Chemistry 345 – Organic Chemistry II (3 cr)
Fall 2022

Online Course Website

The course website can be accessed through the general Canvas dashboard located at https://canvas.wisc.edu

Course Designations

Breadth – Physical Sci. Counts toward the Natural Sci. req.
Level – Intermediate
L&S Credit – Counts as Liberal Arts and Science credit in L&S

Instructional Mode

The course is instructed with all sessions being face-to-face

Credit Hour Completion

The credit standard for this course is met by an expectation of a total of 135 hours of student engagement with the course learning activities (at least 45 hours per credit), which includes 4 hours of scheduled instructor: student meetings per week, reading, studying, and other student work as described in the syllabus.

Regular and Substantive Student-Instructor Interaction

Regular interactions include meeting with the instructional team during three whole-class meetings per week and meeting with teaching assistants during one small group meeting per week. Substantive interactions include direct instruction throughout whole-class meetings, guided group problem-solving during small-group meetings and feedback on written assessments.

Instructors and Teaching Assistants

Prof. Ryan Stowe (rstowe@chem.wisc.edu); office hours tbd.

Teaching assistants are assigned near the start of the semester.

Course Description

Principles of molecular structure and bonding applied to predict and explain the reactivity of aromatic systems, benzylic and allylic systems, aryl and vinyl halides, and carbonyl-containing compounds (e.g., ketones, carboxylic acids, esters, acid chlorides, amides). Emphasis placed on rationalizing the stereochemical and regiochemical outcome of chemical processes as well as arguing reaction outcomes from spectroscopic evidence.

Course Requisites: CHEM 343

Course Learning Outcomes:

- Construct and use a transition state rendering to explain how donor-acceptor interactions result in the stereochemical or regiochemical outcome observed for a reaction
- Construct and use an electron pushing mechanism or reaction energy profile to evaluate the validity of claims as to the outcome of a chemical process
- Construct and use appropriate structural representations to explain observed differences in the physical and chemical properties of substances in terms of electrostatics, orbital overlap and energy
- Construct and use a reaction energy profile to justify why a particular reaction system is likely to produce the product formed most quickly or which is most stable
- Construct or critique an argument, using spectroscopic evidence, as to the product(s) emergent from a particular reaction process.
- Design and justify a multi-step synthetic route capable of feasibly generating a molecular target from specified starting materials

Textbook

Organic Chemistry 7th edition by Marc Loudon and Jim Parise

Graded Materials

Students' grades are determined by their achievement on three quizzes, three midterm examinations, and a final exam. The relative weighting of these assignments is given below

- *Quizzes:* 3 quizzes are worth 15% of the total points in the course
- *Mid-term Exams:* Three mid-term examinations are worth 65% of course points
- *Final Exam:* A final exam is worth 20% of course points

