

## **DEPARTMENT OF CHEMISTRY**

### **Organic Chemistry I (CHEM 2400; CRN 53278; 3 credits)** **Summer 2017**

**Instructor:** Dr. Joan Mutanyatta-Comar  
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**Office hours:** MWF: 10:50 am – 11:50 am. **Any other time by appointment.**

**Lecture:** MWF 9:00 am – 10:40 am. **Library South 102**

**Breakout Session:** M 12:00 noon – 12:50 pm. **Library South 102**

**Required Text: 1. “Organic Chemistry”, 9<sup>th</sup> Edition, By John McMurry**  
Chapters **1-11** will be covered at a rate of approximately **two chapters per week.**  
**Purchase from GSU bookstore or online**

**2. Preparing for Your ACS Examination in Organic Chemistry: The Official Guide, ISBN 0-9708042-1-0**  
**Purchase from GSU bookstore or from GSU Chem club (Courtland N, Room 202)**

**Optional Text: 1. Organic Chemistry I & II: A Student Workbook”, ISBN # 978-0-7575-8271-4, By Keith O. Pascoe**

**2. Organic Chemistry I as a Second Language, 2<sup>nd</sup> Ed, by David Klein ISBN -13 978-0470-12929-6**  
**Purchase online**

**Prerequisite:** General Chemistry.

**Molecular Kit:** [www.andruseducation.com](http://www.andruseducation.com) OR [www.duluthlabs.com](http://www.duluthlabs.com) OR GSU bookstore

#### **Communication:**

1. Please send emails to me from your GSU e-mail account (e.g., jcole1@student.gsu.edu). Please put the course name in the subject of your email. **(Please do not email me from iCollege)**
- 2. Please check iCollege daily for class announcements and updates**

### Course Introduction:

Organic chemistry has great relevance for all students in STEM disciplines. It is important for biologists and health professionals because nearly all of biochemistry involves the organic chemistry you'll learn in this class. For chemical engineers, understanding the properties of organic molecules and how reactions occur is critically important to understanding the processes in an industrial plant. Even if you don't buy the relevance of this class to your field, organic chemistry teaches important problem solving skills that are directly relevant to all scientists, engineers, and health professionals.

### Learning Outcomes: Students in this class will:

- Gain an understanding of the hybridization and geometry of atoms and the three-dimensional structure of organic molecules
- Gain an understanding of the reactivity and stability of organic molecule based on structure, including conformation and stereochemistry
- Gain an understanding of nucleophiles, electrophiles, electronegativity, and resonance
- Be able to use their understanding of organic mechanisms to predict the outcome of reactions
- Analyze and plan multi-step syntheses of organic compounds.
- Apply knowledge gained from class to solve problems.
- Demonstrate inquiry skills that will enable them to formulate questions and to develop explanation of organic concepts.
- Demonstrate confidence as independent thinkers and life-long learners.

### Grading Scheme:

- **Four in-course exams** will be given during the seven weeks. At the end of the period, the lowest grade will be dropped. The average score from the remaining three exams will count **55%** of your final grade. You are strongly encouraged to take all four 'in-course' exams.
- **Quizzes** will count for **10%** of the final grade.
- **Homework** will count for a total of **5%** of the final grade. **Daily in-class exercises will count towards the homework grade. No make-up for in-class exercises will be given.**
- There will be a final exam (**ACS National Exam**) which will count **30%** of the final grade.

**Tentative Letter Grades:**

<b>A+</b>	=	>95%
<b>A</b>	=	90%
<b>A-</b>	=	88%
<b>B+</b>	=	84%
<b>B</b>	=	80%
<b>B-</b>	=	78%
<b>C+</b>	=	75%
<b>C</b>	=	69%
<b>C-</b>	=	65%
<b>D</b>	=	61%
<b>F</b>	=	< 54%

**Note:** CHEM 2400 is a prerequisite for organic II (CHEM2410).  
A grade of "C" or higher in CHEM2400 is required for registration into CHEM2410.

