

# ORGANIC CHEMISTRY I - CHEM 2411

## Spring 2008; TR 12:30-1:45; TLC 1301

**Instructor:** Dr. Vickie Geisler

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**Office:** TLC 2120

**Office Hours:** M, W 9-11:30; M 2-4; T, R 9:30-11

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**Problem-Solving Sessions:** TBA

**Required Material:** *Organic Chemistry*, John McMurry, 6<sup>th</sup> Ed.

2 or 3 inch 3-ring binder

**Recommended Material:** Molecular Models

**Teaching Assistant:** Bette' Ford

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**Course Description:** The first course of a two semester sequence which provides a broad introduction to the basic principles, theories and applications of the chemistry of carbon compounds. This course will emphasize the relationship between structure and reactivity. Topics will include modern structural theory, organic nomenclature, stereochemistry, reaction mechanisms and kinetics, and an introduction to functional group chemistry.

**Learning Objectives:** To learn the language of organic chemistry; to educate students to think independently about organic chemistry; to reason and think analytically in solving problems and making decisions in matters involving organic chemistry. To look for patterns and recognize qualitative similarities between seemingly unrelated facts. To develop a practical understanding for the causes of chemical change; to predict reactivity from structure; and to learn to predict the outcome of a reaction never seen before and to communicate organic chemistry with clarity.

### Classroom and Outside-of-classroom Expectations:

- This course will be taught using the Process Oriented Guided Inquiry Learning (POGIL) method I will not lecture.
- The majority of class time will be spent working in self-managed groups of three or four. I will assign group membership and reshuffle groups on a regular basis.
- Each group must collectively ensure....
  1. there is agreement on each question before moving on
  2. no one is going ahead or falling behind
  3. no one dominates the discussion and everyone feels comfortable speaking up, especially if they are frustrated, confused or behind.
- Each class will begin with a 5.0-minute quiz, individually taken, covering material from the previous class.
- The quiz is followed by group work on a ChemActivity. During this time I will walk around class, observe, ask and answer questions. You must bring your notebook to class every day.
- The POGIL material is designed to use leading questions to guide you towards the formulation of your own knowledge.
- I will serve as a coach to help students in learning the material.
- In many instances, I may not answer a question directly but may ask you a question that will lead you to discovering the answer for yourself.

- You must complete each day's ChemActivity sheet, including the exercises at the end of the activity and the assigned readings and problems in McMurry before the next class period, as they will form the basis of the 5.0-minute quiz.
- You are strongly encouraged to work outside of class in groups. Studies show that most successful students do much of their homework in a productive group environment and that most students who fail are working alone.
- It is highly suggested that you use your binder to store and organize all classroom-related materials. A suggested organization might be to group each day's work as follows: worked out ChemActivity exercises, worked out problem sets, worked out problems from McMurry, and notes from McMurry. These might be ordered in chronological or reverse chronological order.
- During the last five minutes of class, I will stop group work for group reports and to give you time to prepare your group's reflector's report.

### Grading:

- **Quizzes:** After the first week there will be a five minute quiz at the beginning of almost EVERY class period except exam days. When you enter class, sit at your group table and be ready to start the quiz. If you are late, you will not get extra time for the quiz. The three lowest quiz scores will be dropped. Quizzes will be on material covered in the previous class. You will not be excused from any quizzes; there are no make-up quizzes. A quiz missed for any reason will count as one of your "dropped" quizzes. Preparing for the quiz will be most effective if you do it in the context of a regular and productive study group, or with a study partner. Successful students report spending at least 3 hours preparing for each quiz. This entails:
  - Completing the ChemActivities (including exercises),
  - doing the assigned problems in McMurry and
  - reading the selected sections in McMurry.
- **Exams:** There will be four exams given on January 31<sup>st</sup>, February 26<sup>th</sup>, April 1<sup>st</sup>, April 24<sup>th</sup>. No make-up exams will be given. Each exam will specifically test class material covered since the previous exam. However, since the nature of chemistry is cumulative I will assume that you have mastered past material.
- **Final Exam:** The final exam will be a multiple choice exam. It is a comprehensive exam over the entire course. The exam will be given on Thursday, May 8<sup>th</sup> from 11-1.
- **Homework-** problems from the book and problems sets will be assigned on a regular basis. Problem sets will be collected and graded. The grade for the problem set will be equal to a quiz grade. The problem sets will be the basis for the problem sessions. Copying problem sets will result in a grade of zero for that assignment.
- **Problem Sessions: (Attend PS and earn up to two dropped quizzes)**
  - PS is a fun and interactive way to enhance your understanding of the material.
  - During PS you will work on the problem sets. This can earn you "PS points".
  - Earn 1 PS point for each PS you attend and participate. You will earn a dropped quiz for your 4<sup>th</sup> and 9<sup>th</sup> PS point earned.

