

## Chem 270 – Quantitative Analysis – Spring 2009

**Lecture** – Nobel Hall 305, M, W, Th, F – 11:30 AM -12:20 PM

**Laboratory** – Nobel Hall 204, Monday or Thursday, 1:30-5:30 PM

**Instructor** – Dwight R. Stoll

**Office** – Nobel Hall 209

**Campus Phone** – x6304, Home Phone – 507-934-0019

**Email** – dstoll@gustavus.edu

**Office Hours** – By appointment or by chance

### Required Materials

1. *Quantitative Chemical Analysis*, by Potts and Evans, 2009
2. Laboratory Manual – Available through *The Book Mark*
3. Approved laboratory eyewear

**Course Goal** – To provide a learning framework within which students can effectively and efficiently become proficient in the basic skills of modern analytical chemistry. These skills will serve as a solid foundation not only for further study of chemistry, but also for other courses in the physical sciences involving quantitative manipulations and measurements.

### Course Objectives

1. To appreciate that all experimental data are uncertain, and learn and apply appropriate statistical procedures to deal with this uncertainty in the analysis of and reporting on experimental measurements
2. To learn and apply a systematic approach to the treatment of ionic chemical equilibria
3. To understand the basic principles of equilibria in two-phase liquid systems
4. To learn the roles and limitations of equipment used in the modern analytical chemical laboratory, and learn the techniques associated with proper use of this equipment in making accurate and precise chemical measurements
5. To understand the basic principles of separation and spectroscopic methods, and appreciate the application of these methods to chemical measurements in real chemical and biological systems
6. To recognize the significance of quantitative chemical analysis both in society and in science
7. To enjoy learning about chemistry and science

**Grading** – Evaluation of performance in the course will be based upon a variety of activities including problem sets, quizzes, exams, and laboratory results. The number and point assignment for each of these activities is given below.

Activity	Number of Events	Points Per Event	Total Points
Feedback and Participation	15	4	60
Problem Sets	10	20	200
Quizzes	5	20	100
Mid-term Exams	2	150	300
Final Exam	1	250	250
Laboratory Experiments			775
		<b>Course Point Total</b>	<b>1685</b>

Letter grades will be assigned based upon the following scale. *The instructor reserves the right to lower these cutoffs under special circumstances, however the cutoffs will not be raised under any circumstances.*

% of Points	Letter Grade	% of Points	Letter Grade
92-100	A	75-78	C+
88-92	A-	70-75	C
85-88	B+	67-70	C-
81-85	B	60-67	D
78-81	B-	<60	F

**Communication:** I strongly prefer communication by email over voicemail.

**Course Content** – The bulk of the content that will be covered in lecture can be broken down into four categories, which are represented by the following abbreviations in the course calendar.

1. Analysis of Data and Uncertainty - Data
2. Chemical Equilibria – ChemEq
3. Separations - Sepn
4. Spectroscopy - Spec

## Course Calendar

Monday	Tuesday	Wednesday	Thursday	Friday
<b>February</b>				
2	3	4	5	6
9 - <b>Classes Begin</b> Lecture – Introduction	10	11 Lecture – Data-1	12 Lecture – Data-2	13 Lecture – Laboratory Introduction, Glassware Calibration Pre-Lab
16 Lecture – Data-3  <b>PS -1 Due</b>	17	18 Lecture – Data-4	19 Lecture – ChemEq-1 <b>Quiz-1</b>	20 Lecture – Weak Acid Pre-Lab
23 Lecture – ChemEq-2  <b>PS -2 Due</b>	24	25 Lecture – ChemEq-3	26 Lecture – ChemEq-4	27 Lecture – ChemEq-5
<b>March</b>				
2 Lecture – ChemEq-6  <b>PS -3 Due</b>	3	4 Lecture – ChemEq-7	5 Lecture – ChemEq-8  <b>Quiz-2</b>	6 Lecture – Soda Ash Pre-Lab
9 Lecture – ChemEq-9  <b>PS -4 Due</b>	10	11  <b>Exam-1</b>	12 Lecture – ChemEq-10	13 Lecture – Gravimetric Calcium Pre-Lab
16 Lecture – ChemEq-11	17	18 Lecture – ChemEq-12	19 Lecture – ChemEq-13	20 Lecture – ChemEq-14
<b>23 – Spring Break</b>	<b>24</b>	<b>25 – Spring Break</b>	<b>26 – Spring Break</b>	<b>27 – Spring Break</b>
30 Lecture – ChemEq-15  <b>PS -5 Due</b>	31			
<b>April</b>				
		1 Lecture - ChemEq-16	2 Lecture - ChemEq-17  <b>Quiz-3</b>	3 Lecture – Redox Iron Pre-Lab
6 Lecture – ChemEq-18  <b>PS – 6 Due</b>	7	8 Lecture – ChemEq-19	9  <b>Exam - 2</b>	<b>10 – Easter Break</b>
<b>13 – Easter Break</b>	14	15 Lecture – Calcium EDTA Pre-Lab	16 Lecture – Data-5	17 Lecture – Data-6

