

Analysis of Equilibrium Systems
CHEM 2011-1
Winter Quarter, 2011

Instructor Dr. Keith Miller
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Class Time: MWRF 9:00 – 9:50AM
Class Location: Olin 105 (MWF); Olin 205 (R)
Office Hours: MWTh 10:00 – 11:00; other times by arrangement

REQUIRE COURSE ITEMS

Textbook: *Analytical Chemistry*, 6th ed., by Gary D. Christian [2004, Wiley; ISBN 0-471-21472-8]. It is available at the DU Bookstore both in text and electronic versions. You can also find good deals from other online resources. If you look elsewhere, use the ISBN number to make sure you have the correct version!

Calculator: An inexpensive calculator is required. It should have the capabilities for square roots, logarithms, and exponential (scientific) notation operations. The calculator will be used for problem sets, quizzes, and exams. You are responsible for understanding how to perform each of the operations on your calculator. **Remember to bring your calculator with you to every class.**

SUPPLEMENTAL COURSE ITEMS

Textbook: *Chemistry*, 3rd, 4th, 5th eds., by Martin S. Silberberg (textbook used for CHEM 1010).

COURSE DESCRIPTION. Analysis of Equilibrium Systems is the fifth course in the six quarter freshman/sophomore chemistry sequence. The course is an introduction to chemical equilibrium and kinetics. Chemical equilibrium will focus on aqueous systems, starting first with simple systems. Discussions will progress to advanced applications of complex equilibrium, including examples from biological and environmental systems.

LECTURE. The format of class meetings will follow traditional lecture format on MWF with occasional group activities. During lecture, I will summarize new material and present illustrations and examples. In lecture, I WILL NOT identify and describe every detail you will read in the text and any supplemental materials. I will, however, emphasize the important topics covered in the reading as well as problem solving strategies when appropriate. You should stop me at any time if you have questions about the material being covered.

The Thursday (R) class meetings will be devoted to problem solving and group activities. No new lecture material will be covered on these days. However, material from the lecture will be explored in greater detail. **THIS SESSION IS REQUIRED.** A short quiz may be

administered at each meeting. We will work on specific “challenge problems” in small groups, go over spreadsheet applications, and after the hour exams, complete exam keys. If time permits, we will go over any questions you have on the material covered in lecture or homework problems.

It is my goal that all lectures be conducted in an active learning environment. Therefore, we will stop periodically and apply what we have just covered. At times, I will ask you to work with other students to solve problems or answer questions. I encourage you to make the most of these interactions. Experience has shown me that other students often succeed in describing chemistry concepts where professors and instructors fail.

READINGS. You are expected to complete the assigned reading prior to the class lecture. After lecture, you should reread the assigned text. In addition, you are also encouraged to attempt the “Ask Yourself” exercises throughout the text while you are completing your assigned reading. I recommend that you understand the material and how to solve the sample problems before proceeding to the next section. At the end of each chapter, a summary of important equations and terms is provided that should prove helpful in the preparation for quizzes and exams.

PROBLEMS. Problem solving is an important component of all chemistry and most science courses. For most students, successfully solving problems requires practice. Make sure you understand each of the worked-examples in the textbook. Also, I strongly suggest that you complete the suggested problems that will be posted. While you are not required to turn the completed problems in for a grade, I highly recommend that you attempt all of them. These problems are typical of those you will encounter on quizzes and exams.

GRADED EXERCISES. The suggested problems will not be graded. Challenge *problem sets*, however, will be assigned during the course that will be graded. These problems are more difficult than the suggested problems, and will require significant effort on your part. You will work together in small groups to complete the problems. The completed exercise will be handed in for a grade.

QUIZZES. Quizzes will be administered weekly on Thursday or Friday, with the exception of the class meetings following the hour exams. The quizzes will be short (10 – 15 minutes), and will cover material from the preceding 3 – 4 lectures. A significant portion of each quiz will cover material that I have covered in lecture and material that you have seen during group work. The quizzes will be similar in nature to assigned problem sets and suggested homework problems. **NO MAKE-UP QUIZZES WILL BE GIVEN.** An estimated seven (7) quizzes will be given throughout the course. Only the highest scores of five (5) quizzes will comprise the “Quiz” portion of your final grade.

