

<b><u>Instructors</u></b>	Prof. Amanda Hargrove	<b><u>Contact Info</u></b>	Office: 3219 FFSC Email: amanda.hargrove@duke.edu
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**Teaching Assistants** Katie Bitting, Brett Hemric, Brittany Morgan, Jacob Timmerman

**Class Hours** Tuesdays and Thursdays, 10:05am-11:20am  
Laboratory: various  
Recitation: Mondays or Tuesdays (starts week of January 12<sup>th</sup>)

**Office Hours** Mondays 1:30-3:30 pm with Prof. Canelas in 1223 FFSC  
Tuesdays 3:15-5:15pm with Prof. Hargrove in 3219 FFSC

**Prerequisite** Credit for any of the following courses: Chem19, Chem21, Chem22L, Chem31L, Chem43L, Chem101DL, Chem110DL

### **Course Description**

Official synopsis from the Bulletin: The structures and reactions of the compounds of carbon and the impact of selected organic compounds on society. Laboratory: techniques of separation, organic reactions and preparations, and systematic identification of compounds by their spectral and chemical properties.

Welcome to organic chemistry! It is an exciting topic that has direct applications to your environment and health. Chem201DL is the first half of an integrated two-semester course sequence, and the material is challenging and builds upon itself. For this reason, you are urged to employ all of the resources listed below to maximize your comprehension of each section while it is being discussed in class.

**Tips for success:** *Staying current* with readings and problems as each topic is discussed in class is *critical* to being successful in organic chemistry! Falling behind even a few sections will make it difficult to synthesize the material in a way that will allow you to solve complex problems. On the calendar page, the course pace is roughly sketched out so that you can read the appropriate chapter(s) for each week. I want you to maximize your success and learning in this course, so please plan to spend 1-2 hours or more per day, every day, working problems, reading the sections, viewing online material, and working through examples and problems in the book. In addition to your personal study efforts, meeting with a study partner or study group on a regular basis to discuss problem solving is another strategy that many students use with great success. *Be sure to use all of the resources available on a regular basis:* resource room, walk-in tutoring, instructor office hours, etc. Reminders about these will be given in class.

### **Resources**

#### **Required Course Materials:**

*Textbook* Loudon's *Organic Chemistry* ISBN 9780981519432  
*Companion Study Guide and Solutions Manual* ISBN 9780981519449  
As an alternative, these can also be purchased together ISBN 9780981519456

*Materials* Chemistry model kit  
Safety glasses for laboratory  
Personal response system: eclicker2

*Internet* The web page for this course can be accessed through <https://sakai.duke.edu> using your NetID and password to login. The syllabus, lecture notes, problem sets, keys, content videos, and laboratory information will be available as needed. There are separate sakai sites for lecture and laboratory. Sapling Learning will also be employed for drill homework problem sets and some laboratory work: <http://www.saplinglearning.com>. Sapling access must be purchased online.

**Recitations:** Recitations provide you the opportunity to discuss organic chemistry topics and solve challenging problems. You will work in small groups under the guidance of

a TA who has an excellent understanding of the material. Problem sets for recitation will be periodically posted on sakai, and these need to be printed prior to your recitation meeting.

**More Resources:**

Schedules/locations will soon be announced in class and on Sakai:

**1) Chemistry Resource Room (free!)** staffed by Duke students working towards their PhD in Chemistry. **Don't wait until the week of the test for the best help!**

**2) Walk-In Tutoring (free!)** staffed by undergraduate Duke students who have previously excelled in organic chemistry.

**3)** The Chemistry Department also keeps a list of graduate students who are willing to **tutor privately for a fee**; each tutor sets his or her own rates.

<http://www.chem.duke.edu/undergraduates/tutors.php>

**4) The Peer Tutoring Program** offers free private undergraduate tutors for students who do not do well on the first test. [http://duke.edu/arc/peer\\_tutoring/](http://duke.edu/arc/peer_tutoring/)

**DMS**

Students with disabilities are invited to register as soon as possible with the Disability Management System--Student Access Office. Students who are currently registered with the Disability Management System--Student Access Office should visit during faculty office hours or email to schedule an appointment to discuss accommodations. This should be done well in advance of the first exam.

