

Analysis of Equilibrium Systems
CHEM 2011-2
Winter Quarter, 2014

Instructor: Dr. Todd A. Wells
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Class Time: MWF, 9:00 - 9:50AM (recitation – R, 9:00 - 9:50AM)
Class Location: Olin 105 (recitation – BAUD 101)
Office Hours: MWR, 10:00 AM - 11:00 AM

REQUIRE COURSE ITEMS

Textbook: *Quantitative Chemical Analysis*, 8th ed., by Daniel C. Harris
Calculator: An inexpensive calculator is required. It should have the capabilities for square roots, logarithms, and exponential (scientific) notation operations. **Remember to bring your calculator (or laptop) with you to every class.**

SUPPLEMENTAL COURSE ITEMS

Kinetics Modules and Chemistry, 3rd Edition, Gilbert, Kirss, Foster, & Davies (2012)
Solutions Manual of Quantitative Chemical Analysis, 8th ed., by Daniel C. Harris

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 equilibria and kinetics. Chemical equilibria will focus on aqueous systems, starting first with simple systems. Discussions will progress to advanced applications of complex equilibria, including examples from biological and environmental systems.

LECTURE

The format of class meetings will follow traditional lecture format on MWF. 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 quizzes, 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. 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.

READING

The assigned reading schedule will be posted on Blackboard and updated periodically. 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.

ON-LINE COMPONENTS

First, weekly online homework will be assigned using the Sapling Learning. These assignments will be graded. With the exception of the 1st and 10th week, these assignments will be due every Wednesday at 11:59PM (Mountain time). The second online component will be short review sessions that supplement material I covered in class. These will include short readings and/or videos, and assigned homework. These sessions are optional; however, I encourage everyone to at least attempt the homework since they are representative of questions that cover material I expect you to know and understand.

IN-CLASS ACTIVITIES/QUIZZES

In-class activities will allow you to apply your knowledge. These activities may be more challenging than the assigned homework. You will work in small groups to complete these activities. Short quizzes (5-10 minutes) will be given on most Fridays to assess the progress of everyone in the class. Both the in-class activities and quizzes will be graded. In addition, a knowledge assessment will be given the first Friday of the course. This is to help me better understand your background knowledge in the course and better tailor the course to best meet the needs of all students. You will receive credit for completing this assessment.

QUIZZES/EXAMS

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. An estimated seven (7) quizzes will be given throughout the course. Your 2 lowest quiz scores will be dropped and only the scores on the remaining quizzes will comprise the "Quiz" portion of your final grade.

Three (3) exams will be given during the quarter two hour exams and a final exam. Exam problems will be similar to the problems given in the weekly quizzes and to those found on the problem sets.

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. Wells at least one week in advance to take the quiz or an hour exam early. **THERE WILL BE NO MAKE-UP QUIZZES OR EXAMS.**

GRADES

Your final grade will be determined by the percentages with the following components:

<u>Component</u>	<u>Points</u>
Hour Exams (200 points each)	400
Final Exam	200
Online Homework	100
In-class activities/quizzes	100
Total Points	800

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. I have included the links for the Honor Code Statement and Honor Code Procedures for Students below. For further information, please see the Office of Citizenship & Community Standards' website at <http://www.du.edu/honorcode/statement.htm> for the Honor Code Statement and at <http://www.du.edu/honorcode/studentprocedure.htm> for the Honor Code Procedures for Students.

TENTATIVE SCHEDULE

Date	Topic
Jan. 6	Introduction; Units; Solutions
Jan. 8	Solutions cont.; Preparing solutions
Jan 9	Equilibrium
Jan. 10	Equilibrium cont.; error
Jan. 13	Volumetric analysis
Jan. 15	Acids and bases
Jan. 16	Group Work

Jan. 17	Acids and bases cont.
Jan. 20	MLK Holiday - DU Holiday - No Class
Jan. 22	Weak acid/weak base Equilibria
Jan. 23	Group work
Jan. 24	Weak acid / weak base Equilibria cont.
Jan. 27	Buffers
Jan. 29	Preparing buffers
Jan. 30	Group work
Jan. 31	Hour Exam I
Feb. 3	Strong acid/base titrations
Feb. 5	Weak acid/base titrations
Feb. 6	Weak acid/base titrations, cont.; endpoints
Feb. 7	Indicators
Feb. 10	Polyprotic acids and bases
Feb. 12	Principle species; Titrations of polyprotic systems
Feb. 13	Group Work
Feb. 14	Solubility product
Feb. 17	Ionic strength; Activity coefficients
Feb. 19	Systematic treatment; Fractional composition
Feb. 20	Group work
Feb. 21	EDTA titrations
Feb. 24	Chemical kinetics – reaction rates
Feb. 26	Chemical kinetics – rate laws
Feb. 27	Group Work
Feb. 28	Hour Exam II
Mar. 3	Chemical kinetics – rate laws cont.
Mar. 5	Chemical kinetics – temperature/concentration
Mar. 6	Group Work
Mar. 7	Chemical kinetics – mechanisms/catalysis
Mar. 10	Chemical kinetics - mechanisms/catalysis cont.
Mar. 10	Review
Mar. 15 (8:00 – 9:50 am)	Final