodynamic properties of an equilibrium. Project details are described in the lab manual. Schedule details are on the next to last page of this syllabus.

Candidacy Exam

Grades are used for a variety of purposes, most of which extend well beyond Augustana. To facilitate these ends, students' grades should give some reflection of their abilities and mastery of the subject compared to similar students across the nation. In this course the Candidacy exam and the final exam - standardized exams prepared by the American Chemical Society (ACS) - are used to provide that context.

There are **TWO** criteria for attaining a grade in the A range or the B range in this course:

1. Attain the designated level of performance on the candidacy exam.
   AND
2. Achieve the corresponding cumulative percentage on exams and other assignments.

In other words, attaining candidacy (see criteria below) gives you a hunting license for (candidacy for) a grade in the A range or the B range, but does not guarantee that grade. **However, failure to attain candidacy at a particular level means that you cannot receive that grade no matter how well you do on exams and other assignments.**

The first opportunity for Candidacy is with an ACS standardized exam in General Chemistry (final for Chem 117 and 120) during the first month of the course.

- This provides a review of concepts covered in Intro to Chemistry, which will not be covered in class.
- The exam has 70-75 questions, depending on exam year, with a 110 min time limit.
- It may be taken at any time outside of lecture and lab.
- You may take this exam as many times as you want, but no more than once per day.
- The instructor is willing to help in your preparation for this exam by answering your questions about the concepts, but he will not discuss specific questions from the exam. Also consult *Preparing for Your ACS Examination in General Chemistry: The Official Guide* on reserve in Mikkelsen Library.
- The score required for candidacy at a particular level increases by week as shown in Table 1, so take it early. The raw score required varies with exam year. The percentile steps are approximate, corresponding with raw score steps of one per week.

Table 1. Designated Proficiency Levels for Candidacy				
Target Grade	1st Week	2nd Week	3rd Week	4th Week
	Pctile	Pctile	Pctile	Pctile
For B Candidacy	60	62	65	68
For A Candidacy	80	82	84	86

- As soon as you establish candidacy for the grade of your choice, you may stop taking the exam.
- Once you establish candidacy for an A, you must stop.
- Points for the Candidacy Exam are based on the highest percentile achieved and are determined by the following formulas where % = highest percentile scored and %min = minimum percentile for that attempt at the specified grade level:
  - If A candidate, Points = [90 + (% - %min)/2]/2
  - If B candidate, Points = [80 + (% - %min)/2]/2
- Points for scores less than B candidacy, points = (0.573 * percentile + 38.2)/2

The final exam may also be used to establish candidacy, but candidacy exam *points* are determined by your best performance on the General Chemistry exam. Candidacy targets for the final exam are shown in the table below.

ACS Final Exam Targets	
	Pctile
For B Candidacy	60
For A Candidacy	80

Course Philosophies

Teaching/Learning Philosophy:

LEARNING CANNOT OCCUR UNLESS YOU, THE STUDENT, ARE ACTIVELY INVOLVED IN THE LEARNING PROCESS!! Thus learning **is not a spectator sport**, it requires an active effort on the your part; reading, working problems, writing reports, etc. Much of learning is a "trial and error" process; we seldom get it right the first time, so learning also requires **PRACTICE**, **PATIENCE**, and **PERSISTENCE** (similar to participation in sports or music). The teacher **cannot make you learn**; the teacher is only a guide and a resource (a coach, if you will) to help you master the material and to sort the important from the trivial. You should not want or expect the professor to do it for you. *You should take charge of your education.*

What instructor expects of students:

- Read the chapters before they are discussed in class.
- Work problems everyday.
- Come to class with questions and ask them.
- Plan ahead - Safety reports, standards, unknowns before needed.
- Read the lab and get organized before you come.
- Think about what you are doing in lab - don't just blindly follow the recipe.
- Spend 6-8 hours per week **outside** of class efficiently studying (4 hour class * 2, rule of thumb).

What students can expect of Instructor:

- Will *not* lecture on everything.
- Will answer questions.
- Focus in class will be on the more difficult concepts, student questions, problem solving strategies.
- Brief presentation in lab first day highlighting safety issues and facilities.
- Will be available outside of class.

Tips

- This is a fast paced course - *START TODAY*.
- Form a study group.
- Make connections between what you see everyday and what you are doing in class.
- Do all the assigned problems - "practice makes perfect" - a few every day.
- Ask questions and persevere. The instructor wants you to succeed and will help if you just ask.