Homework

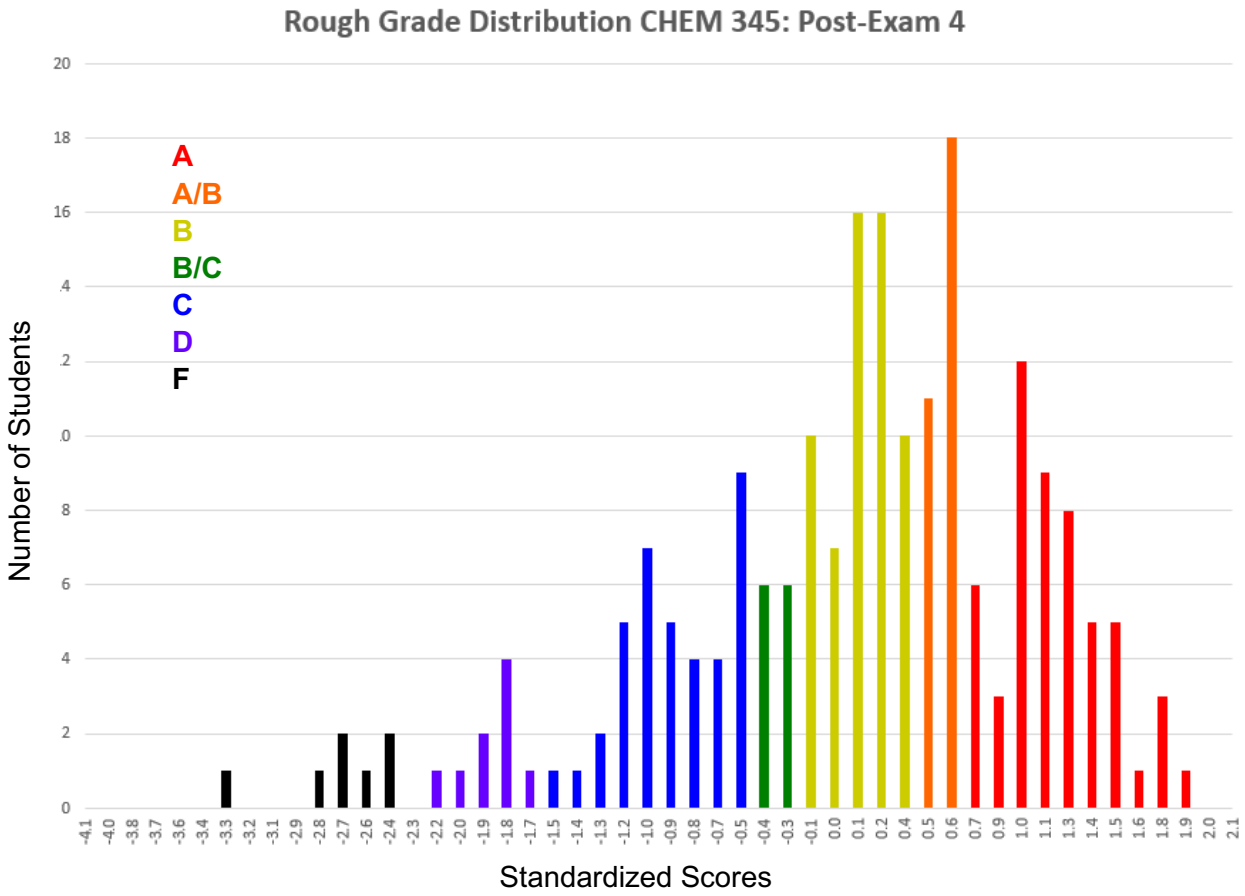
Additional homework assignments are provided to students to assist with preparation for graded assessments. Homework problems are written by the CHEM 345 instructional team and require students to connect structural and energetic ideas to explaining how and why chemical phenomena happen.

Discussion Sections

One TA-led 50-minute discussion section is held each week. Participation in discussion sections is not factored into students' grades. Discussion meetings are dedicated to collaboratively working through challenging problems.

Grading Policy

Grade boundaries will be determined based on the historic distribution of standardized scores in the course. The class mean score will be set to the B – B/C grade boundary. Other boundaries will be determined by standard deviations from this mean. Boundaries will be adjusted to ensure the number of students who earn each grade are consistent with historical distributions. An approximation of this historic distribution is shown by the histogram below.



Standardized scores on each assignment and the course overall are determined by the following formula:

$$Standardized\ Score = \frac{Your\ score - mean\ score}{standard\ deviation}$$

Accordingly, a standardized score of 0 represents the class mean.

Sample Schedule (from Sp22)

This schedule includes a list of recommended readings (from the 7th edition of *Organic Chemistry* by Marc Loudon and Jim Parise), topics, and assignments.

	Monday	Wednesday	Friday
	Jan 24	**Jan 26**	**Jan 28**
Textbook Sections		**12.1 – 12.6**	**13.1 – 13.12**
Topics		Intro to Spectroscopy	
Problem Sets			**Start PS 13**
Discussion Section	**Discussion Activity 1**		
	Jan 31	**Feb 02**	**Feb 04**
Textbook Sections	**13.1 – 13.12**	**13.1 – 13.12**	**15.7**
Topics	Spectroscopy		Aromaticity
Problem Sets			
Discussion Section	**Discussion Activity 2**		
	Feb 07	**Feb 09**	**Feb 11**
Textbook Sections	**16.1 – 16.4**	**16.1 – 16.4**	**16.5**
Topics	Chemistry of Benzene and Its Derivatives		
Problem Sets	**Start PS 16**		
Discussion Section	**Discussion Activity 3**		
	Feb 14	**Feb 16**	**Feb 18**
Textbook Sections	**16.6**	**17.1 – 17.2**	Review
Topics	Chem. of Benzene	Allylic and Benzylic Reactivity	
Problem Sets		**Start PS 17**	
Discussion Section	**Discussion Activity 4**		
	Feb 21	**Feb 23**	**Feb 25**
Textbook Sections	**17.3 – 17.5**	**18.1 – 18.4**	**18.5 – 18.9**

