CHEM 207-01 **FALL 2022**

ORGANIC CHEMISTRY II for Life Science Majors Syllabus*

MWF 8-8:50 am @ ISC1127

Instructor: Dr. Cemile Kumas

Office: ISC 1285

Email: ckumas@wm.edu

Office Hours: M 12-1, F 11-12 or by appointment

Class Zoom Link: Zoom may be used for help-sessions and office hours. Most of our classes are in-person!

https://cwm.zoom.us/j/4610482601?pwd=MzNDL1Nnd0E2OHdncExqREJRSkhFQT09
Meeting ID: 461 048 2601 Passcode: ether

Mandatory Materials: **Workbooks** (price varies for e-book vs paperback ~ $10 - $70) and **Achieve** online homework ($45) are the only mandatory materials. See details below.

Workbook (mandatory): "Organic Chemistry as a Second Language" 4th/5th 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! Make sure you get the **4th or 5th edition**!!!

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) are also available but not mandatory. *Both this textbook and the solutions manual are on reserve for check-out at SWEM library. For safer usage I have also posted the pages of the textbook that contain assigned problems as well as their solutions on Blackboard.*

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. Note: Due to the shortened semester we may not be able to cover all biomolecules, but you will be well-prepared for Biochemistry, where these are discussed in-depth!

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

Diversity & Inclusion Vision Statement: The College of William & Mary values and actively nurtures an environment of diversity and inclusiveness where every individual, regardless of how we may differ – for example, but not limited to, with regard to race, religion, gender, ethnic origin, age, socioeconomic status, political preferences, physical abilities, or sexual orientation – is embraced, respected, and afforded the same opportunity to grow, to succeed, and to contribute to William & Mary's success.

**Tentative: Subject to revision at the discretion of the instructor. Any changes will be announced via BB.*

Course Delivery: in person. All lectures will be recorded and placed on Blackboard. Technical issues may arise it is better to come to live classes!

Help & Review Sessions: EVERY WEDNESDAY at 6:30pm – 7:50pm (mix of virtual and in-person somedays in 1127). Help & Review 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. Help & Review sessions, whether on Zoom or face-to-face, will be recorded and posted on Blackboard.

Final grade:

Graded Coursework	Points
Exam 1*	**200**
Exam 2*	**200**
Exam 3*	**200**
Final	**300**
Quizzes (4x 25 pts)	**100**
Homework (10 x 16 pts)	**160**
In-class short-quizzes (20x2 pts)	**40**
Total (minus lowest 200)	**1000**

* lowest one will be dropped

Your lowest 200 points, stemming from either one of the hour exams will be dropped. This policy is also in place in case of sickness, i.e. if you miss an exam due to sickness, this will be your dropped exam. You cannot drop the final examination, the quizzes or the homework grade.

The maximum amount of points you can achieve in the course are 1030 points with extra credits. 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 1000 points = 900 points.

General information for Quizzes and Exams: Exams will be scanned and graded with the help of a grading software called Gradescope. I prefer all examinations and quizzes are to be taken **in ink. If you choose to use pencil, you must use one that is very dark!**

Quizzes: Quizzes will be taken **in-person on Wednesday mornings at 8:30 am** on the days indicated on the schedule below (dates are subject to change). There will be four (4) quizzes, each worth 25 points. You will be given 20 minutes to finish quizzes. One exception is Quiz 4 which is a take-home quiz. You will be given 24h to take this last Quiz.

In-class Short Quizzes: There will be two question short quizzes at the beginning of some classes (dates will not be announced). These multiple-choice questions will be from previous 1-3 lectures. Total 22 short quizzes will be given throughout the semester and each short quiz will worth 2 points.

You can miss 2 short quizzes for no penalty at all. We will use polleverywhere app, please create an account from: **https://www.polleverywhere.com/login**. (Use W&M credentials when creating your free account). These short quizzes are aiming to increase your participation to the class and will test your understanding of class content from the previous class. This will encourage you to review previous class notes and keep your knowledge up to date.

