

SYLLABUS FOR ADVANCED ORGANIC CHEMISTRY

Chemistry 75000, Class #43074

Fall 2022

Tuesdays from 9:00 AM to 11:50 AM, Room #3309

The Graduate Center of the City University of New York, 365 Fifth Avenue, New York, New York
10016

Instructor: Prof. Alexander Greer

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Required Text: *Advanced Organic Chemistry: Part A* by Carey and Sundberg, 5th Ed. Springer Press, 2007. ISBN: 978-0-387-44897 (hard cover) or 978-0-387-68346-1 (soft cover).

<http://www.springerlink.com/content/978-0-387-44897-8>

Supplementary recommended reading: *Modern Physical Organic Chemistry* by Eric V. Anslyn, Dennis A. Dougherty ISBN-13: 978-1891389313, ISBN-10: 9781891389313

Recommended Material: Molecular Model Set for Organic Chemistry, Prentice Hall.

Schedule:

Lectures: Tuesdays from 9:00 AM to 11:50 AM (in person), Room #3309. You will need to attend the in-person lectures.

Office Hours: Tuesdays 2:00 pm to 3:00 pm, Room #4431 in the Graduate Center; Thursdays 12:00 to 2:00 pm, Room #341 New Ingersoll at Brooklyn College. I encourage you to ask questions about any aspect of the class. I am available in office hours for questions about exams, homework, and class notes; email will not be available for these issues. You can reach me by e-mail (agreer@brooklyn.cuny.edu) for issues other than exams, homework, and class notes, but allow 2-4 days for me to respond to emails. Also, contact me through your Graduate Center email address, because Gmail and other email addresses do not work well for me (sometimes they are not delivered or they go to a spam folder).

Course Description: This course is an introduction to advanced organic chemistry. An emphasis will be placed on structure-reactivity relationships, reactive intermediates, and organic reaction mechanisms. We will meet 15 times, two of which will be for exams, the other 13 times are lecture periods each running a duration of 2 hours and 35 minutes along with a 15-minute break, for a total of 2 hours and 50 minutes. The course instruction will be conducted in-person. As always, a key goal of the lecture is to present new material that help to supplement the material in the textbook.

Lecture and Final Exams: These will be held in-person in Room #3309 at the CUNY Graduate Center at 365 5th Ave. New York, NY 10016. There will be one lecture exam and one final exam; each is counted as 25%. The lecture and final exam questions will be written to analyze your reasoning skills in advanced organic chemistry. They will also be based on homework problems, textbook material, and what is covered in lecture, which includes the oral presentations. Check below for the dates of the lecture and final examinations.

The midterm and final exams will contain about 1/3 questions similar to the class notes and presentations, 1/3 questions similar to homework problems, and 1/3 questions selected to assess your reasoning skills in advanced organic chemistry. Copies of lecture exams from previous semesters will generally not be supplied. These examinations will be closed-book and closed-note. Students will not have access to the textbook. Students may not use online resources (other than the HTML version of the text, if they wish) or consult other people for advice, either in-person or electronically. Doing so represents academic dishonesty and will result in a failing grade for the course if discovered.

Again, lecture and final examinations will be administered in-person at the Graduate Center (room number 3207). To ensure access to exams and lectures, you must be in compliance with current COVID-19 guidelines. Since these guidelines change over time, bookmark and read the following link:

GRADUATE CENTER COVID-19 INFORMATION AND SAFETY GUIDANCE
<https://www.gc.cuny.edu/news/covid-19-information-and-safety-guidance#testing>

Two Oral Presentations: The oral presentations are each 25% of the grade. Students can select topics from the list provided at the bottom of page 4. Each presentation will be about 20 minutes in length. Critically analyze the review paper and topic that you are presenting. Your evaluation will be based on the understanding of the reported experiments and/or computations and ability to answer questions. Students in class are obliged to ask at least two scientific questions of the speakers over the course of the class. Oral presentations will be held every week starting Sept. 6th (see our meeting dates on page 4) Uploading your file in PDF format from a flash drive is advisable, as conversions of powerpoint (PPT) files on the classroom computer may or may not work well and animations may be lost.