20 Lecture – Spec-1	21	22 Lecture – Spectroscopy Pre-Lab	23 Lecture – Spec-2	24 Lecture – Spec-3
27 Lecture – Spec-4  PS – 7 Due	28	29 Lecture – HPLC Pre-Lab	30 Lecture – Spec-5  Quiz-4	
<b>May</b>				
				1 Lecture – Spec-6
4 Lecture – ChemEq-21  PS – 8 Due	5	6 Lecture – ChemEq-22	7 Lecture – ChemEq-23	8 Lecture – Sepn-1
11 Lecture – Sepn-2  PS – 9 Due	12	13 Lecture – Sepn-3	14 Lecture – Sepn-4  Quiz-5	15 Lecture – Sepn-5
18 Lecture – Sepn-6  PS – 10 Due	19	20 Lecture – Sepn-7	19 – Reading Day	20
	26 – Final Exam: 1:00-3:00 PM, NHS 305			

## Laboratory Activity

**Experiments and Reports:** The organization of the approach to laboratory work in the course is explained in the laboratory manual and will be discussed in class. For most experiments you will work individually to experimentally determine a characteristic of a sample that is unknown to you. You are asked to summarize your results on a small index card, and hand in the card along with your laboratory notebook for evaluation one week after the experiment is completed.

**Laboratory Safety:** You will be expected to take reasonable measures in the laboratory to ensure the safety of you and your peers. This includes clear labeling of all containers, responsible and organized collection of waste materials, and wearing protective eyewear at all times in the laboratory, even when you may not be working with chemicals *per se*.

## Details

**Readings** – Recommended readings will be announced via the Moodle course site. The readings will typically be from the Potts and Evans text, but may occasionally include supplemental material.

**Feedback and Participation** – You are asked to complete several short ‘quizzes’ via some electronic medium, typically before times that we meet for lecture/discussion. These ‘quizzes’ are more like surveys than quizzes, as

you will be given full credit for simply completing the questions as long as there is evidence that you have given reasonable thought to preparing your response. You are asked to complete each 'quiz' by 9:00 AM on the day of class. These surveys will be used to gather a variety of information, including your understanding of previous lecture material and readings, to help me in effectively preparing subsequent lecture and discussion topics.

**Problem Sets** – The ten problem sets (Indicated by PS-X in the calendar) assigned throughout the semester will be a combination of problems from the text, and problems prepared by me. Details of each problem set will be announced on the Moodle site. You are encouraged to work with peers in completing these assignments, however each student must submit his/her own work. Problem sets are due at the beginning of class on the days indicated on the calendar above. Grading of the problem sets will be accomplished as follows. From each problem set, two problems will be selected at random for grading. Each problem will be graded for completeness and accuracy on a ten-point scale, for a total of 20 points per problem set.

*Late Work* – The number of points awarded for a particular problem set will decrease by 50 % for every day that lapses between the due date and the date that the work is turned in; problem sets are due at the beginning of lecture.

**Quizzes** – The six quizzes throughout the semester will be completed in class and will be 15 minutes in length. These quizzes will primarily be used as a diagnostic tool to assess your understanding of the material as we progress toward each exam. The quizzes will be closed book and closed note, and will be taken under the guidelines of the Honor Code.

**Mid-Term Exams** – The two mid-term exams will be given in class and will be 50 minutes in length. Each of these exams should be considered comprehensive. The exams will be closed book and closed note, and will be taken under the guidelines of the Honor Code.

**Final Exam** – The final exam will be 120 minutes in length, and will cover material discussed both in lecture and in the laboratory.

***All exams are considered comprehensive***

**Missed Exams/Quizzes** – Examinations and quizzes **will not be made up if missed**, unless due to circumstances beyond your control. If you will miss an exam due to circumstances beyond your control, you must contact me no later than one hour **prior to** the exam. You can call my office or home, or e-mail me. If neither of these work, please contact the Department office at x7320 or as a last resort, the Dean of Students office.

**Honor Code:** The following code will be written in full and signed on every examination and certain specified graded papers:

***"On my honor, I pledge that I have not given, received, or tolerated others' use of unauthorized aid in completing this work."***

Gustavus Adolphus College is proud to operate under an honor system. The faculty and students have jointly created an Honor Board to enforce this policy. In signing this statement a student is promising that his or her work complies fully with the authorized aid as defined by the professor. It is each professor's responsibility to state course penalties for academic honesty policy violations, and to define the level of authorized aid appropriate to the work in the course or to the particular assignment. However, the student is responsible to ask questions about any reasonable doubt regarding the professor's definition.

The following Gustavus website information will be valuable in explaining details:

<http://gustavus.edu/deanofstudents/gustavusguide/academicpolicies.pdf>

In Chemistry 270 all examinations will be conducted under the honor code. Penalty for violating the code will be a score of zero on the exam.

Problem sets, and to some extent laboratory experiments, in this course are collaborative, and collaboration on them is not only legal but also encouraged. Plagiarism on lab reports does, however, constitute a breach of the code. If you are unsure of what constitutes plagiarism, ask your instructor and/or see the Gustavus website.

**Students with Disabilities** - Any student with a documented disability, needing academic adjustments or accommodations, is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Such students also need to contact Student Disability Services in the Advising and Counseling Center in Johnson Student Union.

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (1990) work together to ensure 'reasonable accommodation' and non-discrimination for students with disabilities in higher education. A student who has a physical, psychiatric/emotional, medical, learning, or attention disability that may have an effect on the student's ability to complete assigned course work should contact the Disability Services Coordinator in the Advising Center, who will review the concerns and decide with the student what accommodations are necessary.

*The information listed on the course web site, in the syllabus, and in associated documents is subject to change at the discretion of the instructor.*