

# CHEM731-01:Synthetic Organic Chemistry



## Chem 531/731, Synthetic Organic Chemistry

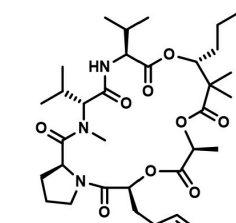
### Fall Semester 2025



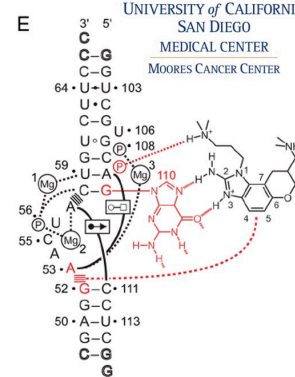
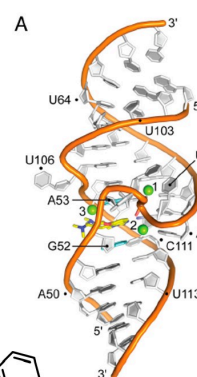
## Natural Product Synthesis and Chemical Methodology



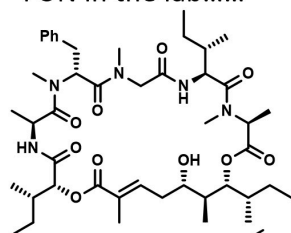
- Natural products in fighting diseases
- Powerful new anticancer agents
- Small molecules in medicinal chemistry
- Targeted battle of the hepatitis C virus
- New chemical methodology
- FUN in the lab.....



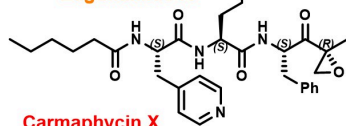
Palmyramide A  
IC<sub>50</sub> 9 nM HCT-119 colon cells



UNIVERSITY of CALIFORNIA  
SAN DIEGO  
MEDICAL CENTER  
MOORE'S CANCER CENTER

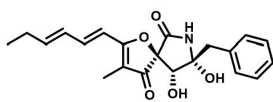


Lagunamide A

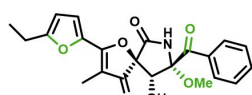


Carmaphycin X

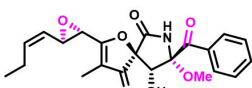
IC<sub>50</sub> 62 pM HepG2 liver cells



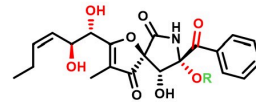
Azaspiroene (1) (anti-cancer)



FD-838 (3) (anti-bacterial)

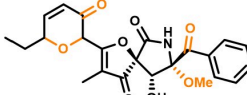


Synerazol (5) (anti-fungal)

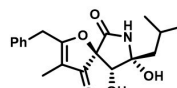


Pseurotin A (2), R = Me (anti-fungal)

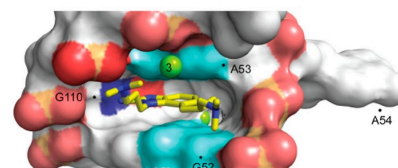
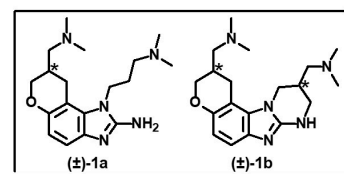
Pseurotin F<sub>2</sub>, R = H



FD-839 (4) (anti-cancer)



Berkeleyamide D (6)



Instructor:

Prof. B. Mikael Bergdahl, Office: CSL 202

Contact:

[bbergdahl@sdsu.edu](mailto:bbergdahl@sdsu.edu) (mailto:bbergdahl@sdsu.edu)

Lecture meetings:

MW, 5:00-6:15 p.m.; AH-3177

Office Hours:

MW, 2:00-4:00 p.m. and by appointment

Texts:

1) 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**

**2) 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**

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**Course Information:** *Chemistry 531/731 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.*

**Highly Recommended Prerequisites:** Strong Background information from Chem 432, 432L or equivalent 2nd semester Ochem class.

**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 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 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 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 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 asking for justification for specific products formed from stabilized carbon nucleophiles and electrophilic addition reactions.

