

2 cr.

Prereq: CHEM 163 and CHEM 163L, CHEM 201 and CHEM 201L; or credit or enrollment in CHEM 178; and concurrent enrollment in CHEM 211L.

Course Description: Theory and practice of elementary volumetric, chromatographic, electrochemical, and spectrometric methods of analysis. Chemical equilibrium, sampling, and data evaluation. Emphasis on analytical chemistry; the same methods are widely used in biological and materials sciences as well.

Lecture: MW, 11:00 am -11:50 am, 2205 Gilman Hall
Instructor: Dr. Jan Borchers
Office: 0273 Gilman Hall
Email: jborch67@iastate.edu
Office Hours: Wed. 9 -10 am, Thurs. 1-2 pm or by appointment

Head TA: Emily King
Email: ecross@iastate.edu
Office Hours: Tues. 10 - 11 am, General Chemistry Help Center, Gilman 1761

Course Materials:

TEXTBOOK - "Exploring Chemical Analysis", 5th ed. by Harris. The e-book is automatically purchased and accessible through "**Immediate Access Course Materials**" in Canvas. You may opt out of Immediate Access within the first 10 days of class if, for instance, you would rather purchase a hard copy of the text through an external source.

SCIENTIFIC CALCULATOR – Any scientific or graphing calculator. **Cell phones may not be used as calculators.**

CANVAS - Canvas will serve as our official electronic course interface. Please check Canvas often for important announcements, course materials, and grade information. Visit www.canvas.iastate.edu

Important Course Policy: Save ALL of the graded work that the Head TA returns to you until after the semester is complete. It is your responsibility to check grades on Canvas. If you discover an error in a grade on Canvas, please show the graded work to the Head TA **within ONE WEEK** of receiving the returned graded work to have the grade corrected.

Classroom Technology Policy:

Allowed: Calculators and Electronic devices which lay flat (eg. tablet, ipad) used for class purposes only.

Not allowed: Cell phones, laptops with vertical screens.

Examinations/Homework Assignments:

EXAMS – There will be four examinations (100 pts each) of which the lowest will be dropped, and a comprehensive final exam (150 points) given on the dates listed below. You will take these exams during class in your regular classroom, 2205 Gilman. *Please note the day and time of the **final exam** is already scheduled (it cannot be changed) so make your end-of-semester travel plans accordingly.* Exams 1-4 will be returned at the next class session after they are graded.

Exam 1: Monday, February 13

Exam 2: Monday, March 6

Final Exam: Thursday, May 11, 7:30 – 9:30 am

Exam 3: Monday, April 3

Exam 4: Monday, April 24

HOMEWORK ASSIGNMENTS – There will be approximately 14 Homework assignments (10 pts each) of which the 2 lowest will be dropped. The homework assignments will be provided chapter by chapter. The homework assignments will be problems at the end of each chapter of the textbook. We ask you to please **show ALL of your work completely for full credit**. If you do not show your work completely (for example, you show only a number for your answer), we cannot award full credit.

The first homework assignment will be due on Tuesday, January 24 by 11:59 pm on Canvas as a PDF. All subsequent homework assignments will be due on Sundays by 11:59 pm on Canvas as a PDF. A list of the homework assignments is provided at the end of this syllabus. The Head TA will grade selected homework problems. The graded problems will be posted on Canvas by the following week. Homework assignments will be graded on the following basis:

- 0 points = no homework submitted on Canvas
- 1-2 points = no work shown, only answers
- 3-4 points = less than 50% complete
- 5-6 points = 50% complete, showing only minimal work or without demonstrating clear understanding
- 7-8 points = 75% complete, showing only minimal work or without demonstrating clear understanding
- 9-10 points = complete with all work shown

Missing/Rescheduling Exams:

Exams may be rescheduled before or for the same-day as, **but not after** the actual exam. The exam will be proctored in-person. Contact the instructor as far in advance as possible to reschedule an exam. Rescheduling the Final Exam requires a legitimate excuse (not vacation). In cases of sudden emergency where the exam simply cannot be taken, the exam will be recorded as a zero and will be automatically dropped at semester's end per the drop policy. **If you miss the final exam, you will fail the course.**

Drop Policy/Purpose of Dropped Assignments:

In this course the lowest: 1 exam and 2 homework assignments will be dropped by semester's end. The drop policy serves two purposes: 1) To accommodate sudden emergencies; and 2) To eliminate the administrative burden associated with deadline extensions, etc.