**Grading**

Scores for the laboratory, online and in-class problem sets, three in-class tests, and final exam will be used to calculate your total number of points as shown:

Tests 1, 2, & 3 (125 points each)	375
Online Homework and In-Class Activities	75
Final Exam	300
Laboratory	250
<b>Total</b>	<b>1000</b>

To encourage collaboration and study groups, the final grades for the course will not be curved this semester. Instead, based upon average point total grade cut-offs over the past five years, the following approximate minimum point cut-offs will be applied in course letter grade assignment: A+ 970, A 870, A- 820, B+ 790, B 740, B- 710, C+ 680, C 610, C- 560, D+ 540, D 520, D- 500.

If you miss one of the tests for any reason OR if you attend all tests but your final exam percentage correct exceeds your percentage correct on any of the in-class tests, then your ONE lowest in-class test score (out of 125 points; a zero in the case of a missed test) will be automatically replaced by more heavily weighting your final exam. There are no make up tests after the date that the test has been given in class.

**Homework**

**Homework on a daily basis is the best way to learn the material and perform well on the tests.** It consists of reading the textbook, working through examples and **problems** at the ends of the chapters, recitation activities, and online problems such as those posted on the Sapling learning website and the course website. Sapling problems will contribute towards the points earned in the course.

**Work and understand as many problems as you can;** it is a great way to spend your study time! Book chapter problems and recitation worksheets will not be collected and graded, but will serve as a good study aid for you to measure your understanding of the material on a daily basis. Read each chapter to solidify your understanding of the material; work ALL sample problems as you read. Please make an effort to **organize and categorize new material** into the grand scheme of all material in the course to find **patterns**. This might seem challenging at first; in the long run, this is a much better strategy than trying to memorize by rote the huge volume of information that will be presented in this course.

**Tests**

Tests will be given on the dates shown on the calendar page. Each of these will cover approximately one third of the course material. The comprehensive final exam will cover all of the course material. Tests

result in earning points rather than a letter grade. **There is absolutely no make up for a missed test after it has been given in class.** It is strongly recommended that you attend every test or make arrangements in advance for absences. If you will be absent for an test due to a planned event such as a religious observance, court appearance, athletic event, military duty, or family obligation, you must clear this with Prof. Hargrove or Prof. Canelas in person at least one week in advance so that you can take the test prior to the regularly scheduled class date.

If a question arises concerning the grading or point tally on a test, then the test in question should be turned in for review within seven days of the date the graded tests were returned in class. *Do not write anything on the graded test itself.* A separate "regrade request" form, which can be obtained from Prof. Hargrove or Prof. Canelas, must be completed and attached to the test. Please read the academic integrity section below and note that tests are often photocopied between the time of the grading and return to students in class.

### Laboratory

A laboratory session will accompany the course. There is no laboratory textbook; general laboratory information and procedures for each experiment are posted on the Laboratory Sakai site. Enrollment in the online Sapling Learning system is required for lab. Students are responsible for reading assigned material and completing a Pre-Lab assignment before each lab period. The laboratory is scheduled as alternating dry and wet labs. Dry labs are done independently and wet labs are performed in the laboratory room assigned. Students are required to follow the prescribed laboratory safety rules contained in the laboratory syllabus for the course. Safety glasses must be worn at all times while in lab; they can be purchased either in the Duke bookstore or for \$5 at the base of the large staircase in the FFSC at times TBD. Further information regarding meeting times, course structure, and requirements can be obtained in the lab syllabus, available on the main lab Sakai site.

**Laboratory Manager: Dr. A. Kasper (FFSC 1225, amanda.kasper@duke.edu)**

### Attendance

**Regular lecture, class activity, and recitation attendance is expected.** In-class activities will contribute towards the points earned in the course. The lowest two in-class activity scores (zero in the case of a missed class for any reason) will be dropped before this portion of the grade is calculated.

Please see <http://t-regs.trinity.duke.edu/attendance.html> and links therein for information regarding **absences** that are considered excused. If class is missed because of a short-term illness, a student should submit an excuse that day on-line at the web address <http://www.aas.duke.edu/trinity/t-regs/illness/>. Similar online forms are available for religious observances and athletic participation.

**Regardless of the reason for absence, NO make up class activity points will be given after the scheduled class time.** Please make arrangements with course faculty to complete assignments *before* the due dates if you will have a pre-planned absence for any reason. If you have an unexpected absence during a test due to a non-planned event such as sickness, car trouble, or family emergency, then please refer to the information in the grading section. A student who misses the **final exam** due to severe illness, injury, or unexpected and tragic family event must provide documentation of the reason for their absence to his or her Dean as soon as possible. The opportunity to make up the final exam (and timetable for completion of the course) is at the discretion of the Dean in consultation with the instructor.

