Chemistry 205: Principles of Organic Chemistry

Instructor: Dr. Patrick Lutz (he/him/his), (440) 775-8892, patrick.lutz@oberlin.edu
I generally respond to emails within 24 hours during the week.

Virtual class meetings: MWF, 11:20am–12:10pm on Zoom

- Zoom meeting link:
- https://oberlin.zoom.us/j/83539783345?pwd=TmFpbjFNME1TazQ5QlRJSEREMXN1dz09
- Password: carbon12

Laboratory meetings (in person): Thursdays and Fridays, 1:30–4:30pm, Science Center N389

Individual/small group virtual student hours:
Exact times may change in response to student demand, but for now:

- Mondays from 10:00–11:00am
- Wednesdays from 12:15–1:15pm
- Thursdays from 11:00am–12:00pm and 5:00–6:00pm

Sign up for an appointment using Google calendar at https://rb.gy/mwyl5c; you will receive an email confirming the meeting with a Zoom link. If you would like to meet in groups, please have one person sign up and share the link with the other group members.

Welcome to Organic Chemistry! Chemistry is often called "the central science" because it is integral to so many areas of study, and perhaps no subdiscipline of chemistry exemplifies this better than organic chemistry. Without organic molecules, there would be no biochemistry, no neuroscience, no polymer chemistry, and no organic electronics, to name a few important examples. I am excited to explore the fascinating world of carbon chemistry with you during this unusual semester.

Learning goals: This course is a one-semester introduction to organic chemistry, the study of carbon-containing compounds. By the end of this course, students should be able to:

1. Accurately draw and name organic compounds.
2. Describe the physical properties of organic compounds, including stereochemical properties.
3. Determine molecular structure using spectroscopic data.
4. Rationalize and predict the reactivity of organic compounds using structural information and knowledge of common mechanistic patterns.
5. Devise syntheses of simple organic molecules.
6. Apply qualitative knowledge of chemical structure and reactivity to new and unfamiliar situations.
7. Execute synthetic procedures in the laboratory and interpret experimental data.

This course provides a foundation for more advanced organic (CHEM 325) and bioorganic (CHEM 254) courses.

Prerequisites: C– or better in CHEM 102 or CHEM 103

Required texts and materials:

1. *Organic Chemistry*, 6th edition (2015) by Marc Loudon and Jim Parise. The 5th edition is also acceptable, but be aware that reading assignments and suggested problems will be drawn from the 6th edition and may not exactly match with other versions. Note that this is the same text for CHEM 254, so you may be able to re-use it in a future semester.
2. *Chemistry 205 Laboratory Manual* (available in lab, $4)
3. Laboratory safety goggles (available in lab, $15)
4. Laboratory notebook (available in lab, $6)

Additional recommended resources:

1. Molecular modeling kit (available in lab, $17)
2. *Organic Laboratory Techniques*, 3rd edition (2001) by Fessenden, Fessenden, and Feist (no need to buy this; relevant sections will be posted to Blackboard as appropriate)
3. *Make it Stick* by Peter Brown, Henry Roediger, and Mark McDaniel. An excerpt from this book will be posted on Blackboard; however, the whole thing is worth reading if you are interested in evidence-based practices on how to learn effectively.
4. Because many class sessions will be devoted to group problem solving, if possible, I suggest that you invest in either an inexpensive tablet (this model is available online for ~$40) or a small whiteboard to help facilitate discussing chemical structures over Zoom.

Note that the *Lab Manual* is required and will be provided on the first day of in-person lab. You will also need to purchase safety goggles and a lab notebook if you do not still have these items from previous semesters. In addition, molecular modeling kits will be available in lab on this day. We will record which items you purchase and your student account will be charged as appropriate, so you need not bring cash with you.

Course format:
Due to public health considerations, the lecture portion of this course will be conducted 100% virtually. The lecture content will be delivered largely through prerecorded videos, with synchronous class sessions reserved for small-group student problem-solving sessions and open question & answer sessions.

The laboratory portion of this course is slated to occur in person, with an appropriate number of students in each section to enable physical distancing. While we hope and have planned for a full term of experiments, we recognize the possibility that health conditions may interrupt these plans at some point during the semester.

You should monitor your email and check the course Blackboard site daily; as there will not be in-person course meetings besides labs, these will be the primary places where important course information is communicated.

This is an unusual academic year. We are all figuring out things as we go, myself included. I've tried to design a course that I think will make the best of the situation at hand, but I reserve the right to make modifications to the format and procedures described in this syllabus in response to changing conditions, or just because we discover that some aspect of the course doesn't work out as well as I thought it will. Of course, I will let you know of any such changes as we move through the semester.

Evaluation:
Grades will be determined using the components in the table below.

9 best quizzes	9%
3 midterm exams	36%
final exam	20%
participation	10%
lab notebook and lab reports	25%

The scale for determining final grades is shown below. Note that you *must* take the final to receive a passing grade. Grades are based on your score alone; there is no "class curve" and you are not competing directly against your fellow students. It is possible that I could lower the grade borders if quizzes/exams prove more challenging than anticipated, but I will not *raise* the cut-offs.

A–	≥ 90%
B–	≥ 80%
C–	≥ 70%
D–	≥ 50%

Participation will be assessed in two main ways:

1. Attendance and participation in group problem-solving sessions (typically during Wednesday and Friday classes). You are permitted to miss 4 problem-solving sessions with no impact on your grade. For any sessions missed beyond that, you may receive credit by sending me the completed problem set by the start of the next class meeting. (If the problem set key has been posted, you are on your honor to attempt it *without* consulting the key.)

   Attendance at the Q&A sessions will not be recorded for a grade, but your participation is still highly encouraged. Students in the Fall 2020 class indicated that these classes were very helpful. They are usually scheduled immediately prior to quizzes/exams, so they are a good opportunity to review and clairlfy the relevant material.

2. During most weeks, you will be asked to complete a short response to the recent lecture videos by answering questions such as: "What do you think were the most important topics from this week's material?" or "What topics did you find the most confusing?"

Your response will be due on Blackboard ons Sundays at 11:59pm. The aggregated responses will help me anticipate likely topics of discussion for coming classes.

There may occasionally be other tasks, such as completing surveys, that will be counted for participation credit. These opportunities will be announced via email or on Blackboard.

Problem sets will generally be posted on Wednesday and Friday mornings and discussed in groups in class. While these problems will not be collected for a grade, you are ***highly encouraged*** to complete any problems that you do not finish during class time on your own. Answer keys will typically be posted at the end of each week.

Quizzes and exams:

There will be three midterm exams and one final exam for this course. The midterm exams are worth a combined 36% of the final grade, and the final exam is worth 20%. Quizzes will be given most weeks that do not have an exam scheduled and are worth a combined 9% of the total grade (the lowest quiz score will be dropped).

Quizzes and exams are planned to be open-book assessments and must be completed ***individually***. While the focus of each quiz/exam will be on the most recently covered material, these assessments are cumulative and may require knowledge of earlier course topics.

Quizzes/exams will be released on Gradescope at a pre-announced time. The deadline will also be listed on the course Blackboard site, as will the total time allotted for you to take the quiz/exam. For example, quizzes will typically be released on Mondays at 12:30pm and due on Tuesdays at 7:00pm with a time limit of 30 minutes, plus 15 minutes to allow for printing and uploading the quiz. This means that you need to set aside a block of 45 minutes within the given time window to complete and submit the quiz in a single sitting (not two blocks of ~20 minutes each, for example).

Quizzes/exams should be completed by hand (not using ChemDraw or similar software) unless otherwise indicated. If possible, it is preferred that you print the quiz/exam, but if not, it is acceptable to complete it on a separate sheet of paper *so long as your work is organized and easy to follow*.

You should submit your completed assessment on **Gradescope** (https://www.gradescope.com/courses/222459, entry code: **JBK524**) by the deadline as a single pdf file. There are a number of free apps, such as Evernote Scannable and Genius Scan, that allow you to generate a pdf directly from a smartphone. Please be sure to double check that all of the pages are included in the pdf file, legible, properly oriented, and in the correct order before you submit the file. Once you upload the file, you will need to select the page(s) that includes your answer for each question. A document is posted to Blackboard with details about how to scan and submit your work.

I know that technical glitches occur from time to time, so if you have difficulty accessing or submitting an assignment, you should email the instructor ***immediately***. Please do not wait until a long amount of time has elapsed since the deadline.

For the purposes of this course, "open-book" means that you may use the course textbook, your personal notes, material posted on the CHEM 205 Blackboard site, molecular models, and a calculator. You may NOT use other sources, including but not limited to external (non-Blackboard) websites and any human being who is not you. **If you have any questions about whether something is an acceptable source to use during an open-book assessment, please ask Dr. Lutz!!**

I am aware of resources such as Chegg, Course Hero, and r/chemhelp. If I discover that *any* CHEM 205 material has made its way onto these or similar sites, I will need to implement more strict protocols for course assessments, which will make for a less enjoyable experience for all of us. Don't be the person who ruins it for your classmates.

