I. Logistics

Instructor  Professor Betsy Stone  
            Chemistry Building W376  
            Tel. (319) 384-1863  
            betsy-stone@uiowa.edu

Class  Trowbridge Hall 134
Location/Time  10:30 – 11:20am MWF

Instructor  Office Hours  
            Wednesdays 3:00-4:30 PM
            Thursdays 3:00-4:30 PM
            By appointment

Grader Office  Hours  
               Times to be announced
               Chemistry Building E208

II. Course Description and Objectives

Description  Analytical Chemistry I is targeted at students pursuing higher education in the chemical sciences. The goal of this course is for students to master discussing, applying concepts, and solving problems in analytical chemistry, with an emphasis on quantitative analysis, solution equilibria, and electrochemistry.

Objectives  Throughout this course, we will focus on the following learning objectives:

1. Identify the principal steps in the analytical process
2. Understand the fundamental concepts of chemical equilibrium
3. Parameterize solution behavior and calculate solution concentrations given the appropriate equilibrium constants
4. Apply knowledge of equilibrium constraints to a range of systems of interest including solubility, acid/base chemistry, complex formation, oxidation/reduction, hydrolysis, and phase partitioning.
5. Investigate solution behavior using electrochemical methods, including potentiometry, voltammetry, and ion selective electrodes.

**Prerequisite Skill Set**
The background needed for successful completion of this course includes first-year chemistry, stoichiometry, algebra, spreadsheet skills, and interpretation of chemical information and science writing.

**Co-requisite Coursework**
004:131 or 004:132, if not taken as a prerequisite

III. Course Content

1. **Introduction and Review**
   a. The Analytical Process and Chemical Measurements
   b. Experimental Error and Statistics
   c. Quality Assurance and Calibration Methods
   d. Review (Appendices A and B)

2. **Chemical Equilibrium, Part 1 (Fundamentals, Acids, and Bases)**
   a. Chemical Equilibrium
   b. Activity and the Systematic Treatment of Equilibrium
   c. Monoprotic Acid-Base Equilibria
   d. Polyprotic Acid-Base Equilibria
   e. Acid-Base Titrations

3. **Electrochemistry**
   a. Fundamentals of Electrochemistry (and Appendix D)
   b. Electrodes and Potentiometry
   c. Redox Titrations
   d. Electroanalytical Techniques

4. **Chemical Equilibrium, Part 2 (Complexation, Precipitation, Advanced Topics)**
   a. EDTA Titrations
   b. Gravimetric Analysis, Precipitation Titrations, and Combustion Analysis
   c. Advanced Topics in Equilibrium

**Required Text**

Students opting to use an earlier edition of the book will be held responsible for material in the 8th edition. Appendix 1 lists course topics and the corresponding chapters in the 8th and 7th
Course Website

The course website is under ICON (http://icon.uiowa.edu). Login with your username and password. Announcements, syllabus, course content, supplemental readings, and grades will be posted here. Please check for homework updates that may contain clarifying information.

Practice Problems

Appendix 1 lists problems from the course textbook (8th and 7th editions) and are recommended to practice applying concepts and problem solving skills. These problems will not be collected or graded. Answers to some of these problems may be found in the textbook; the optional Solutions Manual will contain detailed solutions.

IV. Grading

Letter Grades

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A range</td>
<td>90-100%</td>
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<tr>
<td>B range</td>
<td>80-90%</td>
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<tr>
<td>C range</td>
<td>70-80%</td>
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<tr>
<td>D range</td>
<td>60-70%</td>
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<tr>
<td>F range</td>
<td>&lt; 60%</td>
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The lower limits for letter grades may be adjusted, but will never be raised. For example, the A range for final grades may be 88-100%, but will not be 95-100%.

Plus or minus grades will be appended to letter grades.

Grading Scheme

Problem Sets – 30% (each assignment 5%)
ICON-based Quizzes – 5%
Mid-semester exams – 45% (each exam 15%)
Final exam – 20%

Problem Sets

There will be 6 graded problem sets in this course. Problem sets are designed to highlight important concepts and practice problem-solving skills. They are intended to be challenging and will require time and thought. Do not wait until the last minute to start on these assignments.

A complete assignment will show all work, clearly state all assumptions, and provide clear and concise explanations when asked. Numerical answers must be reported with the correct number of significant figures and units. Graphs must be properly titled and all axes must be labeled. Written explanations shall be given in grammatically-correct sentences.
Problem sets turned in late will not be accepted for a grade without a completed **Explanatory Statement of Absence**. Unless otherwise noted, all assignments are due at the start of class on the due date.

**Exams**

There will be four exams in this course. Three mid-term exams will be held in-class and will cover the following material:

**Exam 1:** The Analytical Process, Chemical Measurements, Experimental Error, Statistics, Quality Assurance and Calibration Methods, Chemical Equilibrium, Activity

**Exam 2:** The Systematic Treatment of Equilibrium, Monoprotic Acid-Base Equilibria, Polyprotic Acid-Base Equilibria, Acid-Base Titrations

**Exam 3:** Fundamentals of Electrochemistry (and Appendix D), Electrodes and Potentiometry, Redox Titrations, Electroanalytical Techniques

The **final exam** is cumulative and will be held during final exam week. Exam dates are listed in Appendix 2.

