

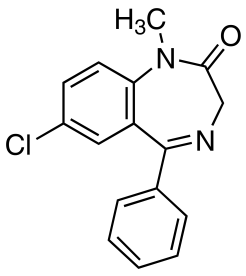
The College of William and Mary

Chemistry 207-02 - Fall 2018

12noon, MWF, Small 110

Organic Chemistry II

for Life Science Majors



Instructor - Dr. Dana Lashley

Office - ISC 1052

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Office hours: Monday 9.00-11.00am and 2.30-3.30pm, Friday 9.00-11.00am or by appointment

Mandatory materials: **Workbooks** (price varies ~ \$30 - \$50) and **Sapling** online homework (\$40) are the only mandatory materials. See details below.

Workbook (mandatory): "[Organic Chemistry as a Second Language](#)" 4th edition, by **Klein**

- [First Semester Topics](#) (ISBN: 978-1-1191-1066-8) AND

- [Second Semester Topics](#) (ISBN 9781119110651)

These are TWO different books and you need both!

Textbook (optional): "[Organic Chemistry](#)", 7th or 8th edition, by **Brown**, Iverson, Anslyn & Foote (ISBN: 978-1-1339-5284-8). A study guide bundle with [solution manual](#) (ISBN: 978-1-2850-5261-8) as well as a model kit (ISBN: 978-0-6693-9912-7) are also available but not mandatory. You can use model kits in exams if you like, but they are not required. [Both this textbook and the solutions manual are on reserve for check-out at SWEM library \(2h at a time\).](#)

Course Objective: Building upon the foundation you acquired in Chem 206 you will be introduced to a series of more advanced topics. You will explore the chemistry and reactions as well as the interconversions of various functional groups. Reaction mechanisms, which explain why reactions occur in a certain way, will be emphasized. Organic molecules form the basis of living species on our planet. Once we have investigated the principles that control the properties of such molecules, this course will travel from simple organic molecules to complex biomolecules such as carbohydrates, proteins and DNA.

Contact: You should always feel free and comfortable to contact me with any questions or concerns. Visit me in my office hours (listed above) or shoot me an email to schedule an appointment.

Smart phones / tablets: You may use smart phones and tablets in class during lectures. Most of you have this technology available and you can use it to easily access course material. I trust that you will use them responsibly for class-related issues. You may not use them during exams and quizzes. I just ask that you be respectful about it and please do keep your phones on silent.

Blackboard: Course related materials such as lecture templates/notes, exam keys and announcements will be posted on Blackboard (www.blackboard.wm.edu).

Review Sessions: Help sessions will be scheduled before exams. Time and location will be announced in class and via email. Help sessions are not mandatory but highly recommended. Homework assignments and exams will be reviewed and course content clarified upon request. You will have the chance to ask many questions. The time for the sessions will be determined by a poll to see when most of you are available.

Final grade:

Graded Coursework	Points
Exam 1*	200
Exam 2*	200
Exam 3*	200
Final	400
Quizzes (4x 50 pts)*	200
Homework (10 x 20 pts)	200
Total (minus lowest 200)	1200

* can be dropped

Your lowest 200 points, stemming from either one of the hour exams or from all the quizzes combined will be dropped. You cannot drop the final examination or the homework grade.

The maximum amount of points you can achieve in the course are 1200. Your final grade will be determined by the sum of your points throughout the semester in the following **FIRM scale**:

	A 93-100%	A- 90-92.99%
B+	87-89.99%	B 83-86.99%
		B- 80-82.99%
C+	77-79.99%	C 73-76.99%
		C- 70-72.99%
D+	67-69.99%	D 63-66.99%
		D- 60-62.99%
F	< 60%	

For example, the minimum amount of points required for an A are 90% of 1200 points =1080 points.

Hour exams: There will be three (3) hour exams, each worth 200 points. They will be taken during regular class hours. Dates for the exams are shown in the schedule below and are subject to change.

Quizzes: There will be four (4) quizzes, each worth 50 points. These will be taken during the regular class periods (12 minutes or so at the beginning of class). Dates for quizzes are shown in the schedule below and are subject to change.