Topics	Allylic and Benzylic Reactivity	Chemistry of Aryl Halides and Vinyl Halides, and Phenols, Transition-Metal Catalysis	
Problem Sets		**Start PS 18**	
Discussion Section	**Discussion Activity 5**		
Quiz/Exam	**EXAM 1 (Ch 1-16)** **5:30 – 7:00 pm**		
	Feb 28	**Mar 02**	**Mar 04**
Textbook Sections	**19.1 – 19.7**	**19.8 – 19.9**	**19.10 – 19.11**
Topics	Chemistry of Aldehydes and Ketones		
Problem Sets	**Start PS 19**		
Discussion Section	**Discussion Activity 6**		
	Mar 07	**Mar 09**	**Mar 11**
Textbook Sections	**19.12 – 19.14**	**20.1 – 20.8**	**20.9 – 20.11**
Topics	Chem of Aldehydes and Ketones	Chemistry of Carboxylic Acids	
Problem Sets		**Start PS 20**	
Discussion Section	**Discussion Activity 7**		
	Mar 14	**Mar 16**	**Mar 18**
Spring Recess			
	Mar 21	**Mar 23**	**Mar 25**
Textbook Sections	Review	**21.1 – 21.7**	**21.8 – 21.9**
Topics		Chemistry of Carboxylic Acid Derivatives	
Problem Sets		**Start PS 21**	
Discussion Section	**Discussion Activity 8**		
Quiz/Exam		**EXAM 2 (Ch 1-20)** **5:30 – 7:00 pm**	
	Mar 28	**Mar 30**	**Apr 01**
Textbook Sections	**21.10 – 21.11**	**22.1 – 22.2**	**22.1 – 22.3**

Topics	Chem. of Carboxylic Acid Derivatives	Chemistry of Enolates, Enols, and α,β-Unsaturated Carbonyl Compounds	
Problem Sets		**Start PS 22**	
Discussion Section	**Discussion Activity 9**		
	Apr 04	**Apr 06**	**Apr 08**
Textbook Sections	**22.4 – 22.6**	**22.7 – 22.12**	**23.1 – 23.8**
Topics	Chemistry of Enolates, Enols, and α,β - Unsaturated Carbonyl Compounds		Chemistry of Amines
Problem Sets			**Start PS 23**
Discussion Section	**Discussion Activity 10**		
	Apr 11	**Apr 13**	**Apr 15**
Textbook Sections	**23.8 – 23.10**	**23.11 – 23.12**	**23.11 – 23.12**
Topics	Chemistry of Amines		
Problem Sets			
Discussion Section	**Discussion Activity 11**		
	Apr 18	**Apr 20**	**Apr 22**
Textbook Sections	**26.1 – 26.3**	**26.4**	Review
Topics	Chemistry of Aromatic Heterocycles		
Problem Sets	**Start PS 26**		
Discussion Section	**Discussion Activity 12**		
	Apr 25	**Apr 27**	**Apr 29**
Textbook Sections	**28.1 – 28.2**	**28.3**	**28.4**
Topics	Pericyclic Reactions		
Problem Sets	**Start PS 28**		
Discussion Section	**Discussion Activity 13**		
Quiz/Exam	**EXAM 3 (Ch 1-23, 26)** **5:30 – 7:00 pm**		
	May 02	**May 04**	**May 06**

Textbook Sections	**28.4 - 28.6**	**24**	**27**
Topics	Pericyclic Reactions	Carbohydrates	Amino Acids, Peptides and Proteins
Problem Sets		**Start PS 24/27**	
Discussion Section	**Discussion Activity 14**		

Accommodations for Students with Disabilities

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." (Windschitl, 2002)

Diversity & Inclusion

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/