

ORGANIC CHEMISTRY I SYLLABUS, FALL 2024

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Office Hours: MWF: 10–12. Open door or by appointment (virtual is an option)

Catalog info: Organic Chemistry I is a 3-credit hour course that fulfills a scientific literacy distribution requirement.

Lecture: 1–1:50 MWF in Mathile 247 (CHEM 2511.03, CRN: 20115)

Text & Equip:

The ONU organic instructors have elected for the First Day Program® for books. This is a partnership with Publisher Wiley and the ONU Bookstore with savings for students. Thus, you will automatically be enrolled in the program and digital materials will be available on the first day of class (paper materials should also be available). Electronic materials will be available in Canvas. While there is an option to "Opt out", I recommend you do not unless you have the text already. Here are the Books/equipment for the course:

- 1) Required: Klein, 4e + WileyPLUS Access 1 semester: ISBN: 9781119802556 (or 9781119760986) (includes downloadable etext); Student retail including tax ~\$84.
- 1a) **And** Recommended: Klein, 4/e Loose Leaf: ISBN: 9781119810643 (covers organic 1 and 2); \$15.29. Note: A copy is available in the ONU Library Circulation Desk. You should opt to get this on the 1st day because if you decide you need this later it can cost you as much as \$150.
- 2) Strongly Recommended: Klein, 4e Student Study Guide Loose Leaf: ISBN: 9781119659587 (covers O-CHEM 1 & 2); Student retail including tax: \$123.19 (Amazon-checked 8/21/2024). Note: A copy is available in the ONU Library Circulation Desk.
- 2a) **OR** Klein, 4e Student Study Guide electronic version (download). This is a \$18 upgrade which is available through WileyPlus/Canvas. (covers O-CHEM 1 & 2)
- 3) A Molecular Model kit like Molecular Visions: ISBN 9780964883710 (ONU bookstore: \$27.74)

Need Help with the Wileyplus/electronic resources? See FAQs: <https://tinyurl.com/FirstDayTroubleshooting> and/or <https://customercare.bncollege.com> Still need help? Call 1-844-932-6657 or bookstorecustomercare@bncollege.com available 7 days/week, 8 am – 11 pm EST.

Prerequisites: You must have completed CHEM 1721 or 1821 with a passing grade to enroll in this course. You must be enrolled concurrently in CHEM 2551 or 2651

Course goals: The course is designed so that the student can develop a basic understanding of organic chemistry structures and reactions thereby laying a foundation for further study in the field and closely related disciplines (e.g. biochemistry, molecular biology, and pharmaceutically relevant sciences).

Course Level Learning Objectives: At the end of this course students will be able to:

1. Describe structural features of organic molecules
2. Explain the acid base reactions of organic molecules
3. Construct appropriate structures of organic molecules
4. Classify the reactivity of organic molecules based on their functional group
5. Explain the movement of electrons in the reactions of organic molecules
6. Compare and contrast two or more organic molecules
7. Interpret spectroscopic data for organic molecules

Point Breakdown:

| | |
|------------------------|--------------------|
| 3 exams, @ 140 points | 420 |
| 5 quizzes, @ 50 points | 250 |
| Online Homework | 130 |
| Bonus | ?? |
| Final exam | <u>200</u> |
| TOTAL | 1000 POINTS |

Grade Scale:

| | |
|---------|---|
| >870 | A |
| 869–760 | B |
| 759–650 | C |
| 649–580 | D |

Quizzes & Exams:

There will be five 50-point quizzes given during the semester. Each quiz will last 15–25 minutes and will cover the most recent material presented in lecture. There will be three 140-point, exams. Exams 1 and 2 will be in class. Exam 3 will be during the Tuesday evening time slot (7:00–8:15 PM). The exams will cover everything from the first day of class with an emphasis on the material covered since the previous exam. The final exam will be cumulative for the semester.

Bonus:

There will be a bonus (points TBA) for correctly completing a spectroscopy bonus problem set.

