Whither Organic Chemistry?

- Organic chemistry is central to human health
- Nature is an organic chemist!

Paclitaxel
Lung, ovarian, breast cancer treatment

vancomycin
Antibiotic of "last resort"

Case Study: Malaria

- >2% of all deaths worldwide
- Prevention: mosquito nets
- Vaccine: does not exist
- Treatment: organic compounds

quinine
Cinchona bark
artemisinin
herbal remedy for >2 centuries

Artemisia annua

Synthetic and Natural Architecture

• Guggenheim Museum – Bilbao, Spain
Course Goals/Questions

• Speak the language of organic chemistry.

• How do organic molecules behave?

• What do the different atoms of organic molecules do? How can we predict what they do?

• How can we change organic molecules by doing reactions?

• How does organic chemistry fit in with biology? With drug discovery?

A slide wherein I divulge the secrets to success in O-Chem:

• Come to class prepared.

• Do something for this course every day. To let more than two days pass without a substantial out-of-class effort is courting disaster.

• Do all the problems. Feel the burn.

• Get help early.
Course Rule: Respect thy Neighbor

• **Be early.** It is disrespectful and disruptive to your classmates and to me to be late.

• **No mobile phone use.** You may leave your phone on vibrate in the event there is an Alert Carolina broadcast message, but your mobile is not to be used otherwise.

• **No laptop use without explicit instructor permission.** If you want the materials that have been posted on Sakai, you should print them before coming to class. Drawing chemical structures is a key component of organic chemistry and you can’t do this on a laptop.

As you know, the Honor Code ([http://honor.unc.edu/](http://honor.unc.edu/)) is a cornerstone in maintaining academic integrity at Carolina. I take it extremely seriously and expect you do as well. While I do not anticipate problems, you should know that I have no compunctions about reporting Honor Code violations.

Syllabus Highlights

• All course materials will be posted at: sakai.unc.edu

• **Q&A Sessions:**
  Tuesday 4:00-5:00 pm, Caudill 221 (except 1/29, 2/12, 3/12, 4/9)
  Friday 3:00-4:00 pm, Caudill 221 (except 3/15)

• Quizzes: Most Tuesdays – intended to be easy if you’ve done the reading

• Course Structure – role of the lecture and group learning
Chemistry 262H
Honors Organic Chemistry II
Spring 2013

All course materials will be posted at: sakai.unc.edu

Class: 9:30-10:45 am TTh, Venable G307 (Note – No class will be held on 3/12 or 3/14)

Instructor: J. S. Johnson, 220 Caudill Laboratories (843-4936; jsj@unc.edu)

Pre/Corequisites: Prerequisites: A grade of C– or better Chem 261 or 261H. It is an Honor Code violation to be enrolled in a course lacking the proper pre- and corequisites.

Q&A Sessions: Tuesday 4:00-5:00 pm Caudill 221 (except 1/29, 2/12, 3/12, 4/9)
Friday 3:00-4:00 pm Caudill 221 (except 3/15)

Textbook: Organic Chemistry, UNC Ed.; Author: P.K. Bruice

Course Goal: Foremost, students in this course should endeavor to develop an understanding of important functional groups in organic chemistry and the reactions in which these groups participate. Implicit in this undertaking is an aggressive approach toward problem solving and pattern recognition. With a foundation in reaction chemistry, a second goal will be to understand the role of organic chemistry in biological systems (carbohydrates, amino acids, lipids).

Exams: Hour Exam I 2/12 (Tuesday)
Hour Exam II 3/7 (Thursday)
Hour Exam III 4/11 (Thursday)
Final Exam 5/7 (Tuesday), 8:00-11:00 am

Final exam rescheduling policy: http://www.unc.edu/ugradbulletin/procedures1.html
A request to reschedule your final exam time will not be considered in the absence of (a) a written examination excuse from the Dean of your school; or (b) an "Official Permit to take Final Examination to remove grade of AB" from the Office of the Registrar (this can be obtained if the student is on the Infirmary List).

I want to grade your best effort. If your mean-adjusted final exam score is better than any of your mean-adjusted hour exam scores, I will replace your lowest mean-adjusted hour exam score with the mean-adjusted final exam score. In the event that you must miss a single hour exam for medical reasons or other emergencies circumstances, the score on your final exam will be inserted as your missed hour exam score. An absence from a second hour exam will result in a score of 0 for that exam. No makeup hour exams will be given; there will be no exceptions to this policy.

Grading: Hour exams (50%); Final exam (40%); quizzes (10%).