### Academic Integrity

Students are expected to abide by the principles outlined in the Duke Community Standard:

"Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and nonacademic endeavors, and to protect and promote a culture of integrity." *To uphold the Duke Community Standard: I will not lie, cheat, or steal in my academic endeavors; I will conduct myself honorably in all my endeavors; and I will act if the Standard is compromised.* In this spirit, each student must sign an Honor Pledge ("I have neither given nor received unauthorized aid on this exam.") on his or her test or final exam. Students found to be in violation of the Honor Pledge will receive a zero for that test, exam, or assignment, and the incident will be reported. In this case, the student also forfeits his or her right to replacement of the lowest in-class test score with the final exam percentage. In some situations, assignment of a grade of "F" for the course may be deemed

the most appropriate grade sanction, and the instructor reserves the right to take this action in cases where the student has been found responsible for an academic integrity violation by the Undergraduate Conduct Board. Additional sanctions, including, but not limited to, suspension and expulsion, can be implemented at the discretion of the Office of Student Conduct. Please see <http://www.integrity.duke.edu/> and/or <http://judicial.studentaffairs.duke.edu/index.html> for more information about this policy.

## Projected Course Calendar (Subject to Revision)

Week #	Date	Read Loudon Chapters/Secs	Topics and Remarks	Recitation Topic (Mondays/Tuesdays)
1	Th Jan 8	1.2C-1.4, 1.7-1.9, 15.6 to 15.7A-C	Review Bonding, Resonance, Formal Charge, Benzene	Review: Structure, Bonding, Resonance, and Formal Charge
2	T Jan 13 Th Jan 15	2 3.1 - 3.3	Alkanes: Structures, Conformations, IUPAC Nomenclature, Combustion Drawing Organic Structures Curved Arrow Notation for Reactions	1. Alkanes
3	T Jan 20 Th Jan 22	4.1-4.7, 14.1-2, 14.4	Alkenes and Alkynes: Nomenclature, E/Z, CIP Rules, Addition of HX, Mechs, Carbocations, Free Energy Diagrams	No Recitation Monday
4	T Jan 27 Th Jan 29	4.8-4.9, 5.1-5.4, 14.6	Catalytic Hydrogenations, Hydrations, Halogenation, Halohydrin formation, Markovnikov vs. anti-Markovnikov	2. Alkenes, Additions
5	T Feb 3 Th Feb 5	5.4 - 5.5	More Alkene Addition Reactions: Hydroboration-Oxidation, Ozonolysis	3. Mechanisms
6	T Feb 10 Th Feb 12	5.6 - 5.7 8.9A, 17.2	<b>TEST 1</b> Radical reactions: HBr + peroxides Free Radical Polymerization, Polymers Radical Halogenations of Alkanes	4. More Mechanisms, Review for Test 1
7	T Feb 17 Th Feb 19	12.1 - 12.6 13.1 - 13.7, 13.8 - 13.10	Infrared Spectroscopy, Mass Spect. <sup>13</sup> C NMR, Chemical Shift Proton NMR, Coupling	5. Radical Mechanisms
8	T Feb 24 Th Feb 26	6.1 - 6.7 6.11 - 6.12 24.2	Stereochemistry, Enantiomers, R&S, Racemates, Diastereomers, Meso Compounds, Fischer Projections	6. Spectroscopy, NMR Problem Set Rev
9	T Mar 3 Th Mar 5	7	Cyclohexane, Conformational Analysis Disubstituted Rings, Bicyclic Cmpds Stereochemistry of Reactions on Rings, Drawing a Reaction Map	7. Stereochemistry
10	<b>March 9 - 13</b>		<b>Spring Break (No Classes)</b>	
11	T Mar 17 Th Mar 19	3.4 - 3.6, 14.7A 8.1 - 8.8	Relative Acidities & Basicities, Grignard & Organolithium Reagents, Acetylides Nomenclature, Structure, and Solvation of Alkyl Halides, Alcohols, Ethers, etc.	8. Cyclic Compounds, Alkene Add'n Reaction Review
12	T Mar 24 Th Mar 26	9.1 - 9.4 9.4 - 9.8, 14.7B	Nucleophilic Substitution & Elimination, Rxn Rates, S <sub>N</sub> 2 for Alkyl Halides Substitution & Elimination, S <sub>N</sub> 2 & E2, S <sub>N</sub> 1 & E1, α-Eliminations	9. Acid & Base Strengths
13	T Mar 31 Th Apr 2	10.1 - 10.4 10.5 - 10.7	Review Substitution and Elimination Reactions of Alcohols and Thiols Sulfonate Esters, Thionyl Chloride, PBr <sub>3</sub> Redox in Organic Chemistry	10. Substitution and Elimination
14	T Apr 7 Th Apr 9	10.8 - 10.11 11.1 - 11.4, 14.8	Designing Multistep Organic Syntheses Ethers, Epoxides, Alkynes in Synthesis	11. Rxns of Alcohols, Retrosynthesis Practice
15	T Apr 14 Th Apr 16	11.5, 11.9-11.10	<b>TEST 3</b> Selected Glycol & Alkyne Reactions	12. More Practice with Multi-step Synthesis
16	T Apr 21		<i>Jeopardy &amp; Review for Final Exam</i>	
	Th Apr 30		<b>Final Exam (Cumulative) 9:00 am</b>	