Cadidacy Exams

The rationale for having students establish candidacy for an A or a B using a standardized exam includes several aspects:

- Establishing candidacy encourages students to take an active role in mastering the material and gives them the freedom/responsibility for establishing the level of candidacy they wish to achieve.
- The process serves as a review of general chemistry concepts and problem solving strategies that we will build on in this course.
- National norms provide a yardstick for determining a consistent grading scale.
- True mastery of a concept implies an ability to apply it in new situations. Exams prepared by someone other than the instructor provide new contexts and formats to test this ability. Or as John W. Moore wrote in an editorial in *The Journal of Chemical Education* **1998**, *75(2)*, 135: *In a world in which change is the norm, only an educated student has been properly equipped to prosper. This means that students need to be able to identify and define problems, to solve them imaginatively, and to apply the chemistry they learn in a variety of contexts in other disciplines.*
- Students gain experience/practice in taking standardized, multiple-choice exams often used as a "hurdle" for many post-college endeavors (e.g. MCAT for medical school, OAT for optometry school, DAT for dental school, GRE for graduate schools, Nursing Boards, Bar Exam, CPA certification, etc.)

In addition, using a **standardized exam** as the final also provides:

- An assessment tool for the Chemistry Department as it evaluates its curriculum.
- A Comparison tool for you and the Chemistry Department to see how you and the class as a whole "stack up" against your peers across the nation.

Nature of Standardized Exams: Analytical Chemistry encompasses a wide range of topics, so wide that it is impossible to cover all of them in any detail in one semester. Each instructor of an Analytical Chemistry course will select a subset of the topics that match the background and career interests of the students and the instructor's personal biases of what is most important. Comparing students in such courses on a nationwide basis with a single exam becomes a daunting task. The ACS (and many other testing agencies) approach the task by designing an exam that covers the entire range of topics in the discipline. That means that virtually all students will encounter questions over material they *have not* seen in class, but also they will surely encounter some questions over the material they *have* seen. The goal of the exam designers is to have an exam where the average student will get about half of the questions correct. However, the actual value of this raw score is not important. What is important is how it compares with the scores of other students taking the exam. The percentile, derived from the distribution and ranking of raw scores, provides this comparison information - it tells you specifically what percentage of students from the sampling pool scored lower than you on the exam.

Strategies for Preparation: A common myth propagated among students is that studying for standardized exams is a fruitless endeavor. **THIS IS ABSOLUTELY NOT TRUE.** If you have a firm understanding of the material covered in class, you can score quite well on these exams. So, **PREPARE** by focusing on the material we have covered in class. Candidacy exams give you an added advantage of providing multiple tries on the same exam. Thus, if you encounter difficulty on a certain type of problem in the exam, focus on that material as you prepare for the next try. As you take the exam, note also the topics of questions over material you have not seen before and learn a bit about this area on your own. With this type of directed effort you should

steadily improve your performance as you work toward candidacy and you will be better prepared for the topics covered in this class.

On Moodle and Class Website http://faculty.augie.edu/~dew

- Syllabus
- Harris Study Guide 9th edition
- Class Averages & Point Distributions for Labs
- Presentation Guidelines
- Obtaining Graphics from Instruments Guide
- Examples of Experimental Sections
- Table of Inorganic Ions and Rules for Naming
- Concentrations of Commercial Concentrated Acids & Bases
- K_a/Indicator Table
- Table of Reduction Potentials
- Solubility Rules
- Link to Freeman Publishers Website for the Text

Only On Moodle

- Computer Exercise 1
- Computer Exercise 2
- Computer Exercise 3
- Data Analysis & Stats Report Template with Honor Pledge
- All Powerpoints used in lecture
- Answer keys to Recommended Problems
- Previous Research reports
- Guide to Moodle Gradebook for Chem 242

Only on Class Website

- past exams

Research Project Time Line

Feb 14	List of group members four groups of 4, and one group of 3, based on enrollment of 19 at time of syllabus printing.
Feb 28	Preliminary proposal due. Pick one or two factors to test and write a proposal describing how you will carry out the tests. Clear your project with the instructor, first come, first served.
Mar 28	(20 pts) Submit a hard copy of the Final Proposal with Honor Pledge and the previous hard copy draft with instructor's comments (may be the preproposal). Drop an electronic copy of the proposal (filename contains Prop and initials) and electronic copies of SciFinder searches (filename contains Sci and initials) in Moodle.
Apr 19, 26 and May 3	Time for lab work - set up, test, data analysis, retest, clean up, check out, prepare written and oral reports. All lab work for the semester ends on May 2. Calculations and data analysis for each day's work is due at the beginning of the next lab period.
Apr 27	Submit a hard copy of the Introduction and Experimental sections of the Final Report and the previous hard copy draft with instructors comments (may be the proposal). Drop an electronic copy (filename contains I&E and initials) in Moodle. The instructor will make comments on the hard copy and return it for incorporation into the Final Report. The report and the presentation should be somewhat similar, so prepare them together.
May 2	Submit a draft of your presentation slides - hard copy (3 slides per page with space for notes) and the previous hard copy draft with instructor comments if you submitted something earlier. Drop an electronic copy (filename contains Pres and initials) in Moodle. The report and the presentation should be somewhat similar, so prepare them together.
May 10	(30 pts) Oral Group Presentations - 10-15 minutes plus time for questions. Drop an electronic copy of the final presentation slides (filename contains Pres Final and initials) in Moodle. Turn in the hard copy of your *previous* preliminary draft with instructor comments. A hard copy of the final set of slides is *not* required.
May 15	(50 pts) Submit a hard copy of the Final Report with Honor Pledge, the previous hard copy draft with instructors comments (may be I&E), and the Presentation feedback. Drop an electronic copy (filename contains Report and initials) in Moodle. The report and the presentation should be somewhat similar, so prepare them together. This due date is **after** the last day of classes to allow time to incorporate Presentation feedback into the Final Report.
The instructor is also available for consultation on preparing the proposal and reports. "Free" revisions are available on any of them if you turn in a draft (along with the previous draft with comments) early enough to give the instructor time to "grade" it and return it before the deadline. The last version turned in by the deadline will be the one that receives the grade. "Free" revisions are limited only by the time necessary for "turnaround" which is affected by the other demands on the instructor's time. Submissions **without** the previous draft will not be reviewed!	

