Chem 731, Advanced Topics in Organic Chemistry
Taught as: Synthetic Organic Chemistry
Fall Semester 2021

Instructor: Prof. B. Mikael Bergdahl
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Lecture meetings: MW, 5:00-6:15 p.m.; AH-3177

Office Hours: MW 9:00-11:00 am and by appointment

Texts:
Francis A. Carey, and Richard J. Sundberg, *Advanced Organic Chemistry*, Part B: Reactions and Synthesis, 5th Ed., Kluwer/Plenum Publ., New York 2007.
ISBN: 978-0-387-68354-6. **Required**
Francis A. Carey, and Richard J. Sundberg, *Advanced Organic Chemistry*, Part A: Structure and Mechanisms, 5th Ed., Kluwer/Plenum Publ., New York 2007.
ISBN: 978-0-387-68346-1. **Highly recommended**

Course Information: Chemistry 731 is an advanced organic chemistry course, which will emphasize modern chemical methodologies most often used in synthetic organic chemistry. Curved arrow mechanism will be presented and emphasized in order to enforce the knowledge and understanding about organic chemistry. Mechanisms covered in this class will be presented in such a way that it connects with fundamental acid-base chemistry, a crucial tool for understanding favorable reaction pathways in organic reactions. Relevant topics are formation of enolates and enamines taking advantage specific reagents, particularly in electrophilic trapping reactions. The course will also cover nucleophilic opening and reductions of carbonyl groups followed by functional group interconversions. Electrophilic additions to carbon-carbon multiple bonds, cycloadditions, rearrangements, and elimination reactions will be highlighted. The course will exemplify synthetic routes and retrosynthetic analysis toward biologically important compounds.
Prerequisites: BS or equivalent degree in chemistry.

****Covid-19 Information****: Students enrolled in this course have to adhere to any covid regulations as handed down by the university administration. At the writing of this syllabus, all attending students, incl. those who are fully vaccinated, must be wearing masks while attending lectures.

Student Learning Outcomes:
- Describe, outline and depict reasonable curved arrow mechanisms for the organic reactions presented in the course.

Activity: Assigned homework problems, lecture and in-class discussions.
Assessment: Exam questions, oral presentation and report writing regarding different types of reaction mechanism.

- Depict, analyze, sketch and draw the stereochemistry of products obtained from the reactions covered in the course.

Activity: Assigned homework problems, lecture and in-class discussions.
Assessment: Exam questions, oral presentation and report writing asking for justification for specific stereochemistry.

- To be able to generate specific enolates by selecting, justifying, and discussing appropriate bases and solvents, and subsequent predictions of the reaction pattern by employing various electrophiles.

Activity: Assigned homework problems, lecture and in-class discussions.
Assessment: Exam questions, oral presentation and report writing asking for justification for specific products formed in enolate chemistry.

- To be able to define, depict, predict and classify functional group interconversions by substitutions, including protection and deprotection of various protecting groups, reduction of carbon-carbon multiple bonds, carbonyl groups, and other functional groups.

Activity: Assigned homework problems, lecture and in-class discussions.
Assessment: Exam questions, oral presentation and report writing asking for justification for specific products formed from substitution, protection, reduction reactions.

- To be able to depict, predict and plan olefination reactions from stabilized carbon nucleophiles and outline electrophilic additions to carbon-carbon multiple bonds.

Activity: Assigned homework problems, lecture and in-class discussions.
Assessment: Exam questions, oral presentation and report writing asking for justification for specific products formed from stabilized carbon nucleophiles and electrophilic addition reactions.

Attendance: The lecture course consists of two 1.5-hour lectures per week. Lectures will be focused on the theoretical basis and understanding of important concepts in mechanisms of synthetic organic chemistry. You will not be penalized for not attending lectures directly, but indirectly it most likely will be reflected as lower course grades.

Examinations: Two midterm exams will be given during regular lecture schedule (Sept. 22 and Oct. 27) from 5:00 p.m. - 7:00 p.m. The final exam is on Wednesday, Dec 10th, 3:30 PM - 5:30 PM. As no make up exams will be given during the semester, it is important that you plan your schedule accordingly. The two 2 hour midterm exams will each be worth 100 points. The final is also a 2 hour exam cumulative and is worth 200 points. Excused absences, substantiated by an appropriate written confirmation, will result in no penalty. Unexcused absences will result in a “zero” and will account for an “F” grade for such exam. Make-up exams will only be offered in exceptional circumstances, typically requiring advance notice.

NIH-Style Written Proposal and Oral Presentation: The homework assignment for the class will be to prepare a shortened NIH-style proposal to propose the total synthesis of a complex natural product with biological activity. These target molecules will be assigned to you in the beginning of the semester. The written proposal is worth a maximum of 75 points and the oral presentation is worth a maximum of 75 points. These presentations are conducted towards the end of the semester,

Grading Policies: Your grade will be determined at the end of the semester, which will not be based on a curve thus your performance will not be affected by others. There is no pre-determined guideline for the grade distribution and most students are assigned high course grades in the end. However, high grades will require a lot of focus, dedication and understanding of the advanced course material. The following flexible scale is a guideline: 85% for “A”, 70% for “B” and 50% for a “C” grade, respectively. The +/- grades will be at the instructor’s discretion.