Exams: ALL Exams will be taken **in-person (at ISC1127) on Wednesday evenings at 6:30pm – 7:50pm** on the days indicated on the schedule below (dates are subject to change). There will be three (3) exams, each worth 200 points. The lowest of these exams will be automatically dropped.
Final examination (firm date) will be a comprehensive in-person final:
Tuesday, December 13th, 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.
Grading concerns/re-grades: ***Gradescope*** will be used for all quizzes and exams. (You must create an account by using entry code: **Y7D2XR**). 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. You may submit regrade requests directly through Gradescope.

Make-up work: Exams, homework and other graded work cannot be easily made-up. See me in the event of extenuating circumstances. There'll be no make-up for extra credit quizzes/HW.

Extra credit: There are two opportunities:

1. Achieve Organic 1 review HW at the beginning of the semester (15 points)
2. Achieve HW at the end of the semester (15 points)

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 do practice problems. **This is really the only way to master organic chemistry!**

GRADED homework assignments will be done using **ACHIEVE (mandatory).** You must purchase access for the semester. The costs are around $45 for online purchase. There will be eleven ACHIEVE homework assignments and two extra credit homeworks. One of the lowest HW scores will be dropped. Although scored on a 100-point scale, each homework will be worth 16 points. Assignments are due at 11:59 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 ACHIEVE go to Macmillan Learning Achieve Home and enter the course ID: (**d9kdf8**). Purchase 1 term achieve access or start a grace period (14 days free trial, but you must purchase after that time).

UNGRADED homework assignments mostly from your workbook and textbook, are assigned to help you prepare for exams. I HIGHLY recommend doing these!

1. 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.
2. Brown Textbook: Homework problems for each chapter can be found below.
3. Problems: will be posted on Blackboard weekly to be solved in Help-sessions on Wednesdays

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

IF you find yourself short on time do 1 & 3. But whatever you do, don't skip doing those!

Class Attendance: In accordance with college policy, class attendance is expected and imperative for success in this class! Please notify me of any long term (more than 2 classes in a week) absences by email. This semester, you can miss 2 short quizzes for no penalty at all. The classes and help sessions will be recorded and available on BB for Covid/sickness related absences.

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.

Mental and Physical Well Being: William & Mary recognizes that students have many different responsibilities and can face challenges that make learning difficult. There are many resources available at W&M to help students. Asking for help is a sign of courage and strength. Please reach out to me if you or someone you know are facing problems inside or outside the classroom, and I will do my best to guide you to appropriate resources on campus. Those resources include:
--For psychological/emotional stress, there is the W&M Counseling Center (757-221-362), 240 Gooch Dr. 2nd floor, https://www.wm.edu/offices/wellness/counselingcenter/). Services are free and confidential.
--For physical/medical concerns, there is the W&M Health Center (757-221-4386), 240 Gooch Drive, https://www.wm.edu/offices/wellness/healthcenter/
--For other additional support or resources, please contact the Dean of Students by submitting a care report (757-221-2510) or by email at deanofstudents@wm.edu
https://www.wm.edu/offices/deanofstudents/services/caresupportservices/index.php

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. There is significant pressure on many of you to perform well academically in this class. In light of that pressure, do not compromise your integrity in any way. Any violation of the integrity of this course on the part of a student may result in **a ZERO on the assignment (HW, Quiz, Exam, etc.)** and filing of the incident with the William and Mary Student Honor Council.

THE KEY TO SUCCESS IN ORGANIC CHEM:

1. **Review orgo1 basics before first class.**
2. **Make organic chemistry your priority.**
3. **Form study groups.**
4. **Learn from your mistakes.**
5. **Don't simply memorize; seek to understand.**
6. **DO HOMEWORK & PRACTICE PROBLEMS!**

Some Important Dates:

First day of Class is Wednesday, August 31st
No class on Labor Day Monday, September 5th
Add/drop ends on Monday, September 12th
Midterm Grading Period: October 10-30
Last day to withdraw from this course is Monday, October 31st
Last day of Class is Friday, December 9th