Final examination (firm date) will be a comprehensive final:

Friday, December 14th, 7 pm - 10 pm. There will be **NO EARLY FINAL EXAM...** plan your schedule (for example travel, jobs, vacation) now to accommodate the day and time for the final exam.

General information for exams: All examinations and quizzes are to be taken **in ink.**

No pencil!!! There will be a **deduction of 2 points** for use of pencil and no regrades.

Grading concerns/re-grades: All grading concerns need to be discussed with me within 3 class days upon receiving your graded exam. After that there will be no re-grades.

Make-up work: Exams, homework and other graded work cannot be easily made-up. See me in the event of extenuating circumstances.

Extra credit: Please see separate handout on extra-credit opportunities.

Homework assignments: Homework will consist of graded and ungraded assignments.

It is **IMPERATIVE** for success in this class to do both graded AND ungraded homework. If you only do the graded homework, you are doing just the **bare minimum**. You can pass the class that way but to get an A or a B you must practice way beyond the bare minimum.

Set yourself aside several hours per week to practice problems.

This is really the only way to master organic chemistry !

Graded homework assignments will be done using **SAPLING (mandatory)**. You have to purchase access for the semester. The costs are around \$40 for online purchase and \$48 in the WM bookstore. There will be twelve (12) SAPLING homework assignments. Although scored on a 100 point scale, each problem-set will be worth 20 points. **The lowest two (2)** assignments will be dropped, and your **highest ten (10)** assignments will count for a maximum total of 200 points. Assignments are due at 11.55 pm on the dates shown in the schedule below. The dates are subject to change and any changes to the schedule will be announced in class and via email. To sign up for SAPLING go to <http://saplinglearning.com/> and follow the instructions provided on the handout further below.

Ungraded homework assignments from your workbook and textbook, are assigned to help you prepare for exams.

Klein Workbook: Homework problems can be found below. Updates will be emailed to you weekly do you know exactly which problems you can do each week. **HIGHLY recommend doing !**

Brown Textbook: Homework problems for each chapter can be found below.

The ungraded problems that I am assigning to you can be found **further below in this syllabus**. Additionally, supplemental problems may be posted on blackboard or handed out during help sessions.

Class Attendance: In accordance with College policy, class attendance is expected and imperative for success in this class !

See undergraduate catalog for more information. Please notify me of any absences by email.

Attendance may be recorded on a few occasions this semester.

Student Accessibility Services: Students with disabilities must contact the Student Accessibility Services in the Dean of Students office to arrange for special accommodations or extra-time during exams.

Honor Code: All students are bound to the Honor Code. There will be **zero tolerance for cheating** and all incidences will be reported to the honor system. See the student handbook for more information on the honor code.

Important dates:

First day of Class is Wednesday, August 29th.

Add/drop ends on Friday, September 7th.

Last day to withdraw from this course is Friday, October 26th.

Last day of Class is Friday, December 7th.

Final Exam is on Friday, December 14th from 7 pm - 10 pm.

Schedule: You will find a tentative schedule below. **This schedule is subject to change!**

The covered chapters indicated in the schedule are from the Brown book.

