Analytical Chemistry I  
CHEM:3110:000A  
Syllabus

I. Logistics

Instructor  Professor Betsy Stone  
Chemistry Building W313  
Tel. (319) 384-1863  
betsy-stone@uiowa.edu

Office Hours  Tuesdays 10:30-11:30am, Wednesdays 1:30-2:30pm, Thursdays 2:30-3:30pm

Lecture  106 GILH,  
Location/Time  10:30 – 11:20am Mondays, Wednesdays, and Fridays

Discussion  Mondays 5:30-6:30pm E203 CB  
Location/Time  Tuesdays 8:30-9:20am E224 CB  
Wednesdays 2:30-3:20pm E215 CB

Teaching Assistants and Office Hours  
Md. Robiul Islam  
md-islam@uiowa.edu  
Chemistry Building E208  
Mondays 4:30-5:30pm  
Wednesdays 4:30-5:30pm

Joshua Coduto  
joshua-coduto@uiowa.edu  
Chemistry Building E208  
Wednesdays 12:30-1:30pm  
Thursdays 10:30-11:30am

Peer Mentor  Virginia Lamas Meza  
virginia-lamasmeza@uiowa.edu

Quiz and Exams Dates and Locations  
Quiz: Friday, September 16 10:30-11:20am 106 GH  
Exam 1: Thursday, October 10 6:30-8:30pm 101 BBE  
Exam 2: Thursday, November 21 6:30-8:30pm 101 BBE  
Final Exam: TBA

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 applying concepts and solving problems in analytical chemistry, with an emphasis on solution equilibria (e.g., acid-base chemistry, solubility, complexation) and electrochemistry (e.g. redox titrations, potentiometry, voltammetry, coulometry).

All equilibrium problems can be solved using a few basic ideas: equilibrium reactions and equilibrium constant expressions; conservation of mass; and conservation of charge. Skills for visualizing information about solutions and titrations will be developed. Electrochemical systems are included in these parameterizations through introduction of the Nernst equation.
Objectives
Throughout this course, we will focus on the following learning objectives:

1. Understand the fundamental concepts of chemical equilibrium
2. Parameterize solution behavior and calculate solution concentrations given the appropriate equilibrium constants
3. 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.
4. 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.

Requirements
CHEM:1120 and (MATH:1460 or MATH:1850) and (PHYS:1511 or PHYS:1611)

III. Course Outline and Corresponding Textbook Chapters

1. Introduction and Review
   a. The Analytical Process (Ch. 0)
   b. Chemical Measurements (Ch. 1; especially pp. 8-20 and Tables 1-1 to 1-3)
   c. Experimental Error (Ch. 3)
   d. Review (Sections 4.7, 5.3, 5.4, Appendices A, D, E)

2. Chemical Equilibrium
   a. Chemical Equilibrium Fundamentals (Ch. 6, 8, 9)
   b. Activity and the Systematic Treatment of Equilibrium (Sections 8-4 to 8.5)
   c. Acids and Bases (Ch. 10, 7, 11, 13)

3. Electrochemistry
   a. Fundamentals of Electrochemistry (Ch. 14, Appendix D)
   b. Electrodes and Potentiometry (Ch. 15)
   c. Redox Titrations (Ch. 16)
   d. Electroanalytical Techniques (Ch. 17)

4. Complexation and Gravimetry
   a. Complexation (Ch. 12)
   b. Gravimetry (Ch. 27)
   c. Precipitation titrations (Section 7.3)

Required Text

The textbook is available at Iowa Book, the Iowa Hawk Shop, and is also in Course Reserves at the UI Sciences Library. Students opting to use an earlier edition of the book will be held responsible for material in the 9th edition. If using an older version of the textbook, see the Harris Chapter Correspondence of Older Editions file on ICON.
Discussion Sections
Discussion sections are limited to approximately 30 students and are a very helpful, more personal complement to lectures. These sessions provide students with the opportunity to ask questions and gain problem-solving experience. Graduate teaching assistants facilitate activities that emphasize quantitative analysis and problem-solving.

Attendance and participation are required throughout the semester. You must receive permission in advance to attend an alternate discussion section. Only requests that satisfy valid absences will be considered.

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.

