

Chemistry 610: Organic Reactions

Fall 2017

Tuesday and Thursday 2:20–3:35 PM

Room 2121, Chemistry

Instructor

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Learning Outcomes

This course is designed to introduce upper-level undergraduates and beginning graduate students to advanced topics in organic chemistry. The course begins with a discussion of bonding phenomena, an introduction to FMO theory, and stereoelectronic effects. This section will be followed by lectures in conformational analysis in both cyclic and acyclic systems. Following this introduction, a discussion of the important classes of organic and organometallic reactions will be presented.

Office Hours

Wednesday 8:30–10 AM or by appointment, Chemistry 320

Texts

Course Texts

Clayden, Greeves, Warren, and Wothers, **Organic Chemistry**, 2nd Edition, Oxford University Press, ISBN: 978-0-199-27029-3.

Kurti and Czako, **Strategic Applications of Named Reactions in Organic Synthesis**, Elsevier Academic Press, ISBN: 978-0-124-29785-2.

Molecular models may help with homework problems and can be used during all exams. A kit is sold by the undergraduate chemistry club outside of 2101 or in Chemistry 104.

Supplemental Texts (these texts are on reserve at Evans Library and may be helpful resources):

Carey and Sundberg, **Advanced Organic Chemistry A and B**, Kluwer Academic / Plenum Publishers, ISBNs: 978-0-306-46856-8 (A) 978-0-306-47380-7 (B). Available as an e-book through TAMU library.

Kirby, **Stereoelectronic Effects**, Oxford University Press, ISBN: 019-8-55893-7. Available at the Reserve Desk at Evans Library.

Additional Resources

Practice problems: evans.rc.fas.harvard.edu/problems/index.cgi

Synthetic notes: faculty.chemistry.harvard.edu/myers/pages/chem-215-handouts

Contacting Me

There are a few reliable ways to get the help you need.

- Office hours: Wednesday mornings, 8:30–10:00 AM, Chem 320
- Email: For all emails regarding class, include “**Chem610**” in the subject line. I will do my best to respond within 24 hours.
- For quick questions, before and after class are good times.

Course Grades

Problem Sets	125 points (25 pts / exam)
Review	200 points
Two In-Class Examinations	200 points (100 pts / exam)
<u>Final examination</u>	<u>200 points</u>
Total	725 points

Problem sets will be distributed in class; collaboration on these homework assignments is encouraged, but each student must hand in their own problem set. Information regarding the mini-review project will be forthcoming. Your grade will be based on your *cumulative* performance towards the total number of points possible in the course. In order to grade based on your best effort, at the conclusion of the semester, if your final exam score (%) exceeds any of your hourly exam scores, your hourly exam score will be replaced by the final exam.

Americans with Disabilities Act (ADA) Policy Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

Aggie Honor Code Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the process of the Honor System. Additional information about the Aggie Honor Code can be found at: <http://www.tamu.edu/aggiehonor/>. The consequences for cheating and plagiarism on any assignment associated with CHEM610 will result in an unsatisfactory grade for the course.

Schedule of Lectures and Tentative Exam Dates

Listed below is a schedule of **approximate** lecture coverage and **approximate** exam dates.

