Aquatic Chemistry  
CHEM 3411  
Spring Quarter, 2014

Instructor: Dr. Keith Miller  
Office: SGM 105  
Contact info: phone: 303.871.7721; email: keith.miller@du.edu  
Class Time: TR 12:00 – 1:50PM  
Class Location: BW 254  
FINAL TIME: JUNE 3, 12:00 – 1:50PM  
Office Hours: By arrangement; open door

REQUIRE COURSE ITEMS


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, activities and exams. You are responsible for understanding how to perform each of the operations on your calculator. Remember to bring your calculator (or laptop) with you to every class.

SUPPLEMENTAL COURSE ITEMS


COURSE DESCRIPTION
This course will cover advanced topics in aquatic chemistry, specifically as they apply to natural waters. The material will build on concepts covered in Analysis of Equilibrium Systems (CHEM 2011), and will include topics in acid-base reactions, oxidation and reduction reactions, complexation, dissolution and precipitation, and weathering processes. Included in the course will be coverage of water quality of surface and ground waters.
TOPICS

• Introduction; hydrologic cycle, water quality
• Equilibrium review, activities, species distribution, ph-C diagrams
• Carbonate system, buffering
• Redox equilibria, solubility, kinetics, weathering
• Clay minerals and adsorption processes

READINGS/CLASS PARTICIPATION
You are expected to complete the assigned reading prior to the class lecture. I recommend that you understand the material and how to solve the sample problems before proceeding to the next section. I will assign readings (and suggested problems) on a weekly basis. Additional readings from secondary sources will also be suggested. It is often very helpful to read similar material from different texts.

PROBLEM SETS/ACTIVITIES
Problem solving is an important component of all chemistry and most science courses. I will post suggested problem sets throughout the course. These problem sets WILL be graded. You are encouraged to work together to complete the problem set. These problems are typical of those you might encounter on the exam. In addition, I will assign activities throughout the quarter that will require work in and outside of class. These activities complement the problem sets and will also be graded. For both the problem sets and the graded activities, a 10% deduction in points will be assessed each calendar day the assignment is overdue.

EXAMS
Two (2) hour exams and a final exam will be given during the quarter. The hour exams will occur during weeks 4 and 8. The exact dates and format for the exams will be provided the second week of the course. **NO MAKE-UP EXAMS WILL BE GIVEN.** 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 ahead of the due date.

INDIVIDUAL PROJECT
There are many topics related to aquatic chemistry that we will not have a chance to cover during this course. Thus, each student will be asked to research and study a topic that we will not cover in-depth in class. I will develop a “short list” of potential topics during the first week for review. Specific guidelines for the project will be provided early in the course. The options for completion of the special project will be diverse, allowing students to fulfill the requirement by selecting from both a variety of topics and project formats.

GRADES
At the end of the quarter, you will be graded according to your performance on the homework problems, graded activities, exams, class participation, and the individual project. Cooperative learning is encouraged. As such, I will not grade on a curve. Your final grade will be determined by the point totals with the following components:
### Component Points

- Problem Sets/Activities/Participation: 250
- Hour Exams (150 pts each): 300
- Final Exam: 300
- Individual Project: 150

**Total Points** 1000

**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 also 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 ACCOMMODATIONS.** 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](http://www.du.edu/disability/dsp/index.html).

**RELIGIOUS ACCOMMODATIONS.** It is University policy to grant students excused absences from class or other organized activities for the observance of religious holy days, unless the accommodation would create an undue hardship. I will do my best to accommodate your requests if you make arrangement with me in advance of your absence. Please examine the course syllabus, including the tentative schedule, for any potential conflicts with holy days and notify me prior to the end of the second week of classes of conflicts that may require your absence from class and/or prevent you from completing an assignment. I have included the link to the Religious Accommodations Policy for your reference. More information can be found at [http://www.du.edu/studentlife/religiouslife/DU_religious_accommodations_policy.html](http://www.du.edu/studentlife/religiouslife/DU_religious_accommodations_policy.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 Student Conduct Policy and Procedures at [http://www.du.edu/studentlife/studentconduct/honor_code_2013-2014.pdf](http://www.du.edu/studentlife/studentconduct/honor_code_2013-2014.pdf).
### TENTATIVE SCHEDULE (3/24/2014)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assigned Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, thermodynamics</td>
<td>Chapters 1, 2 (skip App. 1a; skim 2)</td>
</tr>
<tr>
<td>2,3</td>
<td>Acid base equilibrium</td>
<td>Chapters 3, 4</td>
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<tr>
<td>4</td>
<td>Buffers, titrations</td>
<td>Chapter 5</td>
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<tr>
<td>5</td>
<td>Gas-liquid systems</td>
<td>Chapters 5, 7 (skip 7.5)</td>
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<tr>
<td>6</td>
<td>Metal speciation</td>
<td>Chapter 8 (skip 8.3)</td>
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<tr>
<td>7</td>
<td>Precipitation</td>
<td>Chapter 8 (skip 8.10, 8.12)</td>
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<tr>
<td>8,9</td>
<td>Redox</td>
<td>Chapter 9 (skip 9.7)</td>
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<tr>
<td>10</td>
<td>Adsorption processes</td>
<td>Chapter 10 (skip 10.4)</td>
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