IV. Grading

Grading Scheme
Your final course grade will be based on total points earned for exams, quizzes, and discussion activities. The course components are scored as followed:

- Mid-semester exams (2) 300 points (30%)
- Final exam 200 points (20%)
- Quiz 50 points (5%)
- Discussion activities 350 points (35%)
- Participation 100 points (10%)
- Total 1000 points (100%)

Letter Grades
- A range 90-100%
- B range 80-90%
- C range 70-80%
- D range 60-70%
- F range < 60%

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.

Discussion activities
There will be 15 graded discussion activities in this course worth 25 points each. Activities will be conducted either individually or in groups, as assigned. Activities will be collected and graded. Points are awarded for performance on graded discussion activities. Your lowest activity score will not count toward your grade. You cannot participate in discussion activities if you are not present.

Complete answers to activities will show all equations and 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 complete, grammatically-correct sentences.
Quizzes and Exams

There will be one quiz and three exams in this course. Two mid-term exams will be held on Thursday evenings. Content to be covered on quiz and exam (corresponding to the course outline on page 2) include:

- **Quiz**: Introduction and Review
- **Exam 1**: Chemical Equilibrium
- **Exam 2**: Electrochemistry
- The **final exam** is cumulative and will be held during final exam week. The final examination date and will be announced on the course ICON site once it is known.

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 using the re-grade request form on ICON. Re-grading will involve re-assessment of the entire assignment and may increase or decrease of 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 pop-quizzes, take-home activities, or exam questions.

V. Course Conduct

Attendance

Attendance is mandatory for our quiz, exams, and discussion sections. 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. There will be no opportunity to make up unexcused absences. For lectures, attendance is expected.

Preparedness

Students are expected to be prepared for lectures and discussion sessions to start promptly at the scheduled time. Students are expected to be prepared to participate in activities, engage in problem solving and discussions, and think critically. Bring a calculator, writing utensils, and class notes to each lecture and discussion section.

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.

Tips for Success

- Engage in learning the course material. It’s interesting, fun, and useful!
- Read the assigned textbook chapters
- Practice the suggested problems from the textbook, these are essential to exercise your problem-solving skills and to prepare for graded work.
- Participate your weekly discussion sections and complete the assigned activities.
- Ask questions! Instructors are here to help you learn course material.
- Come to office hours prepared with questions.
- If you are dissatisfied with your performance, see the instructor immediately.
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. Taking notes will help you learn the course material, so no unauthorized photographs or recordings may be taken.

Graded activities

The work that you turn in must be your own, unless activities are assigned to groups. 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 student collaboration should be directed to the instructor.

Exam Conduct

**Equation sheets** will be provided to you. Exams are **closed book** and **closed note**.

**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.

VI. Administrative Details / College of Liberal Arts & Sciences Teaching Policies & Resources – Information for Undergraduates

**Chemistry Center**
Chemistry Building E225
(319) 335-1341

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

**Department of Chemistry Office**
Leonard MacGillivray, Departmental Executive Officer
Chemistry Building E331
(319) 335-1350

**Absences and Attendance**
Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing their course absence policies, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, unavoidable circumstances, or University authorized
**Academic Integrity**

All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College’s [Code of Academic Honesty](https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM2019.pdf). Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through the UI email address ([https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code](https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code)).

**Accommodations for Disabilities**

UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at [https://sds.studentlife.uiowa.edu/](https://sds.studentlife.uiowa.edu/).

**Administrative Home of the Course**

The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here: [https://clas.uiowa.edu/students/handbook](https://clas.uiowa.edu/students/handbook).

**Communication and the Required Use of UI Email**

Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI ([Operations Manual, III.15.2](https://clas.uiowa.edu/students/handbook/student-rights-responsibilities)).

**Complaints**

Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences. For more information, see [https://clas.uiowa.edu/students/handbook/student-rights-responsibilities](https://clas.uiowa.edu/students/handbook/student-rights-responsibilities).

**Final Examination Policies**

The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals. Visit [https://registrar.uiowa.edu/final-examination-scheduling-policies](https://registrar.uiowa.edu/final-examination-scheduling-policies).

**Nondiscrimination in the Classroom**

UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University’s Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity ([diversity.uiowa.edu](https://diversity.uiowa.edu)).
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 must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see https://osmrc.uiowa.edu/.

*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.*