Date	Topics	Reading Assignments	Literature Assignments
Aug 29	No Class	RAIN	RAIN
Aug 31 (1)	Bonding Steric, Electronic, Stereoelectronic Effects	Clayden: Chapters 1, 2, 4 Kirby: Chapters 1, 2 C&S A: Chapter 1 SANROS: 476	<i>J. Am. Chem. Soc.</i> 2002 , 124, 3175.
Sep 5 (2)	The Anomeric Effect Substitution Chemistry	Clayden: Chapter 5 Kirby: Chapter 3 C&S A: Chapter 3 SANROS: 16, 170, 182, 206, 234, 248, 294, 484	<i>Angew. Chem. Int. Ed.</i> 1986 , 25, 349.
Sep 7 (3)	The Endocyclic Restriction Test Baldwin's Rules	Clayden: Chapter 15, 31 Kirby: Chapter 5 C&S A: Chapter 5	<i>Acc. Chem. Res.</i> 1993 , 26, 476.
Sep 12 (4)	Conformational Analysis	Clayden: Chapter 16	<i>Nature</i> , 2001 , 411, 539. <i>J. Am. Chem. Soc.</i> 1987 , 109, 6591. <i>J. Am. Chem. Soc.</i> 1979 , 101, 259.
Sep 14 (5)	Ring Conformations	Clayden: Chapter 32 C&S A: Chapter 3	<i>J. Am. Chem. Soc.</i> 1986 , 108, 1692.
Sep 19 (6)	Olefin Chemistry I PS 1 due	Clayden: Chapter 19 C&S A: Chapter 6 SANROS: 66, 82, 362	<i>J. Am. Chem. Soc.</i> 1982 , 104, 4976.
Sep 21 (7)	Olefin Chemistry II	C&S B: Chapter 4 SANROS: 220, 222	<i>J. Chem. Ed.</i> 1986 , 63, 42. <i>Chem. Rev.</i> 1983 , 83, 84. <i>Acc. Chem. Res.</i> 1996 , 29, 552.

Sep 26 (8)	Olefin Chemistry III	Clayden: Chapter 41 SANROS: 404, 406, 408, 410	<i>J. Am. Chem. Soc.</i> 1985 , 107, 4504. <i>J. Am. Chem. Soc.</i> 2010 , 132, 15752. <i>Chem. Rev.</i> , 107, 3180. <i>Nature</i> 2007 , 446, 395. <i>Nature Chem.</i> 2012 , 4, 603. <i>Acc. Chem. Res.</i> 1997 , 30, 131.
Sep 28 (9)	Oxidation Chemistry	Clayden: Chapter 9 SANROS: 28, 136, 228, 250, 262, 346, 354, 380, 388, 390, 450	<i>J. Am. Chem. Soc.</i> 1997 , 119, 3782. <i>J. Am. Chem. Soc.</i> 1984 , 106, 4186. <i>J. Org. Chem.</i> 1996 , 61, 7106. <i>Acc. Chem. Res.</i> 1997 , 30, 97.
Oct 3 (10)	Nucleophilic Addition to Carbonyls PS 2 due	Clayden Chapters 10, 11 Kirby Chapters 6, 7 C&S B: Chapter 5 SANROS: 54, 100, 188, 268, 364	<i>Acc. Chem. Res.</i> 1983 , 16, 153. <i>J. Am. Chem. Soc.</i> 1974 , 96, 6165.
Oct 5 (11)	Felkin-Ahn Control and Enolates	Clayden Chapter 20, 25 C&S B: Chapter 1 SANROS: 202, 300, 374	<i>Tet. Lett.</i> 1968 , 2199. <i>Tet. Lett.</i> 1982 , 2355.
Oct 10	Exam 1		
Oct 12 (12)	Enolate Structure and Reactivity	Clayden: Chapter 25, 26 C&S B: Chapter 2 SANROS: 2, 164, 242, 272, 286	<i>J. Am. Chem. Soc.</i> 1978 , 98, 2868. <i>J. Org. Chem.</i> 1993 , 58, 147. <i>J. Am. Chem. Soc.</i> 1956 , 78, 2579.
Oct 17 (13)	The Aldol Reaction	Clayden Chapter 28 C&S B: Chapter 2 SANROS: 8, 48, 86, 138, 162, 298, 444	<i>J. Am. Chem. Soc.</i> 1976 , 98, 2868. <i>J. Org. Chem.</i> 1993 , 58, 147.
Oct 19 (14)	Organocatalysis	Clayden: Chapter 33 SANROS: 58, 150, 160, 274, 348	<i>J. Am. Chem. Soc.</i> 2002 , 124, 7163. <i>J. Am. Chem. Soc.</i> 2000 , 122, 9336. <i>J. Am. Chem. Soc.</i> 2003 , 125, 10808. <i>J. Am. Chem. Soc.</i> 2005 , 127, 8826.

