

Policies for Chemistry 3000 - Quantitative Analysis
Meeting Times/Location: MWF 12:30-1:20 PM Engineering 106

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Office Hours: Tuesday & Wednesday 3:00-4:00 PM **and** by individual appointments
Course Text: Quantitative Chemical Analysis (8th Edition) by Daniel C. Harris

Course Objective: The purpose of this course is to introduce the student to the fundamental concepts of analytical chemistry with particular emphasis on quantitative analysis. The theories, concepts of experimental design and data analysis as they apply to quantitative chemical analysis will be presented. Particular attention is placed upon the role of chemical equilibrium and its wide-ranging role in various chemical systems employed for quantitative analysis. The course is calculation (algebraic manipulations) intensive.

Grading: Three in class hour exams and one cumulative final exam will be given. See course outline below for tentative dates for each exam and the material to be covered. There will be no graded homework. Problems at the end of each chapter will be suggested as guides to the general types of problems that may appear on the exams and it is to the student's advantage to understand how to solve these problems as well as those examples covered in class. Regular student attendance at lectures is **strongly recommended**. Only written medical excuses or other (documented) extenuating circumstances will be accepted for missing an exam (see below). Three one-hour exams and a final exam will all contribute equally to your class grade (25% each). The final examination will be comprehensive and will cover material from the entire semester. The most recent, nationally administered, standardized exam from the American Chemical Society (ACS) covering Quantitative Analysis will be used. The class results from this ACS standard exam will also be used anonymously as part of the Department of Chemistry's assessment process (see <http://www.chem.usu.edu/htm/assessment>). The final examination is currently scheduled for Wednesday, December 14 (11:30 AM to 1:20 PM) in **Engineering 106**.

Tentative Grading Scale

A: 100-90% **B:** 89-80% **C:** 79-70% **D:** 69-60% **F:** below 60%

Note: Grade cutoffs may change to lower percentages (but not higher) depending on exact class averages. The attached syllabus is tentative. I will attempt to follow it as closely as possible with respect to lecture topics and exam material. However, any changes as to the exact material to be covered in lecture and on each exam will be announced in class.

Missed Exam Policy

Missed exams that have documented excuses will be made up with a comprehensive exam to be held at the end of the semester at a single time to be arranged. Excusable absences include (1) a significant illness when verified by a note from the Student

Health Center or your doctor (2) a family emergency which will require a note from your academic advisor (3) regularly scheduled university activities (e.g., sports teams) **only with prior approval** and a note from the person in charge of the activity stating the reasons for the absence. Other excuses will be considered on a case by case basis, however, excuses such as I was not ready for the exam, my cat (or car) died, I overslept, etc., will not be acceptable.

Course Withdrawal: Students may withdraw from Chemistry 3000 as outlined in the on-line edition of the Utah State University General Catalog (see: <http://catalog.usu.edu/content.php?catoid=4&navoid=489> - **Dropping Courses**).

Additional Provisions: The administration of Chemistry 3000 will adhere strictly to the USU Academic Policies outlined in the on-line edition of the Utah State University General Catalog (see: <http://catalog.usu.edu/index.php>). The complete code of Policies and Procedures for Students can also be viewed online at: <http://catalog.usu.edu/content.php?catoid=12&navoid=3139>.

In accordance with the Americans with Disabilities Act, reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation in Chemistry 3000. A student who requires an accommodation must contact the Instructor. The disability must be documented by the Disability Resource Center. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with Disabilities. Course material may be requested in alternate formats through the Disability Resource Center.

Chemistry 3005 Laboratory

Students also taking the CHEM 3005 laboratory should note that the laboratory is graded separately from the lecture portion of the class. I will also be teaching the CHEM 3005 laboratory during the Fall 2016 semester. Please contact me with any questions concerning the laboratory. Students will be given a copy of the course's laboratory manual at the first laboratory period (check-in and handout of the first experiment unknowns). The Thursday lab section will meet for the first time on Sept. 8. The Monday section will meet for the first time on Sept. 12. Prior to the first laboratory experiment, students should read the safety section of the manual. Safety goggles and a suitable lab coat (you can use the ones from CHEM 1220) must be worn at all times during laboratory periods. A bound laboratory notebook is also required. Students should carefully read Chapter 2 (this chapter will not be covered in class) in the Chemistry 3000 textbook (Quantitative Chemical Analysis by Daniel C. Harris) prior to the first laboratory experiment. Chapters 4 and 5 in the textbook will also prove useful for the laboratory, but will also be discussed in class. **Laboratory fees for this course (Chemistry 3005) are used for the purchase of equipment and supplies for the laboratory.**

Primary Course Learning Objectives for IDEA course evaluation:

I. Basic Cognitive Background

1. Gaining factual knowledge (terminology, classifications, methods, trends)
2. Learning fundamental principles, generalizations, or theories.