EXAMS. There will be three (3) one-hour exams given during the quarter and a two-hour, cumulative final exam. Dates for these exams are posted on the tentative lecture schedule. **NO MAKE-UP EXAMS WILL BE GIVEN.** There is one exception to this policy. If you will be out of town for a University sanctioned function (e.g., athletic team or music group), you are responsible for making arrangements with Dr. Miller at least one week in advance to

complete the exam prior to the scheduled date. If you miss an exam, then your final exam will be counted twice to replace the missed exam. If you take all three, hour exams **AND** your grade on your final exam is higher than one of your hour exams, **then your final exam will be counted twice to replace your lowest hour exam grade.**

GRADES. At the end of the quarter, your final grade will be determined according to your performance on the exams, quizzes, and class participation/clicker scores. Cooperative learning is encouraged. As such, I will not grade on a curve. If most students do well, there will be a significant number of higher grades. The opposite, however, can also be true! Your final grade will be determined based on the percentages of the following components:

<u>Component</u>	<u>Percentage</u>
Hour Exams (20% each)	60
Final Exam	20
Quizzes/Problem Sets/Participation	20
Total Percentage	100

IMPORTANT – EXAM DATES are as follows:

Hour Exam 1	1/21
Hour Exam 2	2/11
Hour Exam 3	3/4
Final Exam	3/12 (From 10:00 to 11:50)

CELLULAR PHONE, PAGER AND LAPTOP POLICY. I respect the need for each individual to stay in contact with family and friends. The use of cellular phones and pagers, however, is disrupting to the learning environment. Thus, I request that the ringers of all cellular phones and pagers be muted during class. If an emergency arises, and you need to make a call on your phone, I request that you quietly leave the room and conduct your conversation out in the hallway. Laptops can be quite disrupting in class; therefore, **ONLY** laptops used for taking notes will be allowed. If you use your laptop, I might request that a copy of your notes be emailed to me at the end of class.

LECTURE AND TESTING ACCOMODATIONS. I will make every effort to accommodate students diagnosed with a learning disability. I will do this in complete confidence. I do, however, request that any student requiring these accommodations inform me the first week of class. For further information, please see the University Disability Services' website at <http://www.du.edu/disability/dsp/index.html>.

ACADEMIC DISHONESTY. While I advocate collaborative learning and teamwork, I also firmly believe that each individual should maintain the highest ethical standards in all of life's endeavors. As such, I support and will strictly enforce the Honor Code of the University of Denver. For your reference, I have included the link to the Honor Code Statement at <http://www.du.edu/ccs/honorcode.html>.

TENTATIVE SCHEDULE[§] -- Updated January 1, 2011

Week*	Topics	Readings (by sections)
1	Introduction; data handling and error; Solutions	1.1-1.6, 2.1-2.6, 2.9; 3.1-3.10, 3.12, 3.14, 3.16; 5.1-5.8
2	Chemical equilibrium, intro to acid/base	6.1-6.12, 6.14; 7.1-7.4
3	Acid/base and acid base titrations No class on MLK day; Hour Exam 1 -- 1/21	8.1-8.3, 7.5-7.6 8.4-8.5
4	Buffers, polyprotic acids and dibasic systems, mixtures of acids/bases	7.7, 7.9-7.10 7.8, 8.6-8.8
5	Precipitation equilibrium	10.1-10.5, 11.1
6 [†]	Systematic approach to equilibrium Hour Exam 2 -- 2/11	6.13, 11.2-11.4
7	Ionic strength, activity, diverse ion effects	6.15, 6.16, 7.11, 10.6
8	Complexes; Chemical Kinetics	9.1-9.5; 22.1, Readings from Silberberg
9	Chemical Kinetics Hour Exam 3 -- 3/4	Readings from Silberberg
10	Chemical Kinetics/Review Final Exam -- 3/12 (From 10:00 to 11:50)	

[§] Tentative means that the schedule may (and probably will) change. I will inform the class in lecture and post changes on Blackboard when they occur.

* Some Thursday sessions will be used for to cover lecture material that is needed for the laboratory.

[†] The Friday (2/11) of this week is the last day to drop the course without instructor's approval.