**Important Dates:**

June 5 <sup>th</sup>	Classes begin
June 30 <sup>th</sup>	Last day to withdraw with grade "W"
July 4 <sup>th</sup>	Holiday
July 24 <sup>th</sup>	Last day of class
<b>July 28th</b>	<b>Final Exam: Friday July 28, 2017 (8:00 am-10:00 am)</b> <b>Library South 102</b>

**Tentative Teaching Schedule:**

**Note: This calendar is subject to change with prior notice, at the instructor's discretion**

Wk. #	Wk. Of:	M	W	F
01	June 05	L	L	Q + L
02	12	L	E-1	L
03	19	L	L	Q + L
04	26	L	E-2	L
05	July 03	L	L	Q + L
06	10	L	E-3	L
07	17	L	L	Q + L
08	24	E-4	-	Final Exam

## List of chapters and topics covered in Organic I, CHEM2400 (McMurry 9<sup>th</sup> Ed.)

- 1. Chapter 1: Structure and Bonding**  
Atomic structure (nucleus, orbitals, electronic configurations), chemical bond theory (valence bond theory and molecular orbital theory), hybridization (carbon, nitrogen, oxygen, phosphorus and sulfur), drawing chemical structures.
- 2. Chapter 2: Polar Covalent Bonds; Acids and Bases**  
Electronegativity, dipole moments, formal charges, resonance, acids and bases (the Brønsted-Lowry definition, pK<sub>a</sub>, acid and base strength, organic acids, organic bases, the Lewis definition).
- 3. Chapter 3: Organic Compounds: Alkanes and their Stereochemistry**  
Functional groups, alkane and alkane isomers, alkyl groups, naming alkanes, properties of alkanes, conformations of alkanes.
- 4. Chapter 4: Organic Compounds: Cycloalkanes and their Stereochemistry**  
Naming cycloalkanes, *cis-trans* isomerism in cycloalkanes, stability of cycloalkanes (ring strain), conformations of cycloalkanes, conformations of cyclohexanes (monosubstituted, disubstituted, trisubstituted etc).
- 5. Chapter 5: Stereochemistry at Tetrahedral Centers**  
Enantiomers and the tetrahedral carbon, chirality, optical activity, sequence rules for specifying configuration, diastereomers, meso compounds, racemic mixtures and the resolution of enantiomers, a review of isomerism, chirality at nitrogen, phosphorus and sulfur, prochirality.
- 6. Chapter 6: An Overview of Organic Reactions**  
Types of organic reactions, how organic reactions occur (mechanisms), radical reactions, polar reactions, using curved arrows in polar reaction mechanisms, describing a reaction (equilibria, rates, energy changes, bond dissociation energies, energy diagrams, transition states, intermediates).
- 7. Chapter 7: Alkenes: Structure and Reactivity**  
Industrial preparation and use of alkenes, calculating degree of unsaturation, naming alkenes, *cis-trans* isomerism in alkenes, E/Z designation in alkenes, stability of alkenes, electrophilic addition reactions of alkenes (Markovnikov's rule), carbocation structure and stability, carbocation rearrangements.
- 8. Chapter 8: Alkenes: Reactions and Synthesis**  
Preparation of alkenes, reactions of alkenes: halogenation, halohydrin formation, hydration (oxymercuration and hydroboration), hydrogenation (reduction), oxidation (epoxidation, hydroxylation, cleavage to carbonyl compounds), addition of carbenes (cyclopropane synthesis), reaction stereochemistry (addition of water to an achiral and a chiral alkene).
- 9. Chapter 9: Alkynes: An Introduction to Organic Synthesis**  
Naming alkynes, preparation of alkynes (elimination reactions of dihalides), reactions of alkynes (halogenation, addition of HX, hydration, reduction, oxidative cleavage), alkyne acidity (formation of acetylide anions), alkylation of acetylide anions, an introduction to organic synthesis.
- 10. Chapter 10: Organohalides**  
Naming and structure of alkyl halides, preparation of alkyl halides (addition of HX to alkenes, radical halogenation of alkanes, allylic bromination of alkenes,

from alcohols), stability of allyl radical, reactions of alkyl halides (Grignard reagents), organometallic coupling reactions, oxidation and reduction in organic chemistry.

### 11. Chapter 11: Reactions of Alkyl Halides: Nucleophilic Substitutions and Eliminations

The  $S_N2$ ,  $S_N1$  E2, E1 and E1cB reactions and their characteristics, Zaitsev's rule, the E2 reaction and cyclohexane conformation.

#### Notes:

- a) If you miss an exam for any reason that score will be dropped automatically. **NO MAKE-UP EXAMS WILL BE GIVEN.** Students missing an exam will be expected to submit a written note explaining why the exam was missed. A student will not be excused from more than one test for any reason.
- b) **If you have concerns regarding the grade assigned to your exams you must submit your answer sheet for re-grading along with a written explanation of the concern. This submission must be made within one week of the date the exam was returned.**
- c) Students need to show their GSU Panther I.D. card when taking exams.
- d) The instructor reserves the right to assign seating during exams and quizzes.
- e) **Final grades are only available on PAWS/GoSolar. They will not be posted on iCollege. Please note that grades cannot be given to students by phone or email.**

