

Synthesis 2
Introduction to Organic Synthesis
Jon R. Parquette

Chemistry 6430
Fall 2022

MWF 3:00-3:55 PM
McPherson 2017

Zoom Link
<https://osu.zoom.us/j/5120258277?pwd=bk4wVXhQVmQ2OXJlbWp5U1JHY3RzQT09>
Meeting ID: 512 025 8277
Password: parquette

Instructor: Professor Jon Parquette (Office: 181 CBEC; e-mail parquett@chemistry.ohio-state.edu; phone 2-5886).

Office hours: By appointment in-person or via Zoom (using Zoom link above).

Course Format: Three in-person lectures (55 min. per lecture) per week.

Teaching assistant: Tongyue (Tori) Chen (chen.8476@buckeyemail.osu.edu); office hours: by appointment

Lectures. Lecture content will be presented in-person (MWF 3:00-3:55 PM).

Course Description. This course will cover key concepts in organic synthesis and is primarily intended for graduate students and advanced undergraduates. The goal of this class is to explore different synthetic strategies for performing highly selective oxidative and reductive transformations, focusing on important elements of chemo-, regio- and stereoselectivity. In addition, this course will cover fundamental chemical principles of orbital controlled reactions such as cycloadditions and electrocyclic reactions. Students will learn how to exploit these transformations in the context of designing synthetic routes to a range of organic target molecules.

Textbooks: Most of the information provided in this course comes from the primary literature rather than textbooks. Background reading in *Organic Chemistry* (Part B) by Carey and Sundberg and in *Modern Methods of Organic Synthesis* by Carruthers will be assigned to supplement the primary literature. Additional references from literature will be added to supplement and update the relevant sections of these books. **You should purchase these two books, Carruthers and Carey/Sundberg**, as we will be covering many topics in them. I encourage you to look up many of these papers on-line.
Texts and study aids:

Modern Methods of Organic Synthesis (4th Edition) by William Carruthers and Iain Coldham
Advanced Organic Chemistry (Part B, 5th Edition) by Francis Carey and Richard Sundberg
Strategic Applications of Named Reactions in Organic Synthesis by Laszlo Kurti and Barbara Czako
Modern Physical Organic Chemistry by Eric Anslyn and Dennis Dougherty

To fully understand the chemistry that we will be discussing in lecture, you should look up most of the references cited in the lecture notes. You can access most of the libraries journals electronically back to 1995-1996 via Ohiolink and any American Chemical Society Journal back to the 1800's via the internet:

Ohiolink: <http://journals.ohiolink.edu/ejc/alpha.cgi>

ACS Journals: <http://pubs.acs.org/about.html> (on campus).

From Home: you need to enter the site via proxy:

(<http://pubs.acs.org.proxy.lib.ohio-state.edu>) and then enter your university login and password.

Problem sets: Problem sets and the solutions are provided online on CarmenCanvas and in hard copy format in two spiral books. *I recommend that you work as many of the problems that are given in Carey and Sundberg as possible.* Several problem sets with associated answer keys will be distributed in class. These problem sets are provided for your benefit-they will not be graded.

Technology Requirements:

CarmenZoom: CarmenZoom is a service provided by OSU at osu.zoom.us. *System Requirements:* an internet connection (broadband wired or wireless 3G or 4G/LTE); speakers and a microphone; a webcam or HD webcam. For more information on supported browsers and operating systems see support.zoom.us/hc/en-us.

CarmenCanvas CarmenCanvas is a service provided by OSU at carmen.osu.edu.

Health and safety requirements: All students, faculty and staff are required to comply with and stay up to date on all university safety and health guidance (<https://safeandhealthy.osu.edu>), which includes wearing a face mask in any indoor space and maintaining a safe physical distance at all times. Non-compliance will result in a warning first, and disciplinary actions will be taken for repeated offenses.

Grading System: The final grade will be determined by performances on one, in-class midterm, and one comprehensive final exam. The midterm exam will account for about 43% and the final exam 57% of your final grade. **You will need to contact me in advance of missing the exam and provide a validated reason for missing the exam**

To encourage all of you to work together, this course will not be graded on a strictly competitive curve system. The grading scale will be adjusted based on the examination statistics similar to a curve system. However, you will be guaranteed a grade based on the grade scale shown below, irrespective of the exam averages. For example, even if the average score on the exams was 85%, you would still be guaranteed some form of an “A”, not a “C” as required by the curve system. So, you are never penalized by higher class performance. I will never increase the percentage required for a given grade.