Final letter grades will be assigned in accord with the Academic Polices in the College of Arts and Sciences, which describes the meaning of grades as follows (http://advising.unc.edu/AcademicPoliciesProcedures): A - Mastery of course content at the highest level of attainment that can reasonably be expected of students at a given stage of development. The A grade states clearly
that the student has shown such outstanding promise in the aspect of the discipline under study that he/she may be strongly encouraged to continue.

**B** - Strong performance demonstrating a high level of attainment for a student at a given stage of development. The B grade states that the student has shown solid promise in the aspect of the discipline under study.

**C** - A totally acceptable performance demonstrating an adequate level of attainment for a student at a given stage of development. The C grade states that while not yet showing any unusual promise, the student may continue to study in the discipline with reasonable hope of intellectual development.

**D** - A marginal performance in the required exercises demonstrating a minimal passing level of attainment for a student at a given stage of development. The D grade states that the student has given no evidence of prospective growth in the discipline; an accumulation of D grades should be taken to mean that the student would be well advised not to continue in the academic field.

**F** - For whatever reasons, an unacceptable performance. The F grade indicates that the student's performance in the required exercises has revealed almost no understanding of the course content. A grade of F should warrant an adviser's questioning whether the student may suitably register for further study in the discipline before remedial work is undertaken.

The final grading scale (“curve”) will be created to reflect these assessments.

**Honor Code:**

“Since all graded work (including homework to be collected, quizzes, papers, mid-term examinations, final examinations, research proposals, laboratory results and reports, etc.) may be used in the determination of academic progress, no collaboration on this work is permitted unless the instructor explicitly indicates that some specific degree of collaboration is allowed. This statement is not intended to discourage students from studying together or working together on assignments which are not to be collected.”

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# Approximate Course Outline

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading Assignment</th>
<th>Assigned Problems (Minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Jan</td>
<td>Aromaticity</td>
<td>15.1-15.9</td>
<td>1,4,16,17,19,22-27,29-33,35-39,41-48,50,51,52</td>
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<tr>
<td>15-Jan</td>
<td>Reactions of Aromatics</td>
<td>15.10-15.20</td>
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<td>17-Jan</td>
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<td>24-Jan</td>
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<tr>
<td>29-Jan</td>
<td>Carboxylic Acids and their Derivatives</td>
<td>Chapter 17</td>
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<td>31-Jan</td>
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<tr>
<td>5-Feb</td>
<td>Reactions of Carbonyl Compounds</td>
<td>18.-18.3;11.1-11.2;18.4-18.18</td>
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<td>7-Feb</td>
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<td>12-Feb</td>
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<td>14-Feb</td>
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<td>19-Feb</td>
<td>Enolates and Enamines</td>
<td>19.1-19.23</td>
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<td>21-Feb</td>
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<td>26-Feb</td>
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<td>28-Feb</td>
<td>Organometallics and Synthesis</td>
<td>11.3-11.6</td>
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<td>5-Mar</td>
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<td>7-Mar</td>
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<td>12-Mar</td>
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<td>14-Mar</td>
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<td>19-Mar</td>
<td>Pericyclic Reactions</td>
<td>7.12, 30.1-30.7</td>
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<td>21-Mar</td>
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<tr>
<td>26-Mar</td>
<td>Redox Reactions</td>
<td>Chapter 20</td>
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<td>28-Mar</td>
<td>Amines</td>
<td>Chapter 21</td>
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<td>2-Apr</td>
<td>Carbohydrates</td>
<td>22.1-22.20</td>
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<td>4-Apr</td>
<td>Amino Acids and Peptides</td>
<td>23.1-23.13</td>
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<td>9-Apr</td>
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<td>11-Apr</td>
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<td>16-Apr</td>
<td>Catalysis</td>
<td>24.1-24.9</td>
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<td>18-Apr</td>
<td>Lipids</td>
<td>27.1-27.10</td>
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<td>23-Apr</td>
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<td>to be determined/special topics</td>
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<td>25-Apr</td>
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<td>7-May</td>
<td>Final - 8 am</td>
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Problems at the end of chapters are **required** insofar as you are responsible for **all** of the included material on exams.
About This Course

Understanding organic chemistry is not unlike learning a foreign language. Gifted linguists do not develop without daily practice of the art. If you wish to learn organic chemistry, be proactive and industrious in your approach to it. I recommend the following at a minimum:

1) **Come to class prepared.** This is a no-brainer. Much of organic chemistry is conceptually new and if you've introduced yourself to key ideas **before** I lecture on them, they will sink in faster. If you are prepared, it will be easier to thoughtfully consider the content of the lecture rather than passively scribble down the notes, trying to digest them later. I will do what I can to make the class time an active, rather than passive information exchange. In this context, you should be prepared to think about and answer questions that I pose.