## Preliminary Schedule:

## Lecture and Exam schedule; Chem 531/731, Fall 2025

<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>
25-Aug <i>Introduction</i> <i>Chapter 1</i>	26-Aug	27-Aug <i>Chapter 1</i>	28-Aug	29-Aug
01-Sep <i>Labor Day</i> <i>Holiday</i>	02-Sep	03-Sep <i>Chapter 1</i>	04-Sep	05-Sep
08-Sep <i>Chapter 1</i>	09-Sep	10-Sep <i>Chapter 1</i>	11-Sep	12-Sep
15-Sep <i>Chapter 2</i>	16-Sep	17-Sep <i>Chapter 2</i>	18-Sep	19-Sep
22-Sep <i>Chapter 2</i>	23-Sep	24-Sep <i>Midterm 1</i>	25-Sep	26-Sep
29-Sep <i>Chapter 2</i>	30-Sep	01-Oct <i>Chapter 2</i>	02-Oct	03-Oct
06-Oct <i>Chapter 3</i>	07-Oct	08-Oct <i>Chapter 3</i>	09-Oct	10-Oct
13-Oct <i>Chapter 3</i>	14-Oct	15-Oct <i>Chapter 3</i>	16-Oct	17-Oct
20-Oct <i>Chapter 3</i>	21-Oct	22-Oct <i>Chapter 4</i>	23-Jan	24-Oct
27-Oct <i>Chapter 4</i>	28-Oct	29-Oct <i>Midterm 2</i>	30-Oct	31-Oct
03-Nov <i>Chapter 4</i>	04-Nov	05-Nov <i>Chapter 4</i>	06-Jan	07-Nov
10-Nov <i>Chapter 4</i>	11-Nov <i>Veterans Day</i> <i>Holiday</i>	12-Nov <i>Chapter 4</i>	13-Nov	14-Nov
17-Nov	18-Nov	19-Nov	20-Nov	21-Nov

<b>Chapter 5</b>		<b>Chapter 5</b>		
<b>24-Nov</b> <b>Chapter 5</b>	<b>25-Nov</b>	<b>26-Nov</b> <i>Thanksgiving Holiday</i>	<b>27-Nov</b> <i>Thanksgiving Holiday</i>	<b>28-Nov</b> <i>Thanksgiving Holiday</i>
<b>01-Dec</b> <b>Chapter 5</b>	<b>02-Dec</b>	<b>03-Dec</b> <b>Chapter 5</b>	<b>04-Dec</b>	<b>05-Dec</b>
<b>08-Dec</b> <b>Chem 730 presentations</b>	<b>09-Dec</b>	<b>10-Dec</b> <b>Chem 730 presentations</b>	<b>11-Dec</b>	<b>12-Dec</b> <b>Final Exam 3:30-5:30</b>
<b>15-Dec</b>	<b>16-Dec</b> <b>Dec 12-18 Finals Week</b>	<b>17-Dec</b>	<b>18-Dec</b>	<b>19-Dec</b>

### **Chemistry 531/731 Final: Friday Dec. 12th, 3:30-5:30 PM**

**Attendance:** The lecture course consists of two 1-hour + 15-min. lectures per week, 5-6:15pm. Lectures will be focused on the theoretical basis and understanding of important concepts of synthetic organic chemistry with mechanisms. 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. 24 and Oct. 29) from 5:00 p.m. - 7:00 p.m. The final exam is on Friday, Dec 12<sup>th</sup>, 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 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.

**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.

### **Chem 531/731: 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**, Electrophilic 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** Student presentations: 1 week

**Grading**: Your course grade in Chem 531 will be based on 400 points max and **500** points max in Chem 731.


**In summary; Midterm 1 (25%) 100 points**

**Midterm 2 (25%) 100 points**

**Final Exam (50%) 200 points**

**Chem 731 Activity 100 points (Report + Presentation)**

**Total 400 +100 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>  (<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:*
2. Attend all lectures.
3. Take good lecture notes.
4. 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.
5. 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.

6. 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.
7. 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.
8. Keep up to date and don't fall behind.
9. Seek course advice from science professors and students.
10. If necessary, see your instructor or department for a tutor.
11. 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.
12. Practice applying what you have learned in class to the world around you.
13. Try to foster your own scientific curiosity – wonder why things are and how they happen.
14. Put emphasis on understanding concepts rather than memorizing material.
15. *Have a positive attitude.*
16. *Realize that science requires more self discipline than many other majors, but actually offers more rewards.*
17. *Be organized.*
18. *Persevere and be determined to succeed.*

Good Luck in Chem 531/731!!

Mike Bergdahl