Oct 24 (15)	Pericyclics and Cycloadditions PS 3 due	Clayden: Chapter 34, 35 C&S A: Chapter 11 C&S B: Chapter 6 SANROS: 6, 122, 126, 132, 140, 304, 332, 426	
Oct 26 (16)	Asymmetric Diels Alder Reactions [3,3] Rearrangements	C&S A: Chapter 11 C&S B: Chapter 6 SANROS: 20, 22, 26, 56, 76, 88, 90, 98, 156, 204, 226, 324	<i>Angew. Chem. Int. Ed.</i> 2002 , 41, 1650. <i>Angew. Chem. Int. Ed.</i> 2002 , 41, 1668. <i>Acc. Chem. Res.</i> 1995 , 28, 81.
Oct 31 (17)	Photoredox Chemistry	Clayden: Chapter 37	<i>J. Am. Chem. Soc.</i> 2008 , 130, 12886. <i>Nat. Chem.</i> 2010 , 2, 527. <i>J. Am. Chem. Soc.</i> 2010 , 132, 4986. <i>J. Am. Chem. Soc.</i> 2009 , 131, 10875. <i>Acc. Chem. Res.</i> 2016 , 49, 1997.
Nov 2 (18)	Carbenes and Nitrenes	Clayden: Chapter 38	<i>Chem. Rev.</i> 1986 , 86, 919. <i>Chem. Rev.</i> 2003 , 103, 2905.
Nov 7 (19)	Organometallic Transformations PS 4 due	Clayden: Chapter 40 SANROS: 296, 400, 464, 466	Handouts
Nov 9 (20)	Migratory Insertion, Transmetallation Introduction to Pd Catalysis	SANROS: 70, 78, 186, 196, 258, 310, 424, 436, 438, 440, 448, 458, 466, 474	<i>J. Org. Chem.</i> 1993 , 58, 5583.
Nov 14	Exam 2		
Nov 16 (21)	Hydrofunctionalization Reactions		<i>J. Mol. Cat.</i> 1976 , 2, 65. <i>J. Am. Chem. Soc.</i> 1976 , 98, 2134. <i>Science</i> , 2016 , 351, 832.
Nov 21 (22)	Transfer Hydrogenation Hydrogen Borrowing	SANROS: 280, 316, 320	<i>Acc. Chem. Res.</i> 1997 , 30, 97. <i>J. Am. Chem. Soc.</i> 2009 , 131, 1766. <i>J. Am. Chem. Soc.</i> 2008 , 130, 6338. <i>J. Am. Chem. Soc.</i> 2009 , 131, 5054. <i>J. Am. Chem. Soc.</i> 2009 , 131, 2066.

Nov 23 (23)	Olefin Metathesis	SANROS: 10, 12, 152	<i>J. Am. Chem. Soc.</i> 1997 , 119, 3887. <i>J. Am. Chem. Soc.</i> 2003 , 125, 11360. <i>Org. Process Res. Dev.</i> 2009 , 13, 250. <i>Angew. Chem. Int. Ed.</i> 2004 , 43, 3601. <i>Nature</i> 2011 , 479, 88–93.
Nov 28	Thanksgiving	NO CLASS	
Nov 30 (24)	Electrochemical Methods PS 5 due		<i>Angew. Chem. Int. Ed.</i> 2015 , 55, 539. <i>J. Am. Chem. Soc.</i> 2017 , 139, 3293. 10.1021/anie.201707584
Dec 5 (25)	Late-Stage Functionalization		<i>Chem. Soc. Rev.</i> 2016 , 45, 546.
Dec 13	Final Exam	1-3 pm	