- **Academic Honesty:**
  - All exams and quizzes will be closed book/closed notes, and will be taken individually (unless otherwise instructed).
  - Copying problem sets will result in a grade of zero for that assignment.
  - During exams you may not use your own paper or other materials except your pen or pencil.
  - Academic dishonesty will not be tolerated. Academic dishonesty includes unauthorized use of any materials, notes, sources of information, or study aids or tools during a quiz or exam. It also includes the unauthorized assistance of any person other than the course instructor during a quiz or exam, the unauthorized viewing of another person's work during a quiz or exam, or the unauthorized securing of all or part of any quiz or exam before submission by the instructor.
  - Violation of academic honesty will generate disciplinary action that may include a course grade of F. A student who is suspected of cheating must confess to all wrong doing at the first opportunity (when first confronted), or risk a harsher penalty. If you believe that there are situations in the course that foster academic dishonesty, please bring them to my attention. Likewise, if you have observed cheating, bring the details to my attention as soon as practical. Insofar as it is possible, your anonymity will be protected.
  
- **Calculation of Overall Average:**
  - Method 1. The quiz and problem set average, each hour exam score, and the final exam score will be added together and the total will be divided by 6.
  - Method 2. The lowest exam score is dropped from the calculation. The final exam counts twice. The quiz and problem set average, the three best exam scores, and double the final exam score will be added together and the total will be divided by 6.
  
- **Grading Scale:** A: 100-85; B: 84-75; C: 74-60; D 59-50; F: 49-0%
  
- **Note:** Last day to withdraw with a "W" is March 3<sup>rd</sup>.

**Additional Policies:**

- Students are expected to attend all classes. A large part of the learning process in this course is based on the in-class activities. If you are not here you will not have a chance to participate in those activities. There will be no makeup quizzes – if you miss a quiz it will simply be one of the three that is dropped from the calculation. If you miss a class it is your responsibility to get class notes from another student in the class.
- Ringing cell phones are extremely disruptive in the classroom. Please be sure that your cell phone is turned off during class. The receiving cell phone calls and texting during class is inappropriate. Cell phones may not be visible during exams failure to comply may result in an F for the exam.
- This syllabus outlines the policies for the course. You are responsible for understanding them. Any changes in course policy will be announced in class or on the class WebCT site.
- Qualified students with disabilities should contact me as soon as possible to ensure that appropriate accommodations can be made.

## Course Outline:

Chapter 1 and 2	Review: Valence bond theory and molecular orbital theory, hybridization, Lewis structures, formal charges, resonance, polarity, acids and bases
Chapter 3	Alkanes and Cycloalkanes: Functional groups, nomenclature, isomerism
<b>Exam 1</b>	
Chapter 4	Stereochemistry of Alkanes and Cycloalkanes: conformations, Newman projections, cyclohexane, equatorial and axial
Chapter 5	An Overview of Organic Reactions: Mechanisms, Electrophilic addition, curved arrows, nucleophiles and electrophiles, reaction energy diagrams
Chapter 6	Alkenes: DBE, Nomenclature, isomerism, structure, reaction mechanisms and electrophilic addition, Markovnikov's rule
<b>Exam 2</b>	
Chapter 7	Alkenes: Reactions of alkenes
Chapter 8	Alkynes: Structure, nomenclature, properties, acidity, alkylation, reactions, and organic synthesis
Chapter 9	Stereochemistry: Enantiomers, chirality, (R) and (S), Fisher projections, diastereomers, meso, and stereochemistry of reactions
<b>Exam 3</b>	
Chapter 10	Alkyl Halides: Structure, nomenclature, properties, halogenation, preparation, organometallic compounds and oxidation and reduction
Chapter 11	Nucleophilic Substitution and Elimination: $S_N2$ , $S_N1$ , $E_1$ , $E_2$ , and nucleophilicity
Chapter 14	Conjugated Dienes: MO, electrophilic addition, Diels Alder reaction
<b>Exam 4</b>	

## Useful web sites

McMurry: <http://chemistry.brookscole.com/mcmurry6>

Organic Chemistry flash cards and tutorials: [www.ochem.com](http://www.ochem.com)

Virtual Textbook <http://www.cem.msu.edu/~reusch/VirtualText/intro1.htm>

<b>Schedule</b>			
<b>Date</b>	<b>Chemactivity/Topic</b>	<b>McMurry Reading</b>	<b>Problems in McMurry</b>
January 10	1-Orbitals and Hybridization	1-1.12	1.21, 23-27, 30-32, 37, 39, 40, 45-47
January 15	2-Lewis Structures, Formal Charges	2.3-2.6	2.8, 9, 35, 42, 44
January 17	3-Resonance	2.4-2.6	2.36, 37, 39, 40, 45, 47, 56, 57
January 22	4-Acids and Bases	2.1-2.2 and 2.7-2.13	2.27 – 30, 41, 43, 49, 55
January 24	5-Alkanes	3-3.3, 3.6, 3.8	3.26, 27, 36, 39-40, 44-47
January 29	6-Cycloalkanes	3.1, 3.8-3.8	3.24, 29-35, 42, 43, 48-55
January 31	Exam I		
February 5	7-Conformers of Carbon Structures	4.1-4.3	4.3-5, 24 -26, 29, 30
February 7	8-Cyclohexane	4.4-4.14	4.31-40, 42, 46
February 12	9-Organic reactions	5	5.4, 6-9, 21, 26, 29, 39, 40, 43,44, 47
February 14	10-Alkenes	6.1-6.7, 7.7	6.23, 24, 26-31, 33, 37, 38, 41-44, 51
February 19	11-Electrophilic addition	6.8-6.10	6.14-17, 39, 40
February 21	12-Electrophilic addition	6.11-6.12	6.19, 47, 48, 49, 50, 52, 53, 54
February 26	Exam II		
February 28	13-Reactions of Alkenes	7-7.4	7.5, 6, 23 a,b,c,e, 24, 35, 49
March 4	14-Reactions of Alkenes	7.5, 7.7-7.9	7.7-10, 13-14, 23, 24, 25 c,d, 26a,b,f, 27, 36 a,b, 40, 41, 43 a-d, 48, 55
March 6	15-Reactions of Alkenes	7.8-7.10	7.14-16,19,25a,d,26e,30, 31,32,34,35
March 11	16-Reactions of Alkynes	8.1,2,4-9	8.1-11, 19-26, 28-29, 31, 46
March 13	17-Synthesis	8.10	8.13, 14, 32, 36, 37, 38
March 25	18-Stereochemistry	9-9.2	9.1,-3, 32, 33,38
March 27	19-Stereochemistry	9.5-16	41, 42, 44-57, 59, 60, 65
April 1	Exam III		
April 3	20-Radical Halogenation	10	10.1-7, 17-21, 24, 25, 28, 31, 32
April 8	21-Carbon-Carbon bond formation take 2	10	10.22a-e, 23c,e-g, 35-38
April 10	22-One Step Nucleophilic Substitution	11-11.5	11.1-6, 26, 27, 29, 30, 32, 36, 37, 39
April 15	23-Two Step Nucleophilic Substitution	11	11.7-14, 25, 28, 31, 33-35, 38, 40, 41
April 17	24-Elimination	11.10-16	11.15-20, 45-50, 53, 55
April 22	25-Diels Alder and conjugate addition	14-14.7	14.1-10, 20-22, 25, 27, 33-38
April 24	Exam IV		
April 29	Review for final		