

# CHE 326: Organic Chemistry II Lecture, Cornell College

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## **Syllabus for Block 6, February 11<sup>th</sup> – March 6<sup>th</sup>, 2019** **Please carefully read this document and keep it for reference**

**Course Instructor:** Jai A.P. Shanata, Ph.D. (call me Jai, or, if you prefer, Dr. Shanata)

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(email is the best way to reach me unless you need an instant response)

**Office hours:** Russell Science Center 406: You can generally find me immediately before or after morning and afternoon class each day. In addition, I will be available: M-F after afternoon class from 3:00 pm until at least 4:30 pm (unless I have a meeting). *Extended office hours:* On a few evenings (usually before exams and homework are due) we will meet in Zamora's or Cole library. To meet with me at other times check my office to see if I'm in or email me to make an appointment. If necessary, deviations from the listed office hours will be announced in class.

### **Course Overview and Goals**

Welcome to Organic Chemistry II Lecture! Chemistry is a science that describes matter and how it changes over time. These changes may or may not be readily observable. Chemistry seeks to develop ways to explain why some changes do happen (while others don't happen) as well as under what conditions and how these changes occur. Chemistry can be broken down into several common subfields, including: organic chemistry, analytical chemistry, physical chemistry, inorganic chemistry, biochemistry, and theoretical/computational chemistry. Organic chemistry is the study of carbon-containing compounds. An understanding of Organic Chemistry is fundamental to fields such as: biochemistry, psychology, pharmacology, neuroscience, cell biology, molecular biology, physiology, polymers/materials, food and agricultural chemistry, and much more!

There is an artistic component to this course—you will continue to learn to draw molecules on paper and visualize them in your brain. We will use these 'pictures' (models) to work towards representing and understanding how specific arrangements of atoms and their associated electrons are related to the reactivity of the molecules they make up. Although millions of organic compounds are known, several key arrangements of atoms with particular properties—termed functional groups—reoccur in these compounds. To avoid nearly endless memorization and be able to apply your knowledge of chemistry to molecules you've never seen before, learn to recognize functional groups, their reactivity, and patterns therein.

### **Specific Learning Objectives (Educational Outcomes and Priorities in brackets)**

Summary statement: As a whole, through this course, the following items from Cornell College's Educational Priorities and Outcomes will be emphasized: knowledge, reasoning, communication, ethical behavior, and citizenship.

1. Students will be able to draw, visualize and describe in words the basic bonding motifs and types of interactions within Organic Chemistry. [Knowledge]
2. Students will continue to learn to apply kinetics and thermodynamics to organic reactions. [Knowledge, Reasoning]
3. Students will continue to learn the fundamental reaction types of Organic Chemistry. [Knowledge]

- Students will show the mechanistic path for reactions. This process will be applied to several different types of foundational reactions that are expanded and carried out in lab (CHE 327), where you will carry out isolations, syntheses and characterizations of molecules that help you to see, understand, and apply organic concepts. [Knowledge, Reasoning]
- Students will be able to identify and suggest reagents, starting materials, and products for single- and multi-step syntheses of organic compounds. [Knowledge, Reasoning]
- Students will learn to work on their own and in teams with other students to digest, understand, and solve fundamental and applied problems, including how Organic Chemistry relates to their own mental and physical health [Reasoning, Citizenship, Ethical Behavior, Well-being]
- Students will practice writing about and orally presenting scientific topics [Communication]
- Students will **learn to learn** effectively on your own in a college course (with guidance) by reading the textbook actively before class, then listening and engaging with the material during lecture. [Communication, Knowledge]

### Required Course Materials

- Textbook (same as CHE 225—you don't need to buy another one): Paula Bruice, Organic Chemistry (5<sup>th</sup> Edition; ISBN 0-13-196316-3); we will cover most of chapters 4, 11 (with some of 28), 12, 14, 15, 18, 20, and select topics from 21-27 (the bioorganic section) as well as select advanced topics. If you do not have a copy of the textbook, please let me know ASAP as I might have one for you to borrow.
- A model kit (same as CHE 225—you don't need to buy another one). Several options are available. One fairly affordable one is the HGS 1013A model kit.
- Learning Journal and Study Guide—I strongly recommend that you use a binder of papers so that you can add and rearrange as needed. Otherwise, a well-organized bound notebook with additional study materials inserted may be sufficient. A separate handout will provide additional details.
- Frequent access to the internet, including: email, Moodle, library resources, etc.

