

**CHM 3217**

**Organic Chemistry/Biochemistry 1**

**Section 0808**

Fall Semester, 2011

Prof. Nigel Richards

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**Class Times:** T, R 13:55-15:50

**Place:** FLI 115

**Office Hours:** To be scheduled (see below)

### Course Description

This course will provide an overview of the basic principles of organic chemistry from a structural and mechanistic viewpoint. The emphasis will be upon understanding the reactivity and other properties of carbon-based molecules in terms of their structure and fundamental chemical principles. The basic principles of organic (and general) chemistry are an essential element in acquiring a detailed understanding of the biological systems that will be discussed. Please note that by selecting this course you should be aware that you **MUST** register for CHM 3218 in order to satisfy both departmental and professional school requirements for undergraduate organic chemistry. CHM 3217 and CHM 3218 provide an integrated sequence covering structure, bonding, functional group properties and biological chemistry.

Students are expected to attend all lecture classes that are not test reviews unless I state otherwise. The bad news is that attendance at my lectures and office hours will significantly enhance your chances of getting a good grade in this course - please don't say you weren't warned.... This observation is based solely on my experience! This is a pretty tough class and I expect you to work hard to master the material given the relatively small number of lectures in which it is covered. This means that when I don't set or collect any defined homework problems, I expect you to study for at least 2 hours a day in addition to attending the lecture! **We will move at a fast pace, so you must keep up with the problems and reading ... Many students find it beneficial to form study groups that meet regularly during the semester.**

### Course Materials

James A. Deyrup, "Outrageous Organic Chemistry"

This is a well-written set of course notes that I will follow pretty closely throughout the semester. You should have no difficulty in obtaining a copy from Target Copy **from Monday, August 22, 2010 onwards**. Note that the strategy to do well in this class is as follows... **First**, you attend lectures and try to figure out what I tell you. **Then** you go home and consult the material in this course booklet and try to do the problems to make sure you understand the basic principles. **Finally**, if you still can't figure out the answers you ask me for help during one of the three office hours, and/or consult a "real" textbook that covers the basic principles of

organic chemistry. There are many of these to choose from, but they all discuss the same stuff. I prefer the following book, which you should be able to obtain either online or from a local bookstore:

John McMurry, "Organic Chemistry with Biological Applications", 2<sup>nd</sup> Edition, Brooks/Cole: Belmont, 2010

I will place a copy of this book on reserve at the Marston Science Library. Please note that you can buy and read another organic textbook if you wish (they are pretty much all the same these days), but this will mean that you will have to find the pages discussing the relevant material yourself.

### Office Hours (IMPORTANT)

My office hours are legendary around the campus, and will begin during the second week of the semester, by which time you should have discovered that you cannot do the problems in the course booklet. My experience has been that students who make an effort to participate in these small-group teaching efforts always get the most benefit from the class. You should therefore aim to attend at least one of the office hours every week. Come ready to solve problems, to ask questions and to suffer! Wallflowers are not tolerated - if you are too shy to work out problems at the board or to ask questions, then you will not enjoy or benefit from these meetings. I have high expectations that you should try to meet. I will be present at all scheduled office hours - teaching assistants are not used in this class other than to work on web-based materials. The schedule and locations for this semester will be worked out during the first week of class.

### Grades

Three (3) tests will be scheduled during the semester, each worth 100 points, in addition to the final examination. Multiple-choice examinations will NOT be given - the questions will focus on solving problems and applying knowledge that you have learned in lectures, or by attending office hours and reading the course materials. I do my best to avoid conflicts with tests in other science classes, such as physics, but this is not always possible.

Students must also try to solve the problems that are in the class notebook because studying this material will enhance your understanding of the lectures and permit me to cover topics for which no time may be available in class. You should review these problems at the time I talk about the material in lectures. **Despite the inevitable protests, answers to booklet problems will not be provided - this policy is to ensure that students come to office hours and interact with me.**

## Electronic Materials

Information on web-based materials (handouts, sample tests, test keys, links to relevant web sites) that are specifically related to CHM 3217 will be given out when, and if, they become available. Students who wish to set a discussion group are welcome to do so - you may rest assured that I will not view any of your comments. I am very happy to receive e-mail messages from students who point out my mistakes (!) or identify material that made no sense in my lectures. Individual appointments with me should be scheduled by e-mail ([richards@qtp.ufl.edu](mailto:richards@qtp.ufl.edu)). Calling at my office unexpectedly hoping that I will be there and available to see you will only waste your time. When I get it up and running, the website will be found by going to [www.chem.ufl.edu/~richards](http://www.chem.ufl.edu/~richards) and clicking on the CHM 3217 link.

## Other Information

1. Honor code statement: see <http://www.chem.ufl.edu/~itl/honor.html>
2. Students with disabilities: see <http://www.chem.ufl.edu/~itl/disabilities.html>
3. Counseling and Health Care: see <http://www.chem.ufl.edu/~itl/counseling.html>

For reasons to do with copyright, no tape recording in the lecture presentations will be permitted. Students are requested not to provide summaries of their lecture notes to any commercial enterprise in return for financial compensation. You should not ignore this entirely reasonable requirement.

I strongly discourage the use of cell phones and other electronic distractions during my lectures and office hours. If you cannot resist turning your phone off, then I would recommend that you do not come to lectures or class office hours. Persistent offenders will be awarded a lower grade for the course - please do not tell me you were not warned.

Do not upload course materials onto any type of web site, including Facebook. These materials are for your personal use only and are subject to copyright laws. My students and I regularly check web sites and if we find my notes, handouts, tests, test keys or any other CHM 3217-related materials on any unapproved site I will identify the person who is uploading the files and act accordingly. Once again, you ignore this entirely reasonable request at your peril.

## Course Outline

- I. Introduction to Organic Chemistry
  - a) Naming molecules
  - b) Functional groups
- II. Principles of Chemical Bonding
  - a) Molecular orbital descriptions
  - b) Hybrid orbitals and molecular shape
- III. Chemical Bonding and Resonance Structures
- IV. Molecular Orbital Theory
  - a) Conjugated systems
  - b) Aromaticity and its meaning
  - c) Heteroaromatic compounds
- V. Organic Acids & Bases
- VI. Molecular Isomers
  - a) Geometrical isomerism
  - b) Enantiomers & diastereoisomers
- VII. Molecular Spectroscopy
  - a) UV/visible spectroscopy
  - b) IR spectroscopy
  - c) NMR spectroscopy ( $^1\text{H}$  and  $^{13}\text{C}$ )
  - d) Mass spectrometry
  - e) Assigning molecular structures
- VIII. Introduction to Reactions
  - a) Review of reaction thermodynamics and kinetics
  - b) Introduction to reaction mechanisms
  - c) Concerted reactions & stereochemical control

IX. Reactions at  $sp^2$  Centers (I)

- a) Aldehydes & ketones
- b) Carbohydrate chemistry

X. Reactions at  $sp^2$  Centers (II)

- a) Carboxylic acids and their derivatives
- b) Introduction to the chemistry of biochemical co-factors

XI. Reactions at  $sp^3$  Centers

- a) Nucleophilic substitution & stereochemistry

XII. Reactions at  $sp^3$  Centers

- a) Formation of olefins (kinetic vs. thermodynamic control)
- b) Carbocation rearrangements
- c) Introduction to natural products & secondary metabolism

XIII. Reactions of Double Bonds

- a) Addition reactions & stereochemistry
- b) Introduction to steroids and their biosynthesis

XIV. Reactions of Aromatic Rings

- a) Electrophilic substitution
- b) Functional groups and their directing effects
- c) Nucleophilic substitution of activated systems