**Quizzes (in ICON)**

ICON-based quizzes will be used to evaluate textbook comprehension. Quizzes over textbook chapters will be assigned throughout the semester and are due the day before the chapter will be covered in class. Students should prepare for quizzes by reading the assigned chapter(s), reviewing the associated appendices, and working through exercises and problems. A time limit of 30 minutes will be allowed for each quiz.

**Re-grading**

Adjustments to grades will only be considered within one week after an assignment or exam is returned. The re-grade request must be accompanied by a written, detailed description of the grading concern. Re-grading will involve re-assessment of the entire assignment and may increase or decrease the grade.

**Extra Credit**

Any extra credit will be given at the discretion of the instructor. Extra credit opportunities may appear in the form of classroom participation, pop-quizzes, or exam questions.
V. Course Conduct

Attendance

Attendance is mandatory for all exams. In the case of an excusable absence (e.g. illness, mandatory religious obligation, certain University activities, or unavoidable circumstances), an Explanatory Statement of Absence must be provided to the instructor in advance of foreseeable absences or within 72 hours of unforeseeable absences.

For class periods, attendance is expected.

Preparedness

Students are expected to be prepared for class to start at 10:30AM sharp. Students are expected to have read the textbook chapter(s) to be covered in advance of class. Students should bring to class a calculator, writing utensils, and class notes.

Classroom Etiquette

Students shall conduct themselves in a manner that will not disrupt the learning of other students. Cell phones may not be used in class for any reason. All personal devices must be silenced prior to the start of class. Students may not use internet in class, unless instructed.

Exam Conduct

Calculators: Programmable calculators or calculators on mobile devices are not permitted. Students are encouraged to use a non-programmable calculator with scientific notation and logarithm capabilities. If such a calculator is not available, contact the instructor 24 hours in advance of the exam to request to borrow a permissible calculator.

Time Limit: Exams are limited to the allotted two-hour period and time limits are strictly enforced. Please show up on time for exams and turn in your exam promptly at the end of the period when asked.

Personal Belongings: During exams, all personal belongings, including books, bags, notes, mobile devices, and computers, must be fully enclosed in backpacks and left at the front of the room.

Homework Assignments

Graded assignments must be individually prepared. Discussion of assignments with other students will inspire creative and critical thinking and is encouraged. Keep in mind:

- You may not copy from one another.
- For computer-based assignments, each student is responsible for generating and developing their own files. For example, one spreadsheet generated in collaboration by two individuals does not constitute individual work and is not acceptable.
Any questions about what constitutes acceptable group behavior should be directed to the instructor.

**Expected Workload**

This is a 3 credit hour course, so under University policy you should expect (on average) to spend 6 additional hours on this course outside of classroom time per week.

**VI. Administrative Details**

**Chemistry Center**

Chemistry Building E225  
(319) 335-1341

Here, you may obtain signatures to add/drop chemistry courses.

**Department of Chemistry Office**

Mark Arnold, Departmental Executive Officer  
Chemistry Building E331  
(319) 335-1350

**Administrative Home**

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at [http://clas.uiowa.edu/students/handbook](http://clas.uiowa.edu/students/handbook).

**Electronic Communication**

University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences ([Operations Manual, III.15.2, k.11](http://clas.uiowa.edu/students/handbook)).

**Accommodating Disabilities**

A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See [www.uiowa.edu/~sds/](http://www.uiowa.edu/~sds/) for more information.

**Academic Honesty**

All CLAS students have, in essence, agreed to the College’s [Code of Academic Honesty](http://clas.uiowa.edu/students/handbook): "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled ([CLAS Academic Policies Handbook](http://clas.uiowa.edu/students/handbook)).
| **CLAS Final Examination Policies** | The final examination schedule for each class is announced around the fifth week of the semester by the Registrar. Final exams are offered only during the official final examination period. *No exams of any kind are allowed during the last week of classes.* All students should plan on being at the UI through the final examination period. Once the Registrar has announced the dates and times of each final exam, the complete schedule will be published on the Registrar's web site. |
| **Making a Suggestion or a Complaint** | Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS [Academic Policies Handbook](#)). |
| **Understanding Sexual Harassment** | Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI [Comprehensive Guide on Sexual Harassment](#) for assistance, definitions, and the full University policy. |
| **Reacting Safely to Severe Weather** | In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the [Department of Public Safety website](#). |

*These CLAS policy and procedural statements have been summarized from the web pages of the [College of Liberal Arts and Sciences](#) and The University of Iowa [Operations Manual](#).*
# Appendix 1: Units, Topics, Chapters, and Practice Problems

<table>
<thead>
<tr>
<th>Unit and Topics</th>
<th>Harris, 8th Edition</th>
<th>Harris, 7th Edition</th>
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<tr>
<td></td>
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<td>Review (Appendices)</td>
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<td>Monoprotic Acid-Base Equilibria</td>
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<td>Polyprotic Acid-Base Equilibria</td>
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<td>Acid-Base Titrations</td>
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<td>3. Electrochemistry</td>
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<td>4. Chemical Equilibria, Part 2</td>
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<td>Gravimetric Analysis, Precipitation Titrations, and Combustion Analysis</td>
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<td>Advanced Topics in Equilibrium</td>
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Appendix 2: Chemistry 111 Exam Schedule, Fall 2012

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<td>Exam 2</td>
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<td>W151 PBB</td>
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<tr>
<td>Exam 3</td>
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<td>6:30-8:30 PM</td>
<td>W151 PBB</td>
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