Exams and quizzes ***must*** be taken during the scheduled window unless *prior* arrangement has been made with the instructor. If an assessment needs to be moved due to a medical issue or other emergency, you should contact Dr. Lutz at least 24 hours prior to the beginning of the scheduled window. Quizzes/exams missed without prior arrangements due to emergencies may require a note from a dean and/or a doctor.

Note that I may not answer course content–related questions sent during a quiz/exam window until after said window has passed (even if you have already turned in your assignment).

Lab report forms for most experiments will be uploaded to Blackboard. Lab reports are typically due electronically by the beginning of the lab section one week after completion of the experiment. You must use ChemBioDraw to draw chemical structures when writing your lab reports. The lowest lab report grade (excluding the Spectroscopic Unknown lab report) will be omitted when determining your final course grade.

Lab notebook: A critical aspect of a scientist's work is maintaining a detailed log of operations performed and observations in the lab. To encourage good lab notebook recording skills, you will be asked to submit scanned copies of your lab notebook pages along with the lab report form for some experiments. Further details about the required content for the lab notebook are available in the *Chemistry 205 Laboratory Manual.*

Oberlin Workshop Learning Sessions (OWLS): Sam Weaver is our designated HOOT for CHEM 205 and will be running regular virtual help sessions via Zoom; more details to follow.

Academic Advising Resource Center Private Tutoring: A limited number of private tutors are available for students who request them.

Accommodations: If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please see the instructor and the Office of

Disability Resources [disability.resources@oberlin.edu, (440) 775-5588] so that appropriate accommodations can be arranged. A disability may be disclosed at any point during the semester but should be brought up with at least 24 hours' notice before an assignment is released in order to set up appropriate accommodations.

Inclusivity: The course instructor, TAs, and OWLS leader are committed to cultivating an inclusive and supportive learning environment that respects and celebrates a rich variety of backgrounds and perspectives. Please speak with the course instructor or the Chemistry Department chair, Jason Belitsky, if you have an experience in this class that is not consistent with this commitment.

Honor code: You must write and sign the Honor Pledge ("I have adhered to the Honor Code in this assignment") in order to receive credit for lab reports, quizzes, and exams in CHEM 205. You are encouraged to (virtually) discuss lab experiments with your classmates, but all parts of the lab reports (including data, calculations, and answers to any questions) must represent your own work.

Weekly schedule: To meet the challenges of a virtual lecture course, we will attempt to maintain a regular weekly rhythm. Of course, circumstances may require us to occasionally deviate from this schedule, but a general outline of what you should expect each week is shown below:

Sunday	Monday	Tuesday	Wednesday	Friday
• weekly response due on Blackboard	• Q&A session in class • quiz posted after class	• quiz due at 7pm	• group problem session in class	• group problem session in class • problem set key posted • new videos and learning objectives posted

Monday class sessions are generally reserved for group Q&A sessions. I will not plan new content for these sessions but will instead use the time to answer student questions.

During most ***Wednesday and Friday class sessions***, groups of 3–4 students will work together on the weekly problem sets.

Semester schedule: A tentative schedule of topics is shown beginning on the next page. Note that the exact coverage from day to day may vary a bit, but updates will be provided as necessary. **Note that you should watch the indicated lecture videos prior to each class session.**

Day	Date	Lecture Topics (prerecorded videos)	Suggested Reading in Loudon	In Class (11:20am–12:10pm)	Quiz (due Tues @ 7pm)
Mon	Feb 1	**Lecture 1** atomic structure	"Make it Stick" & advice from former CHEM 205 students (handouts on BB)	course intro	
Wed	Feb 3	**Lecture 2** Lewis structures, electronegativity, and formal charge	1.1–1.3	PS 1a (through L2)	
Fri	Feb 5	**Lecture 3** bonding and hybridization	1.5–1.9; 4.1a–b; 14.1	PS 1b (through L3)	Quiz 0 (syllabus & "Make it Stick") *due Friday at 5pm*
Mon	Feb 8	**Lecture 4** resonance; functional groups	1.4; 2.8; 3.3; 15.6	Q&A	Quiz 1 (through L3)
Wed	Feb 10	**Lecture 5** constitutional isomers; nomenclature; acyclic conformational analysis	2.1–2.5	PS 2a (through L5)	
Fri	Feb 12	**Lecture 6** cyclic conformational analysis	7.1–7.5	PS2b (through L6)	