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	HW due dates
W 8/31 F 9/2	1 - Intro 2 - Alcohols (nomenclature and properties)	10 10	(All HWs are due by 11:59pm!)
M 9/5 W 9/7 F 9/9	No classes (Labor Day) 3 - Alcohols (reactions) 4 - Alcohols (reactions)	- 10 10	**Extra credit Achieve HW due 9/10**
M 9/12 W 9/14 F 9/16	5 - Alcohols (reactions) 6 - Alcohols (reactions) 7 - Ethers and Epoxides	10 10 11	**HW1 due (9/17)**
M 9/19 W 9/21 F 9/23	8 - Ethers and Epoxides (reactions) 9 - Organometallic Chemistry, **Quiz 1 (8:30 am)** 10 - Aldehydes and Ketones	11 15 16	**HW2 due (9/24)**
M 9/26 W 9/28 F 9/30	11 - Aldehydes and Ketones 12 - Aldehydes and Ketones, **Exam 1 (6:30 pm)** 13 - Aldehydes and Ketones	16 16 16	**HW3 due (10/1)**
M 10/3 W 10/5 F 10/7	14 - Aldehydes and Ketones 15 - Aldehydes and Ketones 16 - Aldehydes and Ketones	16 16 16	**HW4 due (10/8)**
M 10/10 W 10/12 F 10/14	17 - Carboxylic Acids 18 - Carboxylic Acids **Quiz 2 (8:30 am)** Fall Break	17 17 -	
M 10/17 W 10/19 F 10/21	19 - Carboxylic Acids 20 - Carboxylic Acid Derivatives 21 - Carboxylic Acid Derivatives	17 18 18	**HW5 due (10/22)**
M 10/24 W 10/26 F 10/28	22 - Carboxylic Acid Derivatives 23 - Carboxylic Acid Derivatives, **Exam 2 (6:30 pm)** 24 - Rxns of Enols & Enolates	18 18 19	**HW6 due (10/29)**
M 10/31 W 11/2 F 11/4	25 - Carbonyl Chemistry 26 - Carbonyl Chemistry, **Flipped Class exercise at 6:30 pm** 27 - Carbonyl Chemistry	19 19 19	watch Aldol video before 6:30pm **HW7 due (11/5)**
M 11/7 W 11/9 F 11/11	28 - Carbonyl Chemistry 29 - Carbonyl Chemistry, **Quiz 3 (8:30 am)** 30 - Dienes, Conjugated systems, Cycloaddition Rxns	19 19 20	**HW8 due (11/12)**
M 11/14 W 11/16 F 11/18	31 - Dienes (reactions) 32 - Diels-Alder Rxn / [2+4]-cycloaddition 33 - Diels-Alder Rxn / [2+4]-cycloaddition	20 20 20	**HW9-part1 due (11/19)**
M 11/21 W 11/23 F 11/25	34 - Diels-Alder Reaction - **VIRTUAL CLASS on ZOOM** Thanksgiving Break Thanksgiving Break	20 - -	**HW9-part2 due (11/22)**
M 11/28 W 11/30 F 12/2	35 - Benzene and Aromaticity 36 - Benzene and Aromaticity, **Exam 3 (6:30 pm)** 37 - Electrophilic Aromatic Substitution (EAS)	21 21 21	**HW 10 due (12/3)**
M 12/5 W 12/7 F 12/9	38 - Carbohydrates 39 - Amines, **Flipped Class at 6:30pm on** Electrophilic Aromatic Substitution (EAS) 40 - Total Synthesis of select Drugs, **Quiz 4 (take-home, due 9 am)**	25 22/23	**Extra credit HW (12/9)** watch EAS video before 6:30pm **HW 11 due by (12/9)**
T 12/13	**Final Exam 7 pm - 10 pm**	cumulative	*ALL covered chapters*

Note: This syllabus is subject to change with proper notice at the discretion of the instructor as indicated by class interests and needs. Revisions will be announced email and/or on the course website in Blackboard. You are responsible for being familiar with any revisions whether or not you have been absent from class.

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: (we may not get to this) 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 asterix (*). 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.H_2SO_4, heat ; 2. O_3 ; 3. Me_2S (Ozonolysis work-up step); 4. CrO_3, 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 (we may not get to this)
9.11 - 9.16 (amine synthesis, methods learned in previous chapters e.g. reductive amination), 9.17 - 9.22 (retrosynthesis)