Assigned Homework: Homework problems are assigned for each chapter and are to be turned in at the deadlines shown below. The average of the top 3 out of 4 homework assignments will be taken. The week or so following when you turned in the homework, a grade will be assigned ranging from 0 to 10. Your homework results will be used in boarder-line cases in determining the overall course grade. An average score of 7-10 will help your overall grade, whereas a score of 0-5 will drop your overall course grade. I recommend that you do many of the homework problems at the end of each chapter, but only the problems listed every week on the board will be collected. Late homework papers will not be accepted; under extenuating circumstances such as illness, the missed homework will be counted as the lowest score in the average of the top 3 out of 4 homework assignments.

Homework assignment and schedule. Assignments will be provided one week in advance.

- Homework assignment #1: Due Sept. 20. Problems: 1.1, 1.2, 1.3, 1.4, 1.9, 1.13ab, 1.16, 1.20, 2.1abde, 2.2abc, 2.4a, 2.7aeg, 2.13, 2.26g, 2.33
- Homework assignment #2: Due Oct. 18. Problems: 3.3, 3.4ab, 3.5a, 3.6, 3.7a, 3.8a
- Homework assignment #3: Due Nov. 15. Problems: 4.2acf, 4.3abc, 4.13ace, 4.14, 8.2abcd, 8.3ab, 8.4fgh, 8.5ab, 8.10c,
- Homework assignment #4: Due Dec. 6. Problems: 10.2abce, 10.4cd, 10.5acfg, 10.11a, 10.12ab, 10.19ce, 11.1ab, 11.5be, 11.6be, 11.8, 11.9ab, 11.13, 11.16b.

Regarding homework assignments: Turn in hard copies (print outs) of your homework assignments to me personally in class on the due dates shown. Emailed versions of your homework assignments will not be accepted. Any evidence of plagiarism on the homework assignments will result in a score of zero and possible disciplinary action (see University Policy on Academic Integrity policy below).

Summary Comments. Students will be responsible for all material covered in class and the assignments of the entire semester. There are no exemptions from the final exam. The overall final grade is assigned by myself. After the course ends, I cannot provide information about your grade by email. You can learn about your course grade by visiting the CUNYfirst website. If you have questions for technical support, please direct them to the Graduate Center Information Technology Services (ITS) Self Service: <https://itservices.gc.cuny.edu>, E-mail: itservices@gc.cuny.edu

Policy for Absence from Exams or Illness During Exams. No make-up exams will be given to students who are absent from the lecture examination. Students who miss the lecture exam with a valid excuse will be assigned a score based on the Final exam. The absence must be justified to me as soon as possible. A grade of zero will be given for unexcused absences from the exam. Missing the lecture exam and final exam will result in a score of zero. If you become ill during the exam and feel that you are unable to complete it, inform me immediately and indicate that you are sick and unable to complete it. Your exam will not be graded and you will be considered absent from the exam. If you remain until the end and submit your exam, any claim of illness will no longer be permitted and your exam score will be counted.

Course Letter Grade Policy. Grades are assigned based on the performance in the class. Once overall letter grades for the course are assigned they will not be changed upon request.

Student Bereavement Policy. Students who experience the death of a loved one must contact the Division of Student Affairs, if the student wishes to implement either the Standard Bereavement Procedure or the Leave of Absence Bereavement Procedure.

University Policy on Academic Integrity. The faculty and administration of the Graduate Center support an environment free from cheating and plagiarism. Each student is responsible for being aware of what constitutes cheating and plagiarism and for avoiding both. The complete text of the CUNY Academic Integrity Policy and procedure for implementing that policy can be found at this site: <http://www.cuny.edu/about/administration/offices/legal-affairs/policies-resources/academic-integrity-policy/>. If a faculty member suspects a violation of academic integrity and, upon investigation, confirms that violation, or if the student admits the violation, the faculty member is obliged to report the violation.

Course topics and reading assignments

Date	Subject ^{††}	Chapter in text ^{†††}	Problems in text ^{††††}
Aug. 30	Bonding, Structure, Theory	1	to be announced
Sept. 6	Stereochemistry, Conformation	1 & 2	"
Sept. 13	Mechanisms, Stability, Reactivity	2 & 3	"
Sept. 20	Mechanisms, Stability, Reactivity	3	"
Oct. 11	Nucleophilic Substitution	4	"
Oct. 18	Nucleophilic Substitution/Cooperativity	4	"
Oct. 25	Exam #1	CH. 1-4 ^{†,††}	
Nov. 1	Aromaticity	8	to be announced
Nov. 8	Aromaticity	8	"
Nov. 15	Pericyclic Reactions	10	"
Nov. 22	Pericyclic Reactions, Chemical Aesthetics	10	"
Nov. 29	Free-Radicals	11	"
Dec. 6	Photochemistry	12	"
Dec. 13	Photochemistry/Phototoxicity	12	"
Dec. 15-21	Final Exam (date to be announced)	1-4, 8, 10-12 ^{†,††}	"

† The exam can cover any material discussed in these chapters, topics and oral presentations given in class.

†† Additional topics will be taken from the articles below, which may be used for oral presentations.

††† Work through half of the problems at the end of the chapters, but only turn in the problems that are assigned.

Other Dates: No class is scheduled on September 27 and October 4. Reading day is on December 14. The final exam will be held in-person in Room #3309 at the Graduate Center, December 15-21, 2022 (date to be announced) at 9:00 am.

You will need to seek my approval of the topic that you plan to present on for your oral presentations. Oral presentation topics can only include organic chemistry discussions about: Hammett plots, Thorpe-Ingold effect, energy vs electron transfer, helical molecules, adjuvants, non-enzymatic self-replicating reactions, concerted vs stepwise mechanisms, fluorescence super-resolution imaging, organic chemistry at interfaces, chimeric systems, solid-state reaction synthesis, anchimeric assistance, neighboring group participation, autocatalysis, supramolecular chemistry, two-dimensional silica systems, molecular rotors, nanochitin, proton-coupled electron transfer, cross-coupling of arenes, protocells, amphiphilic compounds, metal-organic cages binding molecular cargoes, nitrogen-centered radicals, single molecule spectroscopy, chemistry of vision, optical brightener chemistry, $n \rightarrow \pi^*$ interactions, cooperative H-bonding, radical chain propagation, enantioselective radical reactions, chemical evolution, prebiotic synthesis, molecular machines, infection diagnostics, *ab initio* dynamics, strong acids/bases, metal/organic frameworks, biomimetic synthesis of natural products, negative thermal expansion, cucurbituril supramolecular systems, viscosity effects in organic chemistry, asymmetric photochemical synthesis, photocatalysis in organic synthesis including visible-light photoredox catalysis, supramolecular liquid crystals, smart materials for microrobots, C-H functionalization in organic molecules, halogen-atom transfer in synthesis, transition metal catalysis in organic synthesis, metallaphotoredox, inverse electron-demand Diels-Alder reactions, acyclic twisted amides, organic synthesis with flow chemistry, desulfonylation in organic synthesis, chemistry of color with flavylum dyes, medicinal chemistry of isocyanides, photon upconversion, C-C bond cleavage at allylic positions, frontier molecular orbitals, molecular gyroscopes, hair dye ingredient toxicity, heavy atom quantum tunneling, quinone methide intermediates, water spectroscopy and dynamics in cells, photoacoustic chemical probes. Requirement: Your oral presentation will need to draw upon literature from one of the following three following review journals: *Acc. Chem. Res.*, *Chem. Rev.*, or *Chem. Soc. Rev.*

Syllabus version: October 2, 2022