The Analytical Sciences Digital Library has a complete textbook for Quantitative Analysis by David Harvey that is freely downloadable. This text emphasizes instrumental analysis and has limited coverage of the topics we will be covering, but it can be a useful reference and the price is right. The link is:
http://www.asdlib.org/onlineArticles/ecourseware/Analytical%20Chemistry%202.0/Text_Files.html

ANALYSIS TENTATIVE LECTURE SCHEDULE			
Date	**Chapter**	**Topic**	**Powerpoints**
on your own	0, 1, 6, 27	Review on your own, ask questions	
Feb 2	-	Introduction	First Day Introduction
5	3	Experimental Error	Statistics
7	4	Statistics	
9	5	Quality Assurance and Calibration Methods	Quality Assurance and Sampling
12	28	Sample Preparation	
14, 16	-	Project Discussion	Method Development Criteria List
19, 21	18, 21	Spectrophotometry and Atomic Spectroscopy	Spectroscopic Analysis
23	8	Activity and Systematic Treatment of Equilibria	Free Energy and Equilibrium Activity Equilibrium
26 (M)		**EXAM 1**	
28, Mar 2	8 (cont)	Activity and Systematic Treatment of Equilibria	Free Energy and Equilibrium Activity Equilibrium
5, 7	9	Monoprotic Acid-Base Equilibria	Equilibrium
9	10	Polyprotic Acid-Base Systems	no powerpoint
Mar 12-16		**Spring Break**	
19	10 (cont)	Polyprotic Acid-Base Systems	no powerpoint
21, 23, 26	11	Acid-Base Titrations	no powerpoint
Mar 28 (W)		**EXAM 2**	
Mar 30-Apr 2		**Easter Break**	
Apr 4, 6	14	Fundamentals of Electrochemistry	Electrochemistry
9, 11, 13	15	Electrodes and Potentiometry	Ion Selective Electrodes
16, 18, 20	16	Redox Titrations	no powerpoint
23, 25, 27	17	Electroanalytical Techniques	included in Electrochemistry
30 (W)		**EXAM 3**	
2	23	Introduction to Analytical Separations	Chromatography
4	24	Gas Chromatography	
7	25	High Performance Liquid Chromatography	
9, 11	26	Chromatographic Methods and Capillary Electrophoresis	
May 17 (W)	**9 am**	**FINAL EXAM**	
No assignments accepted after 5 pm on the last day of classes. Last day to drop or change to S/U is Friday, April 6.			

APPROXIMATE LABORATORY SCHEDULE									
Date	**Title**	**Grp**	**N**	**C**	**A**	**P**	**Lab Due***	**Assignment**	**Due**
Feb 1	Check-in, Mass, Safety	2	30		10	10	Feb 8	Cand Exam	Feb 1 (R) - Mar 2(F)
8, 15	Acid Base Titration	1	8	12	15	15	Feb 22	Comp Ex 1	Feb 16 (F)
22, Mar 1	Gravimetric Determination of Ag	1	8	12	8/7	8/7	Mar 8	Comp Ex 2	Mar 21 (W)
8, 22, 29, Apr 5, 12	Spec Determination of Mn and Determination of Mg by AA and Potentiometric Titration	2	8	12	15	15	1st Mar 29	Comp Ex 3	Apr 20 (F)
								Res Grps	Feb 14 (W)
		1	8	12	15	15	2nd Apr 5	Prelim Prop	Feb 28 (W)
			n	c	p	cn	3rd Apr 12	Final Prop	Mar 28 (W)
		2	8	20	8	14		Draft I & E	Apr 27 (F)
19, 26, May 3	Research Project & check out	3 or 4	100					Prelim Slides	May 2 (W)
								Presentation	May 10 (R)
								Final Report	May 15 (T)
10	Research Presentations								
All lab work ends at 6 pm on May 3. 20% penalty for late labs and computer exercises. Nothing accepted after 5 pm on the last day of classes.							*Assumes typical progress. Consult instructor if not finished with the lab. Labs not due until completed. May repeat a lab *only* after finished *all* other scheduled labs and have time *before* research begins.		