**Optional Course Material:** Study Guide and Solutions Manual (to accompany 5<sup>th</sup> ed of text)

### Class Meeting Schedule

Monday through Friday: 8:30 am – 11:00 am and 1:00 pm – 3:00 pm. We will usually start in the mornings at 8:30, however please keep your schedules clear as exams and some other days may require 8:00 am starts. We will meet 8:30 am – noon on the last day of class: Wednesday, March 6<sup>th</sup>.

**Your grade for the course will be determined as follows:**

<b><u>Point Distribution (some components may be scaled)*</u></b>	
Skills Assignments (including quizzes/Homework) (due through block; all due by 4 <sup>th</sup> week)**	200
Learning Journal and Study Guide	100
Literature Search, Paper, and Reflection	70
Presentation(s)	30
Exam 1 (Friday, February 15 <sup>th</sup> )	100
Final cumulative organic exam (March 1 <sup>st</sup> and 4 <sup>th</sup> )	225
Daily participation /group work	75
<b>Total</b>	<b>800</b>

### Grading Cutoffs\*\*\*

720 points	A-/B+
640 points	B-/C+
560 points	C-/D+
440 points	D-/F

**\*You must complete ALL assignments in order to receive a passing grade. This is true even if the assignment is late and receives partial credit or no credit.**

**\*\*Skills Assignments will likely be scaled—their total will be 1/4<sup>th</sup> of the final course grade. You must earn more than 50% of the skill assignment points in order to pass the class.**

**\*\*\*Cutoffs may be lower depending on the difficulty of the exams.**

### ***Brief assignment explanations:***

- Skills assignments are built around foundational material in the course. Generally, they must be completed perfectly in order to receive all of the points. Some will take 10-20 minutes in class.
- Retrieval practice (quizzes) and homework are NOT intended to be comprehensive. In order to be prepared for a strong performance in this course, at a minimum you should fully understand all example problems in the textbook chapters (a few exceptions will be obvious based on the material we cover in class), all required and recommended problems, and carefully study the notes that you take in class. See detailed tentative schedule. All additional worked problems should be put in your Learning Journal and Study Guide.
- Your Learning Journal and Study Guide (separate from homework) will be collected at the start of each exam (see separate handout for further details).
- Each exam will be comprehensive (including an expectation that you understand and can correctly apply material from course prerequisites such as CHE 121 and 122 (or 161) and CHE 225), but will emphasize material covered since the previous exam.
- If your performance on any exam is unsatisfactory (less than 60%), you must make arrangements to discuss the exam and how to improve with me within 24 hours of the exam's return.
- My goal is for you to have ample time to complete each exam. However, a firm cut-off time for each exam will be announced. If you think that the time that I've allotted may be insufficient, make sure to request accommodations (see "Accommodations and Learning Styles", below).
- Literature Search, Paper, and Reflection: see separate handout for assignment details
- Presentation: You will prepare a brief presentation in groups (~15 minutes per group member) that clearly demonstrates the relationship between material covered in class and a topic of interest to you and of relevance to human health or some other application of Organic Chemistry. These should focus on topics from Chapters 21-30 of the textbook (Bioorganic Chemistry and Drugs).
- Daily participation and group work: Every day, pick up a note card when you come into lecture and write your name on it. These will be used for you to answer miscellaneous questions during lecture and **for you to write at least one question that you have about the material we covered that day.** If everything we covered that day is perfectly clear in your brain, then instead write me a brief note about what was most (or least) interesting to you and the pace of class. **When group work is assigned in class, I will be watching to make sure that everyone is contributing, but also listening.** In addition, you are strongly encouraged to actively participate in class by taking careful notes and asking conceptual questions related to the material at any time (questions related to the required/recommended problems should be asked during office hours).
- Students requesting a 15 day drop (W) must have faithfully attended and participated in class. This includes note cards, quizzes, group work, exams, homework, the literature search/paper assignment and learning journals.

## **Course Policies and Resources**

### **Attendance**

**Attendance at all lectures, exams, and quizzes is absolutely mandatory.** Some homework, quiz, and exam content will be based specifically on discussions in class. If you can't attend for any reason, you should notify me in advance. I expect that students will come **on time**, be prepared, and actively participate in all class meetings. Please show respect for your classmates and limit disruptions; do NOT use electronic devices such as cell phones, tablets and laptops during class time. I reserve the right to reduce the grade of students who have been repeatedly late or have unexcused absences from lecture, even if they have a number of points that would otherwise have earned them a higher grade based on the grading cutoffs.

## Late Work and Academic Support

**You are expected to hand in all assignments on time**; this is part of being a responsible adult. Moreover, being a day behind on the block plan may make it impossible for you to catch up. Unless arranged in advance, late work will receive a reduced grade as follows:

10 minutes – 12 hours late: -20%

12 hours – 36 hours late: -40%

36 hours – 72 hours late: -70%

>72 hours late: -100%

If you can't get a physical copy of an assignment to me, digitize it and send me an electronic version (picture, scan, etc.) by email—I will count it as submitted whenever I receive that email. Then, get the hardcopy to me as soon as possible. Also, note that you must hand in **all** late work, even if it is >72 hours late and receives an automatic 0.

Please contact me as soon as possible if you are having difficulty with the course or if a serious sickness/incident occurs during the block. Similarly, if you need to miss class, let me know ahead of time; at my discretion the assignment in question may be excused. In addition to the resources listed at the end of this syllabus (librarian, quantitative reasoning studio, writing studio), there are many other ways that I and others can help directly and indirectly, but you have to let me know! I reserve the right to reduce the final grade of students who have handed in multiple assignments late, even if they have a number of points that would otherwise have earned them a higher grade based on the grading cutoffs.

If medical or psychological conditions arise during the block, please consult with me, and/or with a medical or psychological health provider, *before* your progress in the course may become impeded. If such concerns make the completion of this course or an Incomplete infeasible, you may petition for a health withdrawal (WH). Be aware that Cornell counselors and health professionals will not normally issue support for a WH unless you have consulted them at or near the onset of the problem.

## Course Communication

- For this course I require that you check your Cornell College email and Moodle accounts each at least once every day in the evening (sometime between 7:00 pm and 11:00 pm).
- The syllabus, selected handouts, list of required and recommended problems, and possibly select quizzes will be posted on our CHE 326 Moodle page. Login at <http://moodle.cornellcollege.edu/>

## Responsible Scientific Conduct and Collaboration Policy

As scholars, in this class and beyond you will be expected to explicitly acknowledge words, ideas, calculations, and data created by others. Failure to do so is a form of academic misconduct, and academic misconduct is an extreme form of disrespect towards your peers and mentors. Obvious examples include plagiarism (copying, paraphrasing, or stitching), cheating on exams, or writing something in your lab notebook that you didn't actually do; however, there are other examples of academic misconduct (and how to avoid them) that are outlined in your student handbook. Students engaging in academic dishonesty in this course will automatically fail the assignment and, at my discretion, may receive a failing grade for the course. Violations of Cornell College's policies on academic misconduct will also be referred to the Registrar and the Dean of the College and will be dealt with as described in the student handbook.

Unless otherwise specified, all work on exams and quizzes must be entirely your own—absolutely no collaboration is allowed. While you may choose to work with other students on the recommended problems, ***all work that is graded in this course must be your own in that you must fully understand everything that you have written down—including in your Learning Journal and Study Guide.*** In order to make sure that this is true, I will on occasion ask you to verbally explain to me a problem or assignment that you have handed in. For all of the recommended problems, I strongly encourage you to first read and attempt the problem on your own without using any external

resources (classmates, internet, instructor, tutor, etc.). Then if you are stuck, start discussing with your classmates or come to office hours and talk to me or the chemistry tutor.

### **Additional Academic Honesty Expectations**

Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Catalogue, under the heading "Academic Honesty."

### **Accommodations and Learning Styles**

Cornell College makes reasonable accommodations for persons with disabilities. Students should notify the Coordinator of Academic Support and Advising and their course instructor of any disability related accommodations within the first three days of the term for which the accommodations are required, due to the fast pace of the block format. For more information on the documentation required to establish the need for accommodations and the process of requesting the accommodations, see <http://www.cornellcollege.edu/academic-support-and-advising/disabilities/index.shtml>.

Additionally, if you would like to discuss how you learn and how we can maximize your likelihood of success in the course, I welcome those conversations at any time.

### **Value of a Liberal Arts Education**

What you take out of your college experience will (hopefully) be more than your GPA. You will gain a range of knowledge, skills, experiences, a network, and grow in to a responsible, caring adult. To facilitate these goals, I encourage you to attend events of interest to you across campus this block. Learn more by reading the weekly campus newsletter (Wednesday mornings) and regularly checking the college calendar: <http://webapps.cornellcollege.edu/events/>

### **Consulting Librarian for the Sciences**

Amy Gullen, Ph.D., is a good resource, especially for the writing assignment/research.  
Cole Library 305, Office: x4240  
[agullen@cornellcollege.edu](mailto:agullen@cornellcollege.edu)

### **Writing Studio**

Jennifer Haigh  
Cole Library 317  
[jhaigh@cornellcollege.edu](mailto:jhaigh@cornellcollege.edu)

### **Chemistry Student Tutors**

Tutors for this block can be contacted directly at:  
Brendan Langmack: [blangmack20@cornellcollege.edu](mailto:blangmack20@cornellcollege.edu)  
Lorin Brokaw: [lbrokaw20@cornellcollege.edu](mailto:lbrokaw20@cornellcollege.edu)  
Jennifer Sorescu: [jsorescu20@cornellcollege.edu](mailto:jsorescu20@cornellcollege.edu)

They will be available on many occasions, including the days before our exams for group tutoring. More FREE tutors can be arranged if needed, please ask me.