Withdraws:

This course is a co-requisite with Organic 1 Laboratory Course (which could have also been completed previously). In the event that you need to withdraw from this course, you must also withdraw from CHEM 2551 (Organic 2 laboratory) or CHEM 2651 (Organic 2 laboratory for majors). Alternatively, if you withdraw from the Organic 1 Laboratory course you must also withdraw from this course.

Incompletes:

Incompletes will be given only when the work of the course is substantially completed and when the student's work is of passing quality.

Academic Misconduct:

ONU expects its students to conduct themselves in a dignified and honorable manner as mature members of the academic community and assumes that individually and collectively they will discourage acts of academic dishonesty. ONU also expects cooperation among administrators, faculty, staff, and students in preventing acts of academic dishonesty, in detecting such acts, reporting them, and identifying those who commit them, and in providing appropriate punishment for offenders. The University Code of Academic Student Conduct is found at https://my.onu.edu/student_handbook in Appendix F. To this end, any student deviating from these standards in this course will be penalized to the fullest extent possible.

Special accommodations policy:

Students requiring accommodations because of physical and/or learning disabilities should contact their Dean's office prior to or during the first week of classes. The student needs to initiate a discussion of classroom/testing procedure accommodations with the instructor at minimum of **2 days in advance of each exam/quiz**.

Common Course Policies:

Ohio Northern University is dedicated to providing an equitable educational experience for all enrolled students. Universal course policies can be found at: https://my.onu.edu/registrar_office/policies. Specifically, the following topics are addressed: Academic Dishonesty Policy; Academic Accommodations Policy; ONU Health and Safety Policy; Title IX Policy; and Diversity, Equity, and Inclusion Language.

Makeups:

In the event that you feel that you will be unable to attend a scheduled exam, you must contact me prior to (or as soon as safely feasibly) to discuss your situation (by phone **AND** email). **If an excused absence is granted by the instructor**, the instructor reserves the right to 1) provide a makeup exam that contains questions covering material up to the day of the makeup exam, 2) administer a cumulative makeup exam at the end of term, 3) prorate the final, or 4) use other means of evaluation that are agreeable between the instructor and the student. The instructor reserves the right to choose the method of makeup, which will generally be in the form of option #3. Unexcused absences including (but not limited to): sleeping through the exam, not informing the instructor in a timely fashion, and vacation travel will result in the score of zero. Departmental policy dictates that makeup exams will not be given to students before the rest of the class.

| Assignments | Due Date |
|---------------|------------|
| Ch. 1 | 09/04 (W) |
| Ch. 2 | 09/10 (Tu) |
| Ch. 3 | 09/15 (Su) |
| Marvin Sketch | 09/22 (Su) |
| Ch. 4 | 09/22 (Su) |
| Ch. 5 | 10/06 (Su) |
| Ch. 6 | 10/13 (Su) |
| Ch. 7 | 10/22 (Th) |
| Ch. 8 | 11/05 (Tu) |
| Spectroscopy | 12/02 (M) |
| Ch. 9 | 12/08 (Su) |
| Ch. 10 | 12/15 (Su) |

Online Homework (Available in Canvas)

The online homework system is WileyPlus and it is accessible in Canvas. It will be graded by multiplying your percent correct times 130 to get the homework score.

1. For technical issues see: wileyplus.com/support.
2. All homework will be due at 11:59 PM on the due date. Late submissions result in 25% deduction per day.
3. You will be able to attempt each chapter 3 times.
4. This is an extremely minimal amount of homework. It is not comprehensive of all topics and skills needed.