#### **Class Preparation and attendance:**

- ✓ Students are **expected** to attend all lectures.
- ✓ **There will be daily, graded class exercises which will count towards your final homework grade. No make-up will be given.**
- ✓ As a courtesy to your fellow students, please arrive on time and do not leave during the lecture.
- ✓ Students are solely responsible for the timely completion of all assignments, absence being no excuse. **Suggested reading assignments given during the course of a lecture should be completed before the next lecture.**

**Chemistry Departments Student Integrity Policy:** The Department of Chemistry follows the University policy on academic honesty published in the “Faculty Affairs Handbook” and the “On Campus: The Undergraduate Co-Curricular Affairs Handbook”. All tests taken must represent the student’s individual, unaided effort. To receive or offer information during any examination will be considered cheating.

Any suspected offense may be referred to the Department’s Chairman for appropriate action.

Class will never be cancelled unless an official from the Chemistry Department gives the class personal notification. Don’t assume a note to be enough without checking the Department’s office.

The University requires that faculty members must, on a date after the mid-point of the course to be set by the Provost (or his designee)

1. Give a **WF** to all students who are on their rolls but are no longer taking the class and
2. Report the last day the student attended or turned in an assignment. Students who are withdrawn may petition the Departmental Chair for reinstatement into their classes.

**NOTE:**

- ✓ **Cell phones and laptops are allowed during lectures BUT NOT during exams.**
- ✓ **Successful students do not allow technology/social media to distract them during class.**
- ✓ **Students are requested not to bring cellular telephones and/or pagers to exams. Persons violating this request will be asked to leave the room.**
- ✓ **No programmable calculators will be allowed in the classroom.**

**Athletes:**

You **MUST** bring proper documentation to your instructor, **BEFORE** you leave for a game/tournament to be able to make-up the work for that week. Tournaments are scheduled months in advance so there is no excuse to not have provided proper documentation before the event.

**Keys to success in organic chemistry:**

**Students who do well in organic chemistry possess the following characteristics:**

- **Attend class:** There is a very good correlation between class attendance and how well a student will do in this course. Some students may be able to teach themselves from the book, but generally, students who struggle most rarely come to class.

- **Are prepared:** You will get the most out of class if you have read the sections to be covered that day.
- **Ask questions:** If you don't understand something, ask the instructor in class, after class, or during office hours.
- **Keep up:** This course is cumulative and covers a lot of content. You will find it much easier if you study a little bit each week, or even better after each lecture. Study however you find most useful: flashcards, review outlines, practice problems, reaction lists, etc.
- **Practice, Practice, Practice:** Organic chemistry, like any skill, is best learned by doing. The best possible advice is to work as many example problems as you can find. Start with assigned workshops, questions from the textbook, questions from the ACS study guide, recommended workbook, SI worksheets (if available), but also look for other sources of problems if you need to. When working problems, make sure that you understand why the correct answer is the right one.
- **Learn fundamental concepts:** Organic chemistry is very difficult to learn by rote memorization. If you understand the concepts, you will find it much easier to keep track of the large amount of information, and more importantly be able to apply it on the tests. Again, practice, practice, practice!!!.
- **Get help early if they need it:** If you get behind, it can be very difficult to catch up. If you feel you are falling behind, increase your effort. Go to the Chemistry Tutoring Center (in Courtland N, room 217, if available for the semester). Also consider getting outside help. I am happy to work with you during office hours. If you feel you need more extensive help, consider hiring a tutor. I can recommend some excellent tutors but a list of active tutors is also available from the Chemistry Department web page.
- **Collect all returned graded exams, worksheets and quizzes.** They go over the questions they got wrong and ask the instructor for clarification. This way they don't make the same mistake again.
- **Make extensive use of FREE support services:** office hours, SI sessions (if available), Chemistry Tutoring Center (Courtland N, Room 217, if available), Student Support Services (SSS)-STEM (contact: Deidre Steed, [dsteed1@gsu.edu](mailto:dsteed1@gsu.edu), 404-413-1682, in person: 145 sparks Hall) .

### **CHEM 2401– starts 2<sup>nd</sup> week of classes**

This is a problem solving class to help you with the lecture. The credits count toward your GPA but not towards your degree. Grading is based on your attendance. [Check GoSolar for more details.](#)

**\*Students with Disabilities:** Students who wish to request accommodation for a disability may do so by registering with the Office of Disability Services. Students may only be accommodated upon issuance by the Office of Disability Services of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructors of all classes in which an accommodation is sought.

**\*A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent for the observance of a religious holy day shall be allowed to take an exam or complete an assignment scheduled for that day within a reasonable time after the absence.**

**\*Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation.**

**\*Deviations from this syllabus may be required.**