Course Protocol:

GRADES: Your Chem 211 course grade will be based on a total possible 600 points as outlined below

3 one hour exams at 100 points each	300 points
Comprehensive final exam at 150 points	150 points
12 homework assignments at 10 points each	120 points
Flex Points	<u>30 points</u>
Total	600 points

GRADING SCALE FOR THE COURSE: The grading scale will be determined by the instructor at the midterm and again at the end of the semester.

LATE WORK: Late work is not accepted under any circumstance. Emergency situations are covered by the drop policy.

ACADEMIC INTEGRITY: Academic integrity is expected of you during this course. If you demonstrate Academic Misconduct in any form, you are in violation of ISU *Student Disciplinary Regulations*. This includes but is not limited to: copying or sharing answers on exams and assignments, plagiarism, and having someone else do your academic work. Please do not engage in academic misconduct! It is considered a

serious offense. As an instructor, I am obligated to inform the Dean of Students of your action(s). Then the Dean will meet with you to discuss sanctions. Depending on the act, you could receive an F grade on the exam or assignment, F grade for the course, and/or could be suspended or expelled from the University. (Please see (<http://www.studentconduct.dso.iastate.edu/academic-misconduct>) for more details and a full explanation of the Academic Misconduct policies.)

Other Useful Information:

ACCESSIBILITY STATEMENT: Iowa State University is committed to advancing equity, access, and inclusion for students with disabilities. Promoting these values entails providing reasonable accommodations where barriers exist to students' full participation in higher education. Students in need of accommodations or who experience accessibility-related barriers to learning should work with Student Accessibility Services (SAS) to identify resources and support available to them. Staff at SAS collaborate with students and campus partners to coordinate accommodations and to further the academic excellence of students with disabilities. Information about SAS is available online at www.sas.dso.iastate.edu, or by email at accessibility@iastate.edu.

If you require accommodations, please contact me as soon as you can (**preferably during the first week** you are enrolled in the course) so that you and I can talk about how we can make appropriate arrangements to meet your needs as soon as possible. **For us to be able to help you for an exam accommodation, our staff has asked that requests be made a minimum of four business days prior.**

FREE EXPRESSION: Iowa State University supports and upholds the First Amendment protection of freedom of speech (<https://bit.ly/isu-freedomspeech>) and the principle of academic freedom (<https://bit.ly/regents-academicfreedom>) in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner.

PUBLIC HEALTH: If you are not feeling well, you should stay home and focus on your health. Should you miss class due to illness, it is your responsibility to work with your instructor to arrange for accommodations and to make up coursework, as consistent with the instructor's attendance policy. You may choose to wear a face mask and/or receive the COVID-19 vaccine and boosters, as well as other vaccines such as influenza, but those options are not required. Thielen Student Health Center will continue to provide COVID-19 vaccinations free-of-charge to students. Wellbeing resources for students are available at: <https://www.cyclonehealth.iastate.edu/wellbeing-resources/>. Public health information for the campus community continues to be available on Iowa State's public health website (<https://health.iastate.edu/public-health/>). All public health questions should be directed to publichealthteam@iastate.edu.

The *last day to drop the course:* Friday, March 31, 2023

Tentative Schedule for Chem 211 (Spring 2023)

Week	Dates	Chapter/Topic	HW Assignments
1	M 1/16	University Holiday	HW#1 – Unit Conversion Worksheet (see “Files” in Canvas). Due Tues. 1/24, 11:59 pm. Upload pdf to Canvas.
	W 1/18	Introductions/Syllabus Review Unit Conversions (dimensional analysis)	