Suggestions:

- 1) **Your textbook is your primary learning resource.** Read the assigned chapters prior to attending class. In class, I will stress the most important points and clarify difficult material. Lectures will not necessarily cover all the required material, and all the material covered in class will not necessarily be covered in the text. Thus, it is very important to read the text AND attend lecture.
- 2) **Organic chemistry is a cumulative subject:** Understanding the new material requires that you have mastered earlier material. Therefore, it is extremely important to keep up with the material.
- 3) **Work the assigned problems!** You cannot learn organic chemistry without doing practice problems. You are responsible for every problem in the text. Make certain that you understand the problem instead of just being able to reproduce the solution. While working problems, it is strongly suggested that you refer back to the text and reread sections of the previous chapters to find the information needed to answer the question. Only use the solutions manual to check problems, not to learn how to do the problems. Consider doing the problem set as if you are going to turn it in to me and do problems each day!
- 4) **Learn and apply concepts.** Although memorization of some key subject matter is required, it is necessary to learn concepts and apply them to the task at hand. Do not confuse having memorized class material (or solutions to a particular problem) as having learned the concepts. Understanding implies application of the information that has been acquired to solve new problems. One of the best ways to master the material is to build a good set of flashcards to predict reaction products (including the regiochemical and stereochemical outcomes) along with the important features of the mechanism for the reactions.
- 5) **Use small study groups effectively.** Studying in small groups (2–3 people) can be very beneficial and is strongly recommended. But, do not do the majority of your studying for this course in groups. The most effective way to study with a group is to discuss the issues with which you are having the most difficulty.
- 6) **Take good class notes by hand.** Pay attention to the topics and material covered in lecture. This way you get a sense of what is important. Consider rewriting your notes adding in some relevant info and/or examples from text. While electronic tablets have been used by some students effectively, the use of paper & pencils/pens has been shown to be more effective. Typing out notes in organic chemistry is not logistically possible.
- 7) **Study in a quiet environment each day.** Do some studying each day (likely 1–2 hours, which is far superior to 10 hours one day per week). Most successful students prefer to find a time each day away from others and especially electronic devices.
- 8) **Attend the Supplemental Instruction Sessions:** These optional sessions will be held Tuesday evenings 7–8 PM in MT 247 by student Andrew Schroeder (a-schroeder.14@onu.edu) They will include worksheets containing problems. Hayden is not only running the sessions, he is attending lecture, and serving as a tutor.
- 9) **Contact me:** If you are having difficulty with this course, contact me ASAP. If you do not know where to start asking questions, the question that needs answered is “When can I get in to see my instructor?”.

Using cell phones in class is highly disruptive, do not use them during lecture.