Date	Lecture number/ subject	Chapter	Quizzes/problem-sets
W 8/29	1 - Intro	10	
F 8/31	2 - Alcohols (nomenclature and properties)	10	
M 9/3	3 - Extra-credit review quiz , Alcohols (reactions)	10	HW1 due (on Sunday Sept 2 nd at 11.55pm!)
W 9/5	4 - Alcohols (reactions)	10	
F 9/7	5 - Alcohols (reactions)	10	
M 9/10	6 - Alcohols (reactions)	10	HW2 due Quiz 1 - in class
W 9/12	7 - Ethers and Epoxides (intro)	11	
F 9/14	8 - Ethers (reactions)	11	
M 9/17	9 - Ethers and Epoxides (reactions)	11	HW3 due <i>Last day: select extra credit option !</i>
W 9/19	10 - Organometallic Chemistry (video lecture - no class)	15	
F 9/21	11 - Aldehydes and Ketones (video lecture - no class)	16	
M 9/24	12 - Aldehydes and Ketones	16	HW4 due
W 9/26	Exam 1		
F 9/28	13 - Family Weekend Lecture		
M 10/1	14 - Aldehydes and Ketones	16	HW5 due
W 10/3	15 - Aldehydes and Ketones	16	
F 10/5	16 - Aldehydes and Ketones	16	
M 10/8	17 - Carboxylic Acids	17	HW6 due Quiz 2 - in class
W 10/10	18 - Carboxylic Acids	17	
F 10/12	19 - Carboxylic Acids	17	
M 10/15	<i>Fall Break</i>		
W 10/17	20 - Carboxylic Acid Derivatives	18	
F 10/19	21 - Carboxylic Acid Derivatives	18	
M 10/22	22 - Carboxylic Acid Derivatives	18	HW7 due
W 10/24	23 - Carboxylic Acid Derivatives	18	
F 10/26	Exam 2	19	
M 10/29	24 - Rxns of Enols & Enolates/Carbonyl Chemistry	19	HW8 due <i>watch video b4 class</i>
W 10/31	25 - Carbonyl Chemistry - Flipped Classroom!	19	
F 11/2	26 - Carbonyl Chemistry		
M 11/5	27 - Carbonyl Chemistry	19	HW9 due Quiz 3 - in class
W 11/7	28 - Carbonyl Chemistry,	19	
F 11/9	29 - Dienes, Conjugated systems, Cycloaddition Rxns	20	
M 11/12	30 - Dienes (reactions)	20	HW10 due
W 11/14	31 - Diels-Alder Reaction / [2+4]-cycloaddition	20	
F 11/16	32 - Diels-Alder Reaction	20	
M 11/19	33 - [2+2]-cycloadditions, Benzene and Aromaticity	20/21	
W 11/21	<i>Thanksgiving Break</i>		
F 11/23	<i>Thanksgiving Break</i>		
M 11/26	34 - Benzene and Aromaticity	21/22	HW11 due <i>watch video b4 class!</i>
W 11/28	Exam 3		
F 11/30	35 - Electrophilic Aromatic Substitution - Flipped Class!	22	
M 12/3	36 - Carbohydrates	25	HW12 due Quiz 4 - in class
W 12/5	37 - Amines; Total Synthesis of select Drug Compounds	23	
F 12/7	38 - Total Synthesis of select Drug Compounds		
F 12/14	Final Exam 7 pm - 10 pm	cumulative	<i>ALL covered chapters</i>

Instructions for SAPLING enrollment:

1. Go to <http://saplinglearning.com> and click on your country ("US Higher Ed") at the top right.
- 2a. If you already have a Sapling Learning account, log in and skip to step 3.
2b. If you have Facebook account, you can use it to quickly create a Sapling Learning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and timezone, accept the site policy agreement, and click "Create my new account". You can then skip to step 3.
2c. Otherwise, click the "Create an Account" link. Supply the requested information and click "Create My Account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
3. Find your course in the list (you may need to expand the subject and term categories) and click the link: [The College of William & Mary - CHEM 207 - Fall18 - LASHLEY](#)
4. You will require a key code, and will be prompted to enter it. Your **key code** is: **noon**
Select a payment option and follow the remaining instructions.
5. If you are new to Sapling Learning familiarize yourself with the training materials and tutorials.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling Learning support team is almost always faster and better able to resolve issues than your instructor.

Suggested End-of-chapter Problems from **Brown Textbook 7th or 8th Edition**

These are not graded, but exam problems may be similar to these. We will discuss SOME solutions in help-sessions. **I recommend doing ALL in-chapter problems before you start these!**

Chapter 10:

10.15(parts a, c, d, j and o), 10.16 (parts a, c, e, f, g and k), 10.26-10.27, 10.29-10.32, 10.35, 10.37-10.38, 10.40-10.42, 10.45, 10.47, 10.51, 10.57-10.59

Chapter 11:

11.10 (parts a, e and h), 11.11 (parts c, e and h), 11.12, 11.15, 11.16, 11.17(concentrated = excess), 11.20, 11.21, 11.24, 11.27, 11.29, 11.31-11.35, 11.43-11.46

Chapter 15:

15.7-15.13, 15.15, 15.20 (parts a, c and d) 15.21-15.23

Chapter 16:

16.14 (exclude parts g and h), 16.15 (exclude parts e, g, h and i), 16.18-16.22, 16.24, 16.25, 16.29-16.32, 16.37, 16.38-16.40, 16.43-16.44(exclude parts d and k), 16.51-16.53, 16.55, 16.56, 16.61 (parts a and b), 16.67 (part a), 16.68, 16.73 (exclude part d), 16.74, 16.78, 16.81

Chapter 17:

17.7(parts b, c and e), 17.8 (exclude parts e, g, h and i), 17.9, 17.10 (exclude part d), 17.13, 17.15, 17.18 (parts a and d), 17.19-17.23, 17.25, 17.28, 17.32, 17.35, 17.36, 17.38, 17.40, 17.42, 17.44, 17.46 (parts a, c and d), 17.47, 17.48, 17.52 (practice drawing mechanism here, even though it doesn't ask for mechanism), 17.53

Chapter 18:

18.12 (parts c, e, f, h, i and l), 18.13 (parts a, c, d and i), 18.19-18.21, 18.22 (exclude part c), 18.23-18.25, 18.27-18.33, 18.35, 18.36, 18.37, 18.39 (part a), 18.40-18.44, 18.49 (on this one wait until we have covered Chapter 19), 18.52, 18.56, 18.57, 18.63-18.67,

Chapter 19:

19.18-19.25, 19.27-19.35, 19.44-19.45, 19.49-19.53, 19.59, 19.62, 19.67, 19.70, 19.71 (exclude rxns 7 and 10), 19.73 (exclude part b), 19.76

Chapter 20:

20.14-20.20, 20.30-20.32, 20.34, 20.37, 20.39-20.40, 20.46, 20.56 (parts b and c)

Chapter 21:

21.8 (parts a, b and g), 21.9 (exclude parts b, g, m and n), 21.12-21.17, 21.19, 21.22, 21.27, 21.32, 21.34-21.37, 21.40, 21.46, 21.50 part (a) and (b), 21.51, 21.53, 21.55 part (a).

Chapter 22:

22.7 (a) and (b), 22.14, 22.15 (a), (b) and (c), 22.16, 22.18, 22.20, 22.21, 22.31 (a)-(d), 22.32, 22.34, 22.35, 22.37(a), 22.40, 22.43

Chapter 23:

23.16, 23.18, 23.19, 23.20, 23.21, 23.22, 23.25, 23.27, 23.28, 23.30, 23.33, 23.34, (23.49-23.50)

Chapter 25:

25.7-25.19, 25.24, 25.34

Suggested End-of-chapter Problems from Klein Textbook 4th Edition

Assigned homework from the Klein workbook relevant for EXAM 1:

KLEIN 1st semester topics :

Chapter 13:

Problems:

13.2 - 13.5, 13.6, 13.11, 13.13, 13.14, 13.15, 13.57 - 13.61, 13.62, 13.63 - 13.65, 13.68 (deals w/ alcohols & rxns)
13.37, 13.38 - 13.43, 13.44 - 13.49 (deals with aldehyde and ketone reactions)

Chapter 14:

Problems:

14.1 - 14.3, 14.5 - 14.7, 14.8 - 14.13, 14.14 - 14.17, 14.18 - 14.22, 14.23 - 14.25, 14.26 b), 14.27 - 14.30, 14.32
(deals with ethers and epoxides)

Problems: 14.31 (deals with epoxide opening with organometallics)

Assigned homework from the Klein workbook relevant for EXAM 2:

KLEIN 2nd semester topics :

Chapter 6:

Problems: 6.2 - 6.7, 6.8, 6.9 - 6.12, 6.16, 6.61, 6.62 - 6.65 (deals with oxidation reactions and organometallic rxn with aldehydes/ketones)

Problems: 6.66, 6.67 - 6.69 (Wittig rxn (C-nucs))

Problems: 6.23, 6.24 - 6.26, 6.28, 6.29 - 6.32 (acetal and hemiacetal formation (O-nucs))