Day	Date	Lecture Topics (prerecorded videos)	Suggested Reading in Loudon	In Class (11:20am–12:10pm)	Quiz (due Tues @ 7pm)
Mon	Feb 15	**Lecture 7** stereochemistry part 1	4.1c; 6.1–6.3, 6.4b	Q&A	Quiz 2 (through L6)
Wed	Feb 17	**Lecture 8** stereochemistry part 2	4.2b; 6.6–6.7, 6.9	PS 3 (through L8)	
Fri	Feb 19	*catch-up day* work on the practice exam		Q&A	
Mon	Feb 22	**Exam 1** (covers through L8)			
Wed	Feb 24	**Lecture 9** mass spectrometry	12.6	TBD	
Fri	Feb 26	**Lecture 10** UV-vis and intro to IR	2.2; 4.3; 12.1–12.3; 15.1–15.2c	PS 4 (through L10)	
Mon	Mar 1	**Lecture 11** more IR and intro to NMR	12.4; 13.1–13.2	Q&A	Quiz 3 (through L10)
Wed	Mar 3	**Lecture 12** NMR	13.3–13.4, 13.6–13.7, 13.9	PS 5a (through L12)	
Fri	Mar 5	**Lecture 13** solving spectral problems	13.10	PS 5b (through L13)	

Day	Date	Lecture Topics (prerecorded videos)	Suggested Reading in Loudon	In Class (11:20am–12:10pm)	Quiz (due Tues @ 7pm)
Mon	Mar 8	**Lecture 14** intermolecular forces	2.6; 8.4–8.8	Q&A	Quiz 4 (through L13)
Wed	Mar 10	**Lecture 15** intro to acid/base chemistry	3.4–3.5	PS 6a (through L15)	
Fri	Mar 12	**Lecture 16** trends in pKa and Lewis acidity/basicity	3.1–3.2, 3.6	PS 6b (through L16)	
Mon	Mar 15	*catch-up day* work on the practice exam		Q&A	
Wed	Mar 17	**Exam 2** (covers through L16)			
Fri	Mar 19	**Lecture 17** substitution reactions, intro to S_N2	2.4e; 3.2b; 9.1–9.4	TBD	
Mon	Mar 22	no class			
Wed	Mar 24	**Lecture 18** finish S_N2, intro to elimination rxns	4.1–4.2, 4.5; 18.1	PS 7a (through L18)	
Fri	Mar 26	**Lecture 19** the E2 reaction	9.5	PS 7b (through L19)	

Day	Date	Lecture Topics (prerecorded videos)	Suggested Reading in Loudon	In Class (11:20am–12:10pm)	Quiz (due Tues @ 7pm)
Mon	Mar 29	**Lecture 20** E1 and S_N1 reactions	4.7c; 9.6; 18.3	Q&A	Quiz 5 (through L19)
Wed	Mar 31	**Lecture 21** wrap up substitution & elimination; intro to alkene reactions	4.6, 4.9b; 9.7	PS 8a (through L21)	
Fri	Apr 2	**Lecture 22** alkene reactions	4.7–4.9a; 5.1–5.3	PS 8b (through L22)	
Mon	Apr 5	**Lecture 23** benzene and aromaticity	15.7; 16.1, 16.6	Q&A	Quiz 6 (through L22)
Wed	Apr 7	**Lecture 24** electrophilic aromatic substitution	16.4	PS 9a (through L24)	
Fri	Apr 9	**Lecture 25** substituent effects, part 1	16.5	PS 9b (through L25)	
Mon	Apr 12	**Lecture 26** substituent effects, part 2	16.5	Q&A	Quiz 7 (through L25)
Wed	Apr 14	*catch-up day* work on your reaction summary list		PS 10 (through L26)	
Fri	Apr 16	*catch-up day* work on the practice exam		Q&A	

Day	Date	Lecture Topics (prerecorded videos)	Suggested Reading in Loudon	In Class (11:20am–12:10pm)	Quiz (due Tues @ 7pm)
Mon	Apr 19	**Exam 3** (covers through L26)			
Wed	Apr 21	**Lecture 27** intro to the carbonyl group; hydride nucleophiles, part 1	10.6; 19.8a	TBD	
Fri	Apr 23	**Lecture 28** hydride nucleophiles, part 2; organomagnesium reagents	9.8; 19.9; 20.10; 21.10a	PS 11 (through L28)	
Mon	Apr 26	**Lecture 29** carbonyl hydration; acetals	19.7, 19.10	Q&A	Quiz 8 (through L28)
Wed	Apr 28	**Lecture 30** imines and enamines; oxidation, part 1	10.7; 19.11	PS 12a (through L30)	
Fri	Apr 30	**Lecture 31** oxidation, part 2; esters	10.12; 19.14; 20.4, 20.6	PS 12b (through L31)	
Mon	May 3	**Lecture 32** nucleophilic acyl substitution	20.7–20.9; 21.5–21.8	Q&A	Quiz 9 (through L31)
Mon	May 10	**Final Exam** *details TBA*			