Class Schedule, Organic Chemistry I:*

| Date | Topic | Reading |
|---------|--|-------------------|
| 08/26 M | Intro, History of Organic Chemistry, Lewis Structures, Formal Charges | 1.1–1.6 |
| 08/28 W | Bond–Line Structures, Formal Charges, Lone Pairs | 2.1–2.2 & 2.4–2.6 |
| 08/30 F | Valence Bond Theory vs. Molecular Orbital Theory, Hybridization | 1.7–1.11 |
| 09/02 M | Labor Day – No Class | |
| 09/04 W | Bond Polarity & Dipole Moments, Resonance and curved arrows | 1.12, 2.7–2.12 |
| 09/06 F | Intermolecular Forces, Physical Properties, Functional Groups | 1.13, 2.3 |
| 09/09 M | Functional Groups (continued) | 2.3 |
| 09/11 W | Quiz 1 Brønsted-Lowry Acids and Bases, pKa, Equilibrium Review, Curved Arrows | 3.1–3.4 |
| 09/13 F | Equilibrium, Choice of Reagents, Solvating Effects, Counter ions, Lewis Definition | 3.5–3.10 |
| 09/16 M | Alkanes, Nomenclature, Constitutional Isomers | 4.1–4.3 |
| 09/18 W | Stability, Sources and uses of Alkanes, Newman Projections & Conformational Analysis | 4.4–4.8 |
| 09/20 F | Cycloalkanes, Conformational Analysis of Cycloalkanes | 4.9–4.10 |
| 09/23 M | Quiz 2 Chair Conformations, Sub. Cycloalkanes, <i>Cis-trans</i> Stereoisomers, Polycyclic Systems | 4.11–4.15 |
| 09/25 W | Isomerism, Stereoisomerism | 5.1–5.2 |
| 09/27 F | Absolute Configuration, Cahn-Ingold-Prelog, Optical Activity | 5.3–5.5 |
| 09/30 M | Enantiomers and Diastereomers, Symmetry and Chirality | 5.6–5.8 |
| 10/02 W | Quiz 3 Fisher Projections, Conformationally Mobile Systems, Resolution of Enantiomers | 5.9–5.11 |
| 10/04 F | Thermodynamics, Equilibrium, Kinetics | 6.1–6.5 |
| 10/07 M | Exam 1 (In class) | |
| 10/09 W | Energy Diagrams, Nucleophiles, Electrophiles, Mechanisms, Arrow Pushing, Rearrangements | 6.6–6.12 |
| 10/11 F | Alkyl Halides Naming, Substitution Reactions, Solvents, S _N 2 Mechanism | 7.1–7.3, 7.12 |
| 10/14 M | Fall Break – No Class | |
| 10/16 W | Nucleophile Strength, S _N 1 Mechanism, Drawing the Complete Mechanisms | 7.4, 7.8 |
| 10/18 F | Determining which S _N Mechanism Predominates, Choosing Reagents | 7.4, 7.8–7.9 |
| 10/21 M | Elimination, Stereoisomers of Alkenes, Stability of Alkenes | 7.1, 7.5–7.7 |
| 10/23 W | E1 & E2 vs S _N 1 and S _N 2 Mechanisms | 7.9–7.10 |
| 10/25 F | Quiz 4 Synthesis strategies | 7.11 |
| 10/28 M | Addition Rxns, Addition vs. Elimination | 8.1–8.2 |
| 10/30 W | Hydrohalogenation, Acid-Catalyzed Hydration, Oxymercuration-Demercuration | 8.3–8.5 |
| 11/01 F | Hydroboration-Oxidation, Catalytic Hydrogenation, Halogenation | 8.6–8.9 |
| 11/04 M | Dihydroxylation, Oxidative Cleavage, Synthesis Strategies | 8.10–8.14 |
| 11/06 W | Exam 2 (in Class) | |
| 11/08 F | Intro., Spectroscopy, Using Molecular Formulae (MF) (14.16), UV Spectra and Conjugation | 14.1–5, 16.11–.13 |
| 11/11 M | Infrared Spectroscopy | 14.6–14.7 |
| 11/13 W | IR (cont.), Intro. NMR Spectroscopy, ¹³ C NMR, Chemical Shift | 15.1–.5; 12–.13 |
| 11/15 F | Theory, Terminology, Origin of Chemical Shift | 15.6 |
| 11/18 M | ¹ H NMR: Chemical Shift, Integration, 1st Order Splitting (the n+1 Rule) | 15.7–15.10 |
| 11/20 W | ¹ H NMR: Splitting (cont.) and Examples | 15.7–15.10 |
| 11/22 F | Bonus Worksheet Due. Mass Spectrometry and Determining MF | 14.8–14.11 |
| 11/25 M | Thanksgiving Break – No Class | |
| 11/27 W | Thanksgiving Break – No Class | |
| 11/29 F | Thanksgiving Break – No Class | |
| 12/02 M | MS Fragmentation, Solving Structure Problems | 14.12–14.16 |
| 12/03 T | Exam 3* Room: MY 107 | |
| 12/04 W | Alkynes, Acidity of Alkynes, Addition to Alkynes, Ozonolysis, Alkylation of Alkynes, Synthesis | 9.1–9.8 |
| 12/06 F | Alkynes (cont), Radicals, Radical Mechanisms, Halogenation, Thermodynamics, Selectivity, | 9.9–9.11 |
| 12/09 M | Radical Mechanisms, Halogenation, Thermodyn., Selectivity, Stereochem., Allylic Bromination | 10.1–10.7 |
| 12/11 W | Quiz 5 Radical Addition of HBr, Radical Polymerization, Synthesis | 10.8–10.13 |
| 12/13 F | Review | |
| 12/17 T | Final Exam (7–9 PM) Room: MY 107 | |

Please note this is a best guess estimate of the lecture content for a give date. *Tuesday evening time blocks (7:00-7:50 PM) are designated for exams and Supplemental Instruction Sessions. Supplemental Instruction Room: MT 247.