Grade Scale

- A 85-100%
- B 75-85 %
- C 60-75%
- D 50-60%
- E below 50 %

Grades at either end of the ranges in the grading scheme will be assigned + or - as appropriate.

Midterm I	Nov. 18	Friday	150 pts.
Final examination	Dec. 9	Friday 12:00- 1:45 PM	200 pts.

Class Attendance Policy. Students are expected to attend every lecture. Although we will not specifically take attendance, students are responsible for everything covered or discussed in each lecture. Occasionally, there will be extra credit quizzes offered in lecture and you must be present in lecture to participate in them.

Other Important Dates.

- Nov. 11 Veterans Day-No Class (falls on a Friday)
- Wed-Fri, Nov. 23-25:** *Thanksgiving Day and Columbus Day* observed --no classes, offices closed.
- Wed., Dec. 7:** *Last day of classes*

Approximate Weekly Topical Coverage

General Topics Covered

	Topics	Reading
1.	Reduction Chemistry (2 wks) A. Reduction of Carbon-Carbon π -Bonds B. Reduction of Carbon-Heteroatom Bonds C. Stereoselectivity D. Reduction of a Functional Group to an Alkane	C/S Chp. 5; Carr. Chp. 7
2.	Oxidation Chemistry (2 wks) A. Oxidation of Alcohols B. Oxidation of Carbon-Carbon Bonds C. Oxidation of Carbon-Hydrogen Bonds	C/S Chp. 12; Carr. Chps. 4/6
3.	Sigmatropic Reactions (1.5 wks) A. General Characteristics. [i,j] Sigmatropic Shift B. [3,3] Sigmatropic Rearrangements C. [2,3] Sigmatropic Rearrangements D. Vinylcyclopropane-Cyclopentene Rearrangements	C/S Chp. 6.4-6.6
4.	Cycloaddition Reactions (1.5 wks) A. General Characteristic of Pericyclic Reactions B. Woodward-Hoffman Rules C. Diene/Dieneophile Reactivity D. Regio- and Stereoselectivity of Cycloaddition Reactions E. Catalytic Rate Enhancement F. [2+2] Cycloaddition G. Ene Reactions H. 1,3 Dipolar Cycloadditions	C/S Chp. 6.1-6.3.; Carr. Chp. 3

Students with Disabilities: The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's [request process](#), managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

The Department of Chemistry and Biochemistry promotes a welcoming and inclusive environment for all students and staff, regardless of race, gender, ethnicity, national origin, disability or sexual orientation. There is no tolerance for hateful speech or actions. All violations of this policy should be reported to the OSU Bias Assessment and Response Team (BART, studentaffairs.osu.edu/bias).

The Department encourages diversity at all levels, particularly among the next generation of scientists. Students are encouraged to participate in organizations that provide support specifically for science and engineering students who are African-American, Asian, disabled, Hispanic, LGBTQ or women. These organizations are listed on the Colleges of Arts and

Sciences (artsandsciences.osu.edu/stem-organizations) and Engineering (engineering.osu.edu/studentorgs) web sites.

Homework Problems: *Problem solving is essential to learning organic chemistry.* You should work all the homework problems that appear in the assigned reading. Specific problems will be assigned for each; however, you should try to work as many of the problems at the end of each chapter as you can. The Study Guide provides detailed answers to the problems. These problem sets will neither be collected nor graded, they are for your benefit.

Academic Misconduct. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Cheating: I will not tolerate *any* form of academic misconduct. All suspected cases will be dealt with according to OSU procedures via the Committee on Academic Misconduct. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Examples of misconduct include, but are not limited to: (1) violation of course rules; (2) providing or receiving information during quizzes and examinations; (3) submitting plagiarized or falsified work for credit; (4) falsification, fabrication, or dishonesty in assignments, quizzes, experiments, or exams; (5) serving as a substitute for another student on an examination or falsely claiming to have taken an examination; (6) alteration of grades, marks, or examination answers in an effort to change the earned credit or grade; (7) alteration of University forms used to drop or add courses, or unauthorized use of those forms. (8) Posting quiz and exam content online or receiving information regarding its content from the internet at any point during the semes

Sexual Misconduct/Relationship Violence. Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Diversity. The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.