INTRODUCTION AND OBJECTIVES

Organic Chemistry 2 (A301-002) is a second semester introductory course in organic chemistry.

In addition to extending and reinforcing the basic knowledge of topics such as nomenclature, structure and functionality that were introduced in Organic Chemistry I, important new areas such as substitution and elimination reactions, aromatic molecules, pericyclic reactions and biological chemistry will be introduced. The aims of the course are to increase familiarity with the advanced fundamentals of organic chemistry, and to recognize the impact of organic chemistry on our daily lives. Lectures will be held in Monroe 127 and will begin promptly at 9:30 am on Monday, Wednesday and Friday, and will run until 10:20 am. Attendance at lectures is expected.
Lecture content will not cover all of the material required for Organic 2. It is important that students read and understand the material listed in the reading assignments and any assignments distributed throughout the course.

WEB SITE AND LISTSERVE

CHEM A301-002 will make use of blackboard, and occasionally lecture notes will be made available as pdf files. Students should develop a habit of routinely checking the A301-002 blackboard site.

COURSE TEXT BOOK:


The text book provides a good guide to most of the topics which will be covered in Organic Chemistry 2. In addition, a solution guide and study manual by the same author is available. Students are also encouraged to acquire a good set of molecular models.

For supplementary, detailed description of some of the topics in the course, students should consult the references listed below.

ADDITIONAL REFERENCES


REFERENCES FOR PLANNING A LOGICAL CHEMICAL SYNTHESIS


PRELIMINARY READING

Students are strongly encouraged to examine the list of topics below and to read the material ahead of time.

LECTURES

1. **Substitution and Elimination Reactions, Part I**: Substitution reactions of alkyl halides.  
   *Bruice Reading*: 10.1-10.3; 10.5-10.7; 10.9-10.10

2. **Substitution and Elimination Reactions, Part II**: Elimination reactions of alkyl halides.  
   *Bruice Reading*: 11.1-11.7;

3. **Substitution and Elimination Reactions, Part III**: Competition between substitution and elimination.  
   *Bruice Reading*: 11.8-11.11

4. **Substitution and Elimination Reactions, Part IV**: Reactions of alcohols, ethers, epoxides and sulfur containing compounds.  
   *Bruice Reading*: 12.1-12.10

5. **Organometallic Compounds**: Grignard reagents, Heck, Suzuki and Stille reactions  
   *Bruice Reading*: 12.11-12.12

6. **Aromatic Compounds, Part I**: Introduction to aromaticity; nomenclature.  
   *Bruice Reading*: 15.1-15.7; 16.1

7. **Aromatic Compounds, Part II**: Reactions of benzene; general mechanism of electrophilic substitution.  
   *Bruice Reading*: 15.8-15.15; 16.2
8. **Aromatic Compounds, Part III**: Effect of substituents on reactivity and orientation.
   *Bruice Reading*: 16.3-16.7

   *Bruice Reading*: 16.10-16.13

10. **Aldehydes and Ketones, Part I**: Introduction to carbonyl chemistry; structure and bonding; addition of nucleophiles.
    *Bruice Reading*: 18.1; 18.2-18.3; 18.5

11. **Aldehydes and Ketones, Part II**: Addition of strong nucleophiles, hydrides and organometallics; the Witting reaction.
    *Bruice Reading*: 18.4; 18.10

12. **Aldehydes and Ketones, Part III**: Stereoselectivity in carbonyl additions: cyclic stereocontrol of large vs small nucleophiles; torsional vs steric effects; acyclic stereocontrol: The Felkin-Ahn model vs chelation control.
    *Bruice Reading*: 18.11

13. **Aldehydes and Ketones, Part IV**: Hydration, hemiacetal and acetal formation; the anomeric effect; reactions with amines.
    *Bruice Reading*: 18.7-18.8; 18.6

14. **Carboxylic Acids, Part I**: Structure; Acidity.
    *Bruice Reading*: Ch 17

15. **Carboxylic Acids, Part II**: Synthesis; Esterification.
    *Bruice Reading*: Ch 17

16. **Carboxylic Acids, Part III**: Reactions at carbon and oxygen.
    *Bruice Reading*: Ch 17

17. **Carboxylic Acid Derivatives, Part I**: Acyl transfer reactions.
    *Bruice Reading*: Ch 17

18. **Carboxylic Acid Derivatives, Part II**: Relative reactivities; hydrolysis.
    *Bruice Reading*: Ch 17

19. **Carboxylic Acid Derivatives, Part II**: Relative reactivities; hydrolysis.
    *Bruice Reading*: Ch 17

20. **Carboxylic Acid Derivatives, Part III**: Acid chlorides; anhydrides; amides.
    *Bruice Reading*: Ch 17

21. **Chemistry at the α-position, Part I**: Carbonyl acidity; deuterium exchange; enol-keto tautomerism.
    *Bruice Reading*: Ch 19

22. **Chemistry at the α-position, Part II**: Alkylation.
    *Bruice Reading*: Ch 19

23. **Chemistry at the α-position, Part III**: Aldol condensation.
    *Bruice Reading*: Ch 19