*Also, please make use of all resources—office hours, etc., starting early in the block—day 1 or 2!*

## **Rubric for Presentations**

Meeting with Jai	5			
Questions and Answers (in-class, HW, and exam)	5			
	<u>Expert</u>	<u>Proficient</u>	<u>Apprentice</u>	<u>Novice</u>
<b>Organization and Structure</b>	2	2	1	0
<b>Content</b>	6	4	3	<3
<b>Examples</b>	5	4	3	<3
<b>Visual Aids/Clarity</b>	3	2	1	0
<b>Delivery/Speaking skills</b>	2	2	1	1
<b>Length</b>	2	2	1	1
<b>Totals</b>	20	16	10	
<b><u>Grand Total</u></b>	<b><u>up to 30</u></b>			

## **Sample time log (for learning journal)**

<u>Activity</u>	<u>Start</u>	<u>Stop</u>	<u>total time</u>
Reading			
Chapter notes			
Required			
Recommended			
Studying			
Sleep			
Other			
Total			

**Table 1. Tentative Schedule**

Day		Date	Topics (tentative)	Reading/Work
0		prior to block	read chapter 4!	Review CHE 225; Chapter 4
1	M	2/11	syllabus; few review problems; Ch 4	review anything needed
2	T	2/12	student review presentations; more chapter 4	Chapter 11
3	W	2/13	chapter 4 wrap up (slides); Ch 11	Chapter 28; prepare topic
4	R	2/14	am = finish ch 11; 11:15 am (all campus convocation in King Chapel); pm = Chemistry of chocolate webinar and review	Study for exam
5	F	2/15	am: exam 1 (8:30 am - 1:30 pm)	break
	Sat	2/16		work on paper: topic development
	Sun	2/17		possible paper topics due; read chapter 12
6	M	2/18	Chapter 28; some multistep synthesis; library with Amy Gullen	Work on search/paper
7	T	2/19	Finished chapter 28; started Chapter 12	Work on paper and Ch 14
8	W	2/20	finished ch 14; problem solving and more multistep synthesis--none on Exam 1	Ch 15
9	R	2/21	chapter 14	Ch 17 (review, no LJ); Ch 18
10	F	2/22	ch 15	work on paper; submit draft by 9:00 pm
	Sat	2/23		<b><i>paper due by 9:00 pm</i></b>
	Sun	2/24		take a day off this weekend!
11	M	2/25	chapter 18 (and review ch 17); meet with Jai	work on presentation/finish Ch 18
12	T	2/26	chapter 18	Ch 20
13	W	2/27	Chapter 20	Study for exam
14	R	2/28	am: organometallics and food chemistry; pm: Jai works relevant problems (and/or demos)	Study for exam
15	F	3/1	<b>am: timed multiple choice (8:30 - 10:30 am); pm: group exam</b>	break
	Sat	3/2		work on presentation; reading TBA
	Sun	3/3		big picture review/rest
16	M	3/4	<b>Final (please set aside all day for it). It will cover 225 and 326, through Ch 20. It will emphasize material since Exam 1 [spectra at end?]</b>	reading TBA; practice problems assigned by other students
17	T	3/5	student presentations	prepare for final skills assignment
18	W	3/6	8:30 am - noon: <b>Final skills assignment</b> ; course evaluation; then special topic lecture (grad school/science/life advice; science philosophy)	Have a wonderful break!

*\*Learning Journals will be graded during exam 1 and day 16 (final exam)*

**The instructor reserves the right to amend the schedule and the syllabus. You will be notified of any changes.**

**These assigned problems will be collected twice during the block, as indicated.**

*Learning Journal Number 1 (collected at 8:30 am on Friday, February 15<sup>th</sup> and worth 30 points)*

**Required problems (must be in learning journal):**

**\*Some sort of extra review material (equivalent of ~10 problems). For example, you do the Practice CHE 225 Exam 1 in the review section.**