Problems: 6.48, 6.53, 6.54, 6.58, (N-nucs) also do 6.50 and 6.57

Problems: 6.14 - 6.18, 6.19 - 6.22 (H-nucs / reduction reactions)

note: MeOH can be used as work-up for NaBH₄ instead of H⁺, H₂O or just H₂O

Mixed synthesis problems w/ different topics: 6.81, 6.83, 6.84, 6.88, 6.89, 6.90, 6.91, 6.92, 6.94, 6.95, 6.96, 6.97, 6.98, 6.100, 6.101, 6.103, 6.105, 6.106, 6.107, 6.108, 6.109

Chapter 7:

7.24, 7.25 - 7.28, 7.32, 7.33, 7.35 (Fischer Esterification)

7.55, 7.61, 7.63 (solution for the last two problems using rxns that you know is different from Klein book solution - see below)

7.29, 7.30, 7.31, 7.32 - 7.36, 7.39*, 7.41, 7.44*, 7.46*

NOTE: there is a typo in Klein for the problems marked by an asterisk (). The Nitrogen in the PRODUCT should have an extra proton and a positive charge.

7.47 - 7.50, 7.51, (the correct solution is slightly wrong in Klein, see below), 7.52, 7.53

7.2 - 7.4, 7.5 (only draw product for this one, no mechanism), 7.7 - 7.10, 7.12, 7.13, 7.14 - 7.18 (for 7.15, 7.16 and 7.17 the Klein solution is missing -78°C with the Gilman Cuprate), 7.18 (pyridine acts as a base on the carb. acid!), 7.19, 7.20, 7.22, 7.43, 7.54 (again Klein is missing -78°C with the Gilman Cuprate), 7.58, 7.60, 7.62, 7.65

7.61 solution: 1. H₂SO₄, heat ; 2. O₃ ; 3. Me₂S (Ozonolysis work-up step); 4. CrO₃, H⁺, heat

7.63 solution: 1. LiAlH_4 ; 2. H^+ , H_2O ; 3. PCC, CH_2Cl_2 ; 4. 1,2-ethanediol, H^+

7.63 alternative shorter solution:

1. DIBAL
2. H^+ , H_2O
3. 1,2-ethanediol, H^+

7.51 solution:

1. NaOH, H_2O
2. Ethanoyl chloride

Assigned homework from the Klein workbook relevant for EXAM 3:

KLEIN 2nd semester topics :

Chapter 8:

8.1 - 8.7, 8.8, 8.9 - 8.12, 8.14, 8.18, 8.19, 8.20 - 8.23, 8.24 - 8.27, 8.28 - 8.36
8.37- 8.50 (Aldol and Aldol Condensation)
8.51 - 8.56, 8.57 - 8.60, 8.61, 8.62 - 8.63 (Claisen Condensation)
8.64 (Dieckman Condensation)
8.65, 8.66 - 8.68, 8.69, 8.70 - 8.72, 8.73 - 8.76 (AAES and MES)
8.77 - 8.80, 8.85 (Michael Reaction and 1,4 addition)

Note: Robinson annulation is sadly not covered in Klein.

Chapter 10: Diels-Alder

10.1 - 10.8, 10.10 - 10.16, 10.9

Note: The Diels-Alder problems in the Klein book are on the easy side. Make sure you also practice more difficult ones as seen on Sapling, Brown book and also via Handout for Exam 3 Help-session after the break.

Chapter 1: Aromaticity

1.7 - 1.15

Additional homework from the Klein workbook relevant for Final exam:

KLEIN 2nd semester topics :

Chapter 4: Electrophilic Aromatic Substitution (EAS)

4.5 - 4.8, 4.9 - 4.17, 4.18 - 4.27, 4.30 - 4.37, 4.38 - 4.45, 4.46 - 4.56, 4.57 - 4.67, 4.68. 4.69 - 4.74, 4.75 - 4.79, 4.82, 4.84, 4.86, 4.87 - 4.92, 4.94, 4.97 - 4.99, 4.101

Chapter 9: Amines

9.11 - 9.16 (amine synthesis, methods learned in previous chapters e.g. reductive amination), 9.17 - 9.22 (retrosynthesis)