Design and Conduct:
Chapter 1, Alkylation of Enolates and Other Carbon Nucleophiles: 3 weeks
Chapter 2, Reactions of Carbon Nucleophiles with Carbonyl Compounds: 3 weeks
Chapter 3, Functional Group Interconversion by Substitution, Including Protection and Deprotection: 3 weeks
Chapter 4, Electrophilc Additions to Carbon-Carbon Multiple Bonds: 3 weeks
Chapter 5, Reduction of Carbon-Carbon Multiple Bonds, Carbonyl Groups, and other Functional Groups: 3 weeks
Chem 731 Graduate Student presentations for the Chem 531 students: 1 week

Grading: Your course grade will be based on 550 points maximum. Your grade will be based on your performance on your exams, the written proposal and the oral presentation.

In summary;	Midterm 1 (18%)	100	points
	Midterm 2 (18%)	100	points
	Written Proposal (14%)	75	points
	Oral Presentation (14%)	75	points
	Final Exam (36%)	200	points
	Total	550	points

Cheating and Plagiarism: Academic dishonesty is not tolerated and will result in you receiving a grade of zero for the specific activity. Furthermore, all actions of dishonesty will be reported to the SDSU Center for Students Rights and Responsibilities for investigation and possible disciplinary action, which can include expulsion from SDSU. For additional information on SDSU policies, please see the following URL: http://csrr.sdsu.edu/cheating-plagiarism.html

Students with Disabilities: If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact the Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services.

To the student and how to succeed in Organic Chemistry (and science in general):

1. *Develop good study habits:*
   a. Attend all lectures.
   b. Take good lecture notes.
   c. Use your lecture notes as a guide to your reading in the textbook. Write your questions down if there is something you don't understand. Ask your instructor if you don't understand a concept.
   d. Make flash cards of definitions, concepts, reactions, structures, and nomenclature that are in the textbook that are emphasized by your instructor in lecture. Writing something is equivalent to reading it ten times.
   e. Do all the homework problems with the aid of the study guide or answer book. The suggested problems (homework) have about the same difficulty as the problems you will be given on the exams.
   f. One of the alternative ways to learn, is to find a study partner or to form a study group and work on problems independently and then together.
   g. Keep up to date and don't fall behind.
   h. Seek course advice from science professors and students.
   i. If necessary, see your instructor or department for a tutor.
   j. Try to see the "big picture"; try to see how the topic of the week fits in with the whole course. If you have a difficulty achieving this, ask your instructor.
   k. Practice applying what you have learned in class to the world around you.
   l. Try to foster your own scientific curiosity – wonder why things are and how they happen.
   m. Put emphasis on understanding concepts rather than memorizing material.
2. *Have a positive attitude*.
3. *Realize that science requires more self discipline than many other majors, but actually offers more rewards*.
4. *Be organized*.
5. *Persevere and be determined to succeed*.

Good Luck in Chem 731!!

Mike Bergdahl

Lecture and Exam schedule; Chem 531/731, Fall 2021

Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
23-Aug ***Introduction*** ***Chapter 1***	**24-Aug**	**25-Aug** ***Chapter 1***	**26-Aug**	**27-Aug**
30-Aug ***Chapter 1***	**31-Aug**	**01-Sep** ***Chapter 1***	**02-Sep**	**03-Sep**
06-Sep *Labor Day Holiday*	**07-Sep**	**08-Sep** ***Chapter 1***	**09-Sep**	**10-Sep**
13-Sep ***Chapter 2***	**14-Sep**	**15-Sep** ***Chapter 2***	**16-Sep**	**17-Sep**
20-Sep ***Chapter 2***	**21-Sep**	**22-Sep** ***Midterm 1***	**23-Sep**	**24-Sep**
27-Sep ***Chapter 2***	**28-Sep**	**29-Sep** ***Chapter 2***	**30-Sep**	**01-Oct**
04-Oct ***Chapter 3***	**05-Oct**	**06-Oct** ***Chapter 3***	**07-Oct**	**08-Oct**
11-Oct ***Chapter 3***	**12-Oct**	**13-Oct** ***Chapter 3***	**14-Oct**	**15-Oct**
18-Oct ***Chapter 3***	**19-Oct**	**20-Oct** ***Chapter 4***	**21-Oct**	**22-Oct**
25-Oct ***Chapter 4***	**26-Oct**	**27-Oct** ***Midterm 2***	**28-Oct**	**29-Oct**
01-Nov ***Chapter 4***	**02-Nov**	**03-Nov** ***Chapter 4***	**04-Nov**	**05-Nov**
08-Nov ***Chapter 4***	**09-Nov**	**10-Nov** ***Chapter 4***	**11-Nov** *Veterans Day Holiday*	**12-Nov**
15-Nov ***Chapter 5***	**16-Nov**	**17-Nov** ***Chapter 5***	**18-Nov**	**19-Nov**
22-Nov ***Chapter 5***	**23-Nov**	**24-Nov** *Thanksgiving Holiday*	**25-Nov** *Thanksgiving Holiday*	**26-Nov** *Thanksgiving Holiday*
29-Nov ***Chapter 5***	**30-Nov**	**01-Dec** ***Chapter 5***	**02-Dec**	**03-Dec**
06-Dec ***Chem 730 presentations***	**07-Dec**	**08-Dec** ***Chem 730 presentations***	**09-Dec**	**10-Dec** *Finals week* ***Final Exam***
13-Dec	**14-Dec**	**15-Dec**	**16-Dec**	**17-Dec**
Dec 10-16 Finals Week				

Chemistry 531/731 Final: Friday Dec. 10th, 3:30-5:30 PM