24. **Chemistry at the α-position, Part IV**: Aldol condensation (contd.); crossed and intramolecular aldol; Mukaiyama aldol; benzoin condensation.
    *Bruice Reading*: Ch 19

25. **Conjugate Addition Chemistry, Part I**: 1,2- and 1, 4-addition; Michael additions, Robinson annulation.
    *Bruice Reading*: Ch 19

26. **Synthesis**: Stereoselective enolate reactions; diastereoselective alkylation.
    *Bruice Reading*:

27. **Amines, Part I**: Structure and nomenclature.
    *Bruice Reading*: Ch 21

28. **Amines, Part II**: Synthesis and reactivity.
    *Bruice Reading*: Ch 21

29. **Amines, Part II**: Synthesis and reactivity (contd.)
    *Bruice Reading*: Ch 21
30. **Amines, Part IV:** Nitriles; anilines; Hofman elimination; diazotization; heterocycles.  
*Bruice Reading:* Ch 21

31. **Pericyclic Reactions Part I:** Introduction.  
*Bruice Reading:* Ch 29

32. **Pericyclic Reactions Part II:** FMO analysis; electrocyclic reactions.  
*Bruice Reading:* Ch 29

33. **Pericyclic Reactions Part III:** Cycloadditions.  
*Bruice Reading:* Ch 29

34. **Pericyclic Reactions Part IV:** Cycloadditions (contd.); sigmatropic rearrangements.  
*Bruice Reading:* Ch 29

35. **Amino Acids, Peptides and Proteins Part I:** Nomenclature.  
*Bruice Reading:* 23.1

36. **Amino Acids, Peptides and Proteins Part II:** Acid-base properties  
*Bruice Reading:* 23.2-23.7

37. **Amino Acids, Peptides and Proteins Part III:** Introduction to solid phase synthesis.  
*Bruice Reading:* 23.10

38. **Proteins and Enzymes:** Introduction to structure and biological catalysis.  
*Bruice Reading:* 23.11-23.15

39. **Carbohydrates, Part I:** Classification and properties.  
*Bruice Reading:* Ch 22.1-22.3

40. **Carbohydrates, Part II:** Mutarotation and base-catalyzed isomerization.  
*Bruice Reading:* Ch 22 10

41. **Special Topics:** Combinatorial Organic Synthesis and Drug Design  
*Bruice Reading:* 30.11

**HOMEWORK** No homework will be assigned during the course. Students are encouraged to prepare for the examinations by completing the relevant problems at the end of each Chapter.

**METHOD OF ASSESSMENT AND GRADING:**

Your final grade will be determined on the basis of four components, which will be distributed as follows: Three 50 min in-class exams will be given and a comprehensive, two-hour final exam. The anticipated dates of the in-class examinations are listed below and may be subject to change. No make-up or early exams will be given unless under exceptional circumstances. Calculators may not be used during the examinations. Please note that, using a total point scheme to determine final grades, "letter grades" cannot be given to any individual exam performance. However you can monitor your progress by the relationship of your score to the class average.

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<thead>
<tr>
<th>Date</th>
<th>Exam Type</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>2/10</td>
<td>Class examination 1</td>
<td>20%</td>
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<tr>
<td>3/17</td>
<td>Class examination 2</td>
<td>20%</td>
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<tr>
<td>4/7</td>
<td>Class examination 3</td>
<td>20%</td>
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<tr>
<td>TBD</td>
<td>Final examination</td>
<td>40%</td>
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An overall mark of 55% is normally considered adequate passing standard and it is not necessary to achieve a pass in every component of Organic Chemistry 2. Marks may be subject to scaling before final grades are awarded.
ANTICIPATED GRADING SCALE

- 100-89                      A
- 88-82                      B+
- 81-75                      B
- 74-70                      C+
- 69-65                      C
- 64-60                      D+
- 59-55                      D
- <55                        FAIL

REVIEW SESSION (TENTATIVE) AND MOCK EXAMS

A review session may be given before the final exam and the date will be announced sometime during the semester. Please note that mock-exams and previous tests are not currently available for Organic Chemistry 2. Review sessions for class exams may be given if time permits.

ABSENCES

No student will be excused from taking an exam at the scheduled time without the prior permission of the instructor. If you believe that you have a valid reason for requesting an excused absence, contact me before the exam either in person, e-mail or by phone. A grade of zero will be given for an absence. Make-up exams are only given in exceptional circumstances (documentation should be provided, e.g. physicians note) and will take the form of a one-hour oral examination.

NOTIFIED CHANGES TO THE SYLLABUS

The material in this syllabus outline is currently accurate, but deviations may be necessary as the semester progresses. Students must be sure that they are aware of such variations which may be announced on the in lectures, or on the CHEM A301-002 Blackboard site.

Please read and make sure that you understand the section on academic dishonesty, integrity of scholarship and grades, in the Loyola University Undergraduate Bulletin

CONSULTATION AND OFFICE HOURS

Students are welcome and encouraged to consult the instructor on any aspect of the subject that is causing concern. In particular, if a section of work in the subject is causing difficulty, you should obtain help with this work as soon as possible.

Office Hours: Open office hours M-F after 2.00 pm or by appointment