II. Application of Learning

3. Learning to apply course materials (to improve rational thinking, problem solving and decisions)
4. Developing specific skills, competencies and points of view needed by professionals in the field most closely related to this course.

Specific Course Objectives:

- * Understand the importance of stoichiometry and chemical equilibrium in chemical analysis. Be able to apply these concepts to analytical problem solving.
- * Understand the basic concepts of proper experimental design and how to validate experimental data.
- * Understand the sources for error in chemical measurements and account for errors in data analysis
- * Comprehend the need for experimental calibration in chemical measurement
- * Be able to evaluate and employ proper analytical standards and be able to formulate suitable standardization strategies
- * Recognize the potential for interferences in chemical analyses and how to devise appropriate remedies
- * Be able to distinguish between qualitative and quantitative measurements
- * Be able to compare and critically select methods for chemical analyses
- * Solve stoichiometric and other analytical calculations
- * Be able to properly perform quantitative volumetric, photometric, and potentiometric calculations
- * Be able to explain the necessity for and use of error estimates and statistical methods
- * Understand the importance of various equilibria (pH, solubility, complexation and redox) to both proper sample preparation and chemical analysis.
- * Be able to apply basic spectrophotometric methods for various chemical analyses
- * Understand how chemical separations simplify otherwise very complex chemical analyses

Tentative Course Outline For Chemistry 3000 (Quantitative Analysis)

Aug. 29	Chapter 1	Introduction and Brief Review of Units and Concentration
Aug. 31	Chapter 3	Experimental Error
Sept. 2	Chapter 4	Statistics
Sept. 5		Labor Day Holiday - No Classes
Sept. 7	Chapter 4	
Sept. 9	Chapter 5	Calibration
Sept. 12	Chapter 6	Chemical Equilibria
Sept. 14	Chapter 6	
Sept. 16	Chapter 6	Introduction to Acids and Bases
Sept. 19	Chapter 6	
Sept. 21	Chapter 26	Gravimetric Analysis
Sept. 23	Chapter 26	
Sept. 26	Chapter 26	Titrations / Volumetric Analysis
Sept. 28	Chapter 26	
Sept. 30		First Hour Exam (On material covered from Aug. 29 - Sept. 26)
Oct. 3	Chapter 26	
Oct. 5	Chapter 7	Systematic Treatment of Chemical Equilibria
Oct. 7	Chapter 7	
Oct. 10	Chapter 7	
Oct. 12	Chapter 8	Monoprotic Acid-Base Equilibria
Oct. 14	Chapter 8	
Oct. 17	Chapter 8	
Oct. 19	Chapter 9	Polyprotic Acid-Base Equilibria
Oct. 20	Friday's Class	Schedule
Oct. 21		Fall Break – No Classes
Oct. 24	Chapter 9	
Oct. 26	Chapter 10	Acid-Base Titrations
Oct. 28		Second Hour Exam (On material covered from Sept. 28 - Oct. 24)
Oct. 31	Chapter 10	
Nov. 2	Chapter 10	
Nov. 4	Chapter 11	EDTA Titrations
Nov. 7	Chapter 11	
Nov. 9	Chapter 13	Fundamentals of Electrochemistry
Nov. 11	Chapter 13	
Nov. 14	Chapter 13	
Nov. 16	Chapter 14	Electrodes and Potentiometry
Nov. 18	Chapter 14	
Nov. 21	Chapter 14	
Nov. 23		No Class - Thanksgiving Break
Nov. 25		No Class - Thanksgiving Break
Nov. 28	Chapter 17	Fundamentals of Spectrophotometry
Nov. 30		Third Hour Exam (On material covered from Oct. 26 - Nov. 21)
Dec. 2	Chapter 17	
Dec. 5	Chapter 22	Introduction to Analytical Separations
Dec. 7	Chapter 22	
Dec. 9	Chapter 22	
Dec. 14		Final Exam is scheduled for 11:30 AM to 1:20 PM in Engineering 106