

## Policies for Chemistry 3000 - Quantitative Analysis

**Instructor:** Dr. Robert Brown  
**Office/Phone:** W 026/797-0545

**Meeting Times/Location:** 12:30-1:20 PM BUS 319  
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**Office Hours:** MWF 1:30-2:20 PM **and** also by individual student appointments  
**Course Text:** Quantitative Chemical Analysis (7th Edition) by Daniel C. Harris

**Course Objective:** The purpose of this course is to introduce the student to 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 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 page 96 of the current 2009-2010 general catalog for more information on the University's assessment policy). The final examination is currently scheduled for Monday, December 7 (11:30 AM to 1:20 PM) in BUS 319.

### **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 quarter 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 most recent edition of the Utah State University General Catalog (pages 8 & 58).

**Additional Provisions:** The administration of Chemistry 3000 will adhere strictly to the USU Academic Policies outlined in the 2009-2010 Utah State University General Catalog (pages 80-83). The complete code of Policies and Procedures for Students can also be viewed online at: <http://www.usu.edu/studentservices/studentcode/>

**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. Dr. Stephen Bialkowski will be teaching the laboratory during the Fall 2009 semester. Any questions concerning the laboratory that you may have should be directed to Dr. Bialkowski (his email is: sbialkow@cc.usu.edu). Students must have a copy of the course's laboratory manual prior to the first laboratory period. Check for posted notices outside both the main chemistry office and the scheduled laboratory room, first floor Maser Lab for additional details prior to the first laboratory meeting. These notices are typically posted the first week of classes and will announce the first laboratory meeting (usually during the second week of the semester). In addition, students should read the safety section of the manual prior to the first laboratory and must have safety eyewear (prescription glasses, safety glasses or goggles) for all 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 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.**

### **Additional Specific Course Learning 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. 24	Chapter 1	Review of Units and Concentration
Aug. 26	Chapter 3	Experimental Error
Aug. 28	Chapter 4	Statistics
Aug. 31	Chapter 5	Calibration
Sept. 2	Chapter 6	Chemical Equilibria
Sept. 4	Chapter 6	
Sept. 7		<b>Labor Day Holiday</b>
Sept. 9	Chapter 6	Introduction to Acids and Bases
Sept. 11	Chapter 6	
Sept. 14	Chapter 7	Titration / Volumetric Analysis
Sept. 16	Chapter 7	
Sept. 18	Chapter 27	Gravimetric Analysis
Sept. 21	Chapter 27	
Sept. 23		<b>First Hour Exam (On material covered from Aug. 24 - Sept. 16)</b>
Sept. 25	Chapter 8	Systematic Treatment of Chemical Equilibria
Sept. 28	Chapter 8	
Sept. 30	Chapter 8	
Oct. 2	Chapter 9	Acid-Base Equilibria
Oct. 5	Chapter 9	
Oct. 7	Chapter 9	
Oct. 9	Chapter 9	
Oct. 12	Chapter 10	Polyprotic Acid-Base Equilibria
Oct. 14	Chapter 10	
Oct. 16		<b>Fall Break – No Classes</b>
Oct. 19	Chapter 11	Acid-Base Titrations
Oct. 21		<b>Second Hour Exam (On material covered from Sept. 18 - Oct. 14)</b>
Oct. 23	Chapter 11	
Oct. 26	Chapter 11	
Oct. 28	Chapter 12	EDTA Titrations
Oct. 30	Chapter 12	
Nov. 2	Chapter 14	Fundamentals of Electrochemistry
Nov. 4	Chapter 14	
Nov. 6	Chapter 14	
Nov. 9	Chapter 15	Electrodes and Potentiometry
Nov. 11	Chapter 15	
Nov. 13	Chapter 15	
Nov. 16	Chapter 18	Fundamentals of Spectrophotometry
Nov. 18		<b>Third Hour Exam (On material covered from Oct. 19 - Nov. 13)</b>
Nov. 20	Chapter 18	
Nov. 23	Chapter 18	
Nov. 25		<b>No Class - Thanksgiving Break</b>
Nov. 27		<b>No Class - Thanksgiving Break</b>
Nov. 30	Chapter 23	Introduction to Analytical Separations
Dec. 2	Chapter 23	
Dec. 4	Chapter 23	
Dec. 7		<b>Final Exam is scheduled for 11:30 AM to 1:20 PM in Bus 319</b>