Please work ALL problems found within the assigned reading sections.

Suggested additional problems at ends of chapters (Loudon, 5<sup>th</sup> Edition)

These problems are suggested for your self study and will not be turned in. Please do these *in addition to* the study problems, problems found throughout the readings, recitation worksheets, and introductory drill problems in Sapling.

The problems below are, in general, more challenging than the examples and problems found within the chapter readings. You need to work on these ***gradually on a daily basis*** to be fully prepared for tests. Please feel welcome to work additional problems if you are struggling with a concept; the list below should be considered a minimum starting point.

Chapter Sections	Problems
1.2-1.4, 1.7-1.9	Ch 1: 25, 27, 31, 33, 41, 45-47
15.6-15.7C	Ch 15: study problems 15.2 and 15.3, 27, 29, 38c-f
2 (all)	Ch 2: 26-30, 33, 35, 37, 40, 42, 45
3.1-3.3	Ch 3: 25, 26, 32, 33, 36, 37
4 (all)	Ch 4: 39, 41a, 42a, 44a-c, 46d, 50, 54, 57, 62, 63, 66
14.1-2, 14.4, 14.6	Ch 14: 28cd, 29a, 30, 26abcfg, 27abd
5.1-5.5	Ch 5: 27 not i&o, 31ab, 32acegi, 34-5, 46, 48abc, 52
<b>Test 1</b>	<b>Chapters 2&amp;4 (all), sections of Chapters 1, 3, 5, 14, 15</b>
5.6-5.7	Ch 5: 27io, 29, 31cd, 32bdfhj, 36, 48efg, 49, 51
8.9A	Ch 8: 31, 32, 55
17.2	Ch 17: 18ab, 37ef
12 (all)	Ch 12: 22, 24a, 26, 28a, 35, 39
13 (all)	Ch 13: 35, 38a, 39d-e, 44, 49, 54
6.1 – 6.9, 6.11-12	Ch 6: 28, 30-32, 36, 37, 42, 44-46, 51
24.2	Ch 24: 1-3
7 (all)	Ch 7: 34, 36, 37, 39, 40, 44, 47, 51, 53-55, 58, 63
3.4 – 3.6	Ch 3: 27, 31, 35, 39a&c, 40, 41a&c, 43, 44
14.7A	Ch 14: 15, 16, 31
8.1-8.5	Ch 8: 33, 35, 36, 37ace, 38, 42, 47, 50, 56, 59a
<b>Test 2</b>	<b>Chapter 7, 12, &amp; 13 (all), parts of 3, 5, 6, 8, 14</b>
8.6 – 8.8	Ch 8: 44ace, 48, 51, 52, 53, 62a
9 (all)	Ch 9: 35-37, 39, 40b, 41ac, 42, 47, 50-1, 58, 61, 63-4, 67
14.7B	Ch 14: 18-22, 33acgh
10 (all)	Ch 10: 40ad, 41, 43ace, 45acf, 53, 54, 55, 59, 60
11.1 – 11.4	Ch 11: 1-22 (odd)
14.8	Ch 14: Study problem 14.2, 23, 34abe, 36
<b>Test 3</b>	<b>Chapters 9 &amp; 10 (all), parts of 8, 11, 14</b>
11.5 – 11.10	Ch 11: 45, 47, 50, 52-54, 56, 60, 61, 68
<b>Final Exam</b>	<b>Cumulative</b>