**Chapter 4 (in-text): 4, 7, 8, 12(a,b), 23**

**Chapter 4 (end-of-chapter): 37(a,c), 46(all), 47(all), 54 (all), 56(all), and 58(all).**

**Chapter 11 (in-text): 1, 5(a,b,c), 13 (draw the mechanism for the propagation steps), 16 (also: which is the thermodynamic product?)**

**Chapter 11 (end-of-chapter): 20(all), 24(a,b,c,d), 29(d,f), 30(a and b), 35(a,b)**

Recommended (these are one of several ways that you can earn extra points for the active engagement/extra effort component of the learning journal):

Chapter 4 (in-text): 6 (all; give two answers for d), 13, 17(b), 26, 28(a), 30(c; hint: there are 5—consider configurational isomers)

Chapter 4 (end-of-chapter): 39(all, except e), 43, 50(a,b,c)

Chapter 11 (in-text): 3(a), 18

Chapter 11 (end-of-chapter): 22, 29(a-c), 32(b, c, and d: synthesis problems, start practicing now if you'd like), 38, 40

*Learning Journal Number 2 (collected at 8:30 am on the day of the main final exam and worth 70 points)*

**Required problems (must be in learning journal):**

**Chapter 28 (in-text): 1, 7(c), 12, 15, 19**

**Chapter 28 (end-of-chapter): 23(a,e), 27(a,b,c), 33, 35**

**Chapter 12 (in-text): 2, 7, 10, 14(a,e), 17a, 20a**

**Chapter 12 (end-of-chapter): 41, 50, 54a, 58b**

**Chapter 13 (end-of-chapter): 56(b,c), 71c, 72a**

**Chapter 14 (in-text): 2, 4, 7(compare to #2), 9, 18, 19, 24, 26(b,c,f), 28(b,d)**

**Chapter 14 (end of chapter): 30, 31 (first 2 rows), 36, 39, and 42(b)**

**Chapter 28 (in text): 22--an interesting polymerization that relies on chapter 14 concepts-try hard before you consider looking in the solutions manual.**

**Chapter 15: (in text): 3(a,b,c), 5(b,c), 6(a), 11(d), 12(b,d,h), 17(c,e), 23, 29, 33(a,b)**

**Chapter 15 (end of chapter): 34(a,c,d,f,h), 39, 41 and 62 (together), 42(b,g), 43(all), 45(b,e), 48(a,b,f), 63**

**Chapter 18: (in text): 5(c), 7(a,c), 8(b,e,f), 12(a,c), 19(b), 20(b), 28(a), 36(a,b), 38(all), 42(b), 43(d: use of other carbon containing compounds is permitted)**

**Chapter 18 (end of chapter): 48(d,e), 49(a,b,c,k), 52, 56(a,b), 63, 65, 68(b), 69(show mechanism)**

**Chapter 20 (in text): 2, 4, 6, 7(a,c,d), 11(a), 14, 21**

**Chapter 20 (end of chapter): 27(c,f(excess amine), g), 31, 36, 42(a), 45**

Recommended (these are one of several ways that you can earn extra points for the active engagement/extra effort component of the learning journal):

Chapter 28 (in-text): 9, 11(c,d)

Chapter 28 (end-of-chapter): 26, 30, 36

Chapter 12 (in-text): 6, 11, 15, 19, 27, 33, 35, 38

Chapter 12 (end-of-chapter): 43(a,b,c,d,f,i), 45, 52, 54b, 58c, 69a, 70

Chapter 13 (end-of-chapter): 71a

Chapter 14 (in-text): 1, 3b, 10, 22(it turns out that the rate determining step for a reaction is not always the step with the slowest rate constant—use this information to answer problem 22), 29(d)

Chapter 14 (end of chapter): 32(c,d), 33, 34, 35(b)

Chapter 15: (in text): 1(a,d), 9(c,f), 14(b), 25, 31(a,b)

Chapter 15 (end of chapter): 35(a,b,g), 38(as many as you find useful), 44(as many as you find useful), 54

Chapter 18 (in text): 13(a), 17(b), 21(c), 24(c), 30(a,c), 27(d--a Robinson annulation is a Michael addition followed by an intramolecular aldol reaction), 39(c), 42(a, c--for these two, the use of other carbon containing compounds is permitted), 44, 45

Chapter 18 (end of chapter): 49(h, j, more), 53, 66, 68(c), 70, 82, 83(b)

Chapter 17: 66 (for extra practice with combined IR/NMR)

Chapter 20 (in text): 3, 12, 15, 16, 17, 18, 22, 24

Chapter 20 (end of chapter): 27(a,d), 28, 38, 39(begin by protonating the carbonyl O, then attacking the carbonyl carbon with a pi bond from the five membered ring), 42(b,c,d), 44, 47