2	M 1/23	Problem solving using unit conversions. Expectations for showing work in the course.	HW#2 – Due Sun. 1/29, 11:59 pm , pdf, Canvas Ch. 0 Problems: 1, 2, 4 Ch. 1 Problems: 1, 2, 11, 17, 23, 27, 30, 31, 32
	W 1/25	Ch. 0: The Analytical Process	
3	M 1/30	Ch. 1: Chemical Measurements	HW#3 – Due Sun. 2/5, 11:59 pm , pdf, Canvas Ch. 3 Problems: 1, 2, 3, 4, 7, 9
	W 2/1	Ch. 3: Math Toolkit	
4	M 2/6	Ch. 3: Math Toolkit	HW#4 – Due Sun. 2/12, 11:59 pm , pdf, Canvas Ch. 3 Problems: 10, 11, 19, 20 Ch. 4 Problems: 1, 2, 4
	W 2/8	Ch. 4: Statistics	
5	M 2/13	Exam 1 (thru Ch. 3)	HW#5 – Due Sun. 2/19, 11:59 pm , pdf, Canvas Ch. 4 Problems: 7, 14, 15 (7(c) isn't too bad because it uses the shorter formula)
	W 2/15	Ch. 4: Statistics	
6	M 2/20	Ch. 5: Quality Assurance and Calibration Methods	HW#6 – Due Sun. 2/26, 11:59 pm , pdf, Canvas Ch. 5 Problems: 6, 8, 9, 11, 15, 17, 22 Ch. 6 Problems: 1, 3, 10, 12, 25
	W 2/22	Ch. 6: Good Titrations	
7	M 2/27	Ch. 8: Introducing Acids and Bases	HW#7 – Due Sun. 3/5, 11:59 pm , pdf, Canvas Ch. 8 Problems: 4, 15, 30 Ch. 9 Problems: 2, 4, 6, 10
	W 3/1	Ch. 9: Buffers	
8	M 3/6	Exam 2 (thru Ch. 8)	HW#8 – Due Sun. 3/12, 11:59 pm , pdf, Canvas Ch. 10 Problems: 9, 18
	W 3/8	Ch. 10: Acid-Base Titrations	
Spring Break 3/13 - 3/17			
9	M 3/20	Ch. 10: Acid-Base Titrations	HW#9 – Due Sun. 3/26, 11:59 pm , pdf, Canvas Ch. 10 Problems: 14 Ch. 11 Problems: 16, 32
	W 3/22	Ch. 11: Polyprotic Acids and Bases	
10	M 3/27	Ch. 17: Instrumental Methods in Electrochemistry	HW#10 – Due Sun. 4/2, 11:59 pm , pdf, Canvas Ch. 17 Problems: 9, 13, 22 Ch. 18 Problems: 5, 8, 10, 16
	W 3/29	Ch. 18: Let There be Light	
11	M 4/3	Exam 3 (thru Ch. 17)	HW#11 – Due Sun. 4/9, 11:59 pm , pdf, Canvas Ch. 19 Problems: 3, 5, 7, 13
	W 4/5	Ch. 19: Spectrophotometry: Instruments and Applications	
12	M 4/10	Ch. 20: Atomic Spectroscopy	HW#12 – Due Sun. 4/16, 11:59 pm , pdf, Canvas Ch. 20 Problems: 3, 6, 10 Ch. 21 Problems: 3, 4, 8, 9(??)
	W 4/12	Ch. 21: Principles of Chromatography and Mass Spectrometry	
13	M 4/17	Ch. 21: Principles of Chromatography and Mass Spectrometry	HW#13 – Due Sun. 4/23, 11:59 pm , pdf, Canvas Ch. 21 Problems: 20, 22, 24, 25, 27
	W 4/19	Ch. 22: Gas and Liquid Chromatography	
14	M 4/24	Exam 4 (thru Ch. 21)	HW#14 – Due Sun. 4/30, 11:59 pm , pdf, Canvas Ch. 22 Problems: 2, 7, 14, 15, 17
	W 4/26	Ch. 22: Gas and Liquid Chromatography	
15	M 5/1	Ch. 23: Chromatographic Methods and Capillary Electrophoresis	
	W 5/3	Ch. 23: Chromatographic Methods and Capillary Electrophoresis	
FINAL EXAM* – Thursday, May 11, 7:30 – 9:30 am			

*ISU Final examinations policy will be followed absolutely (<http://www.registrar.iastate.edu/exams/>).