2) **Do something for this course every day.** You will learn and retain more if you spend some time each day reading the text, studying notes, or working problems, rather than doing (e.g.) five hours once a week (or twelve hours the night before the exam). **To let more than two days pass without a substantial out-of-class effort is courting disaster.**

3) **Do all the problems.** Do not skip working the problems, look at the answers, and say “Oh, I understand that now.” Chances are good that you don’t, at least not to the degree needed. Hold off on checking the answers until you have wrangled, wrestled, and discussed. Look up related material in the notes and the appropriate text chapter. You will only learn the content by adopting a thorough and aggressive approach toward problem solving.

4) **Get help early.** If you are having problems with the material, seek help early in the semester. Halfway through the course is way too late. In addition to instructor-led Q&A sessions (page 1), another resource is the Chemistry Resource Center (hours: 2-7 pm (Mon-Thurs), room: Kenan 143 beginning on the second week of classes). The Chemistry Department also maintains a list of students that are available for hire as tutors: [http://www.chem.unc.edu/undergrads/index.html?display=help__resources&content=tutoring](http://www.chem.unc.edu/undergrads/index.html?display=help__resources&content=tutoring)

5) **Use summary sheets/flash cards.** As new reactions and concepts are introduced, prepare a summary sheet or flash card that contains:
   a) the name of the reaction
   b) general example (use R groups); include all necessary reagents, solvents, and reaction conditions. Include workup conditions where appropriate.
   c) Specific examples
   d) Step-by-step mechanism showing electron movement with curved arrows
   e) Stereochemistry of the reaction (if applicable)
   f) Any electronic or structural effects on the reaction
   For studying purposes, grouping reactions by category is helpful.

6) **Studying in groups can help.** Group studying can be effective when everyone is working hard and at a similar level of understanding. It can also give a false sense of understanding if the group comes up with an answer that is not completely obvious to the individual. If you study in groups, do not fall into the trap of feeling that your understanding of the material is more advanced than it is.

7) **The purchase of a molecular model set (Student Stores) is strongly recommended.** Much of what we will learn requires visualizing molecules in three dimensions. Constructing molecular models is really the only way to understand the shape and conformation of organic molecules. You will be able to use your model sets on exams.
Course Structure

Introduction. Some of this course will be taught using team learning techniques. A growing body of evidence indicates that active, collaborative learning is the most effective method of information transfer. Most, if not all, of the science courses you have taken rely heavily on lectures as the mechanism of information transfer. While lecture remains an important and indispensable teaching tool, exclusive reliance on it has been documented to be less effective with respect to understanding and retaining material presented in the course.

Student Responsibilities. Team learning in this course will entail group problem solving sessions conducted in class under my “supervision”. At the end of a given class period, I will make available online a handout on material that will be covered in the next class period. This material will be supplemented with material from your text. It is the student’s responsibility to carefully study this material before coming to the subsequent class period. This “background” information will be employed as the basis for an in-class problem session that will augment your understanding of the material you covered outside of class. For team learning to be effective, you must come to class prepared. To promote this, we will have brief (5-10 minute) quizzes at the beginning of class periods. These quizzes are intended to be simple if you have studied the assigned material. Your quiz scores will count toward your final grade.

Problem Solving Class Sessions. The Tuesday/Thursday course schedule lends itself well to a format wherein we have problem solving sessions during the Tuesday class and a “normal” lecture on Thursday. In this way, you will have five days (Thursday to Tuesday) to assimilate the new material before a problem session. The problems I will distribute after your quiz on Tuesday will be something akin to a problem set. You will be working in groups of three/four. The following things are important in the group setting:

- Each group member must be vocal and contribute. There will be disagreement on how to solve a given problem. This format provides a forum to discuss your opinion and provide the evidence to support it. You know you have a strong grasp of material when you are able to explain it to someone else!
- Each group member should feel an obligation to your colleagues. If you come to class unprepared, you will hinder your own development, and the progress of your colleagues.
- Respect your colleagues. Listen to what they have to say and learn from them. It is an important skill to be able to voice your opinion while respecting the opinions of others.

Summary. I have used this format successfully and with very positive student response in the past. You will learn the same material that has been taught in previous years. You will additionally begin to develop a skill, “scientific self-expression” if you will, that is necessary whatever your career goals and underdeveloped by more passive learning techniques. I encourage your feedback at any point and am willing to listen to any concerns you might have.

Further Reading. This course development is part of an NSF grant awarded to the instructor. If you wish to learn more about team learning techniques in organic chemistry, I encourage you to consult the following literature on the subject: