Course Description:
This course will cover Chapters 1 – 11, along with 14 and 15 of the introductory text book, “Organic Chemistry, 3rd Edition,” by David R. Klein. The material covered will focus on organic structural theory, including conformation and configurations of molecules, acid-base reactions, functional groups – alkanes, alkenes, alkynes, alcohols, ethers, epoxides, alkyl halides, carbonyl and aromatic compounds, stereochemistry, basics of organic reactions, nucleophilic substitution and elimination reactions, infrared (FT-IR), and proton and carbon nuclear magnetic resonance (NMR) spectroscopies. Major emphasis is on the relationships between molecular structure, chemical reactivity, and physical properties. Thorough integration of reaction mechanisms as elucidated using principles of kinetics, thermodynamics, stereochemistry, and spectroscopy. 3 hours lecture / 3 hours lab.
*Prereq: Grade of C-, or better in CHEM 112; C, for Chemistry Majors

Required Materials:
- Molecular Model Set for Organic Chemistry (*Required*)
- Scientific calculator capable of exponential notation, square roots, and logarithmic functions
- Laboratory Procedures: Handouts
- Permanently bound quad or line-ruled laboratory notebook
- Laboratory Goggles (~$5-7), available from the campus bookstore, or, Safety Glasses, available from the ACS Student Affiliates, combination lock for lab drawer, misc. office supplies (Sharpie, scotch tape, stapler

Course Objectives:
At the completion of CHEM 231, you should be able to:
- Recognize, name, and represent organic compounds and organic functional groups
- Describe relationships between structure, chemical reactivity, and physical properties
- Analyze structural conformations and configurations
- Investigate chemical properties of organic molecules through reactions and synthesis
- Illustrate and investigate organic reactions through kinetics and reaction mechanisms
- Predict products (along with their stereochemistry) of organic reactions
- Appreciate the relevance of organic chemistry to the world around us
To accomplish these objectives:
Don’t try to memorize everything for the course – it doesn’t work. Try to focus on the major concepts and develop some flexibility into the application of those concepts. This doesn’t mean, however, that you won’t have to memorize anything. There are some fundamental principles and vocabulary that you will have to remember to successfully complete this course.

How to Succeed:
• Don’t get behind!!!
• Ask questions!!!
• Work lots of problems!!! Then do more problems!!!
• Get help when needed!!! Don’t be afraid to ask questions; come see me for help; or, participate in the Department’s Chemistry Peer Learning Program:
  When? Tuesday, Wednesday, & Thursday from 1:00 – 3:00 pm in 212 Caputo Hall; and
  Tuesday, Wednesday, & Thursday from 5:00 – 7:00 pm in 153 Roddy Hall
How to Succeed:

Tentative CHEM 231 Course Calendar
Fall 2019
MWF, 10:00 – 10:50 am, 149 Roddy

<table>
<thead>
<tr>
<th>Textbook Chapter</th>
<th>Topics</th>
<th>Topics</th>
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<tbody>
<tr>
<td>Chapter 1</td>
<td>A Review of General Chemistry: Electrons, Bonds, and Molecular Properties</td>
<td>1</td>
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<tr>
<td>Chapter 2</td>
<td>Molecular representations</td>
<td>49</td>
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<td>Chapter 3</td>
<td>Acids and Bases</td>
<td>93</td>
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<td>Chapter 4</td>
<td>Alkanes and Cycloalkanes</td>
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<td>Chapter 5</td>
<td>Stereoisomerism</td>
<td>181</td>
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<td>Chapter 6</td>
<td>Chemical Reactivity and Mechanisms</td>
<td>226</td>
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<td>Chapter 7</td>
<td>Alkyl Halides: Nucleophilic Substitution &amp; Elimination Reactions</td>
<td>271</td>
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<tr>
<td>Chapter 8</td>
<td>Addition Reactions of Alkenes</td>
<td>343</td>
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<tr>
<td>Chapter 9</td>
<td>Alkynes</td>
<td>400</td>
</tr>
<tr>
<td>Chapter 10</td>
<td>Radical Reactions</td>
<td>435</td>
</tr>
<tr>
<td>Chapter 11</td>
<td>Synthesis</td>
<td>479</td>
</tr>
<tr>
<td>Chapters 14, 15</td>
<td>IR/Mass Spec. (602), and NMR Spectroscopy (649) will be discussed in both lecture and lab and included on appropriate exams.</td>
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</tr>
</tbody>
</table>

Final Exam (Cumulative): Thursday, 12/12/2019, 8:00 – 10:00 am, 149 Roddy

Attendance Policy / Exam (Quiz) Make-up Policy:
Students are responsible for all notes, discussions, assignments and handouts presented in each class (whether you are present or absent). Also, students are expected to be present when any evaluation (i.e., quiz, exam, etc.) is given, as well as all laboratory sessions. If you miss an Exam for a legitimate documented reason (i.e., personal illness, as verified by a valid medical excuse, or personal emergency, as a death, or critical illness in the immediate family, or participation in a university sponsored activity, or jury duty, or military duty, or observed religious function), as described in the Class Attendance Policy of the Millersville University Governance Manual, Section 3, a make-up

Dr. S. M. Bonser
Fall 2019
CHEM 231.01
(CRN: 4333)
Exam will be given at a time mutually agreed upon by the instructor and the student. **You have 24 hours prior to the exam to notify me of your absence in order to qualify for a make-up.** No excuses will be accepted if presented to me after a missed Exam. If there is a true emergency, I will accept notification **up to and only 24 hours after the Exam.** I can be contacted by phone, or email. If I am not available, leave a message with the Department secretary. In this regard, there is no excuse for not contacting me. It is **YOUR** responsibility to verify that your message reached me!

**NOTE:** If you must leave campus for a family emergency, notify your dorm RA, dorm director, or the Office of Student Services. They will officially notify all of your professors that you have had to leave school temporarily. Departure times for travel before University breaks are not a valid excuse to miss class, so please make your travel arrangements accordingly.

**Failure to comply with any of the above will result in a grade of zero.**

**Special Need Students:** Please see the Office of Learning Services (Lyle Hall) ASAP if you have special needs for this class. If you have a condition that may affect your ability to perform laboratory exercises, to exit safely from the premises in an emergency, or which may cause an emergency during class, or lab, please discuss this in confidence with your instructor and someone at the Office of Student Support Services.

**Problems from the textbook:**
Work the problems at the end of the chapters. They will not necessarily be collected; however, it is to your advantage that you work as many as possible until a concept is mastered. There is a strong, direct correlation between the number of problems worked and understood and exam grades and an inverse correlation to the perceived difficulty and length of exams. Besides, they have a tendency to appear on quizzes and exams.

**Course Evaluation:**
- 4 hourly exams (4 x 100 pts. = 400 pts.) 45%
- 4 quizzes (4 x 25 pts. = 100 pts.) 15%
- Final comprehensive exam (100 pts.) 20%
- Laboratory: Reports / Assignments / Problem Sets 20%

- **Tentative Quiz Dates:**
  - Fridays: 09/06/19 (#1); 10/04/19 (#2); 11/01/19 (#3); 11/25/19 (#4);
- **Tentative Exam Dates:**
  - Fridays: 09/20/19 (#1); 10/18/19 (#2); 11/15/19 (#3); 12/06/19 (#4);
- **Final Exam:** Thursday, December 12, 2019: 8:00 – 10:00 am: 149 Roddy

**Grade Distribution:**
- A 92.5 – 100
- A’ 90.0 – 92.4
- B’ 87.5 – 89.9
- B 82.5 – 87.4
- B’ 80.0 – 82.4
- C’ 77.5 – 79.9
- C 70.0 – 77.4
- D’ 68.0 – 69.9
- D 66.0 – 67.9
- D’ 62.0 – 65.9
- F < 60.0

**Academic Honesty and Dishonesty:**
Plagiarism is the deliberate, or even accidental representation of another’s work as your own without proper reference. Although you will work together on some material and experiments, this does not mean that lab reports and assignments should be identical. Each participant uses the collective data and discussion to prepare his or her own individual report. You should be familiar with the University policy on academic honesty and dishonesty as outlined in the Student Handbook and Academic Honesty and Dishonesty brochure; the content applies to this
course. If you are caught, you will be removed from the course and assigned an F for the course, and the filing of a report with the Associate Provost for Academic Programs and Services!

Classroom Etiquette:
Feel free to ask questions; however, socializing and chatting during class is rude and unfair to those students interested in learning and participating. If you persist in talking during class, you will be asked to leave. ALL CELL PHONES ARE TO BE TURNED OFF !!! Please note that I reserve the right to take disruptive behavior such as habitual tardiness, frequent or excessive talking during class, cell phone disruptions, or leaving before class is over into account when determining your final grade.

Last day to withdraw from class: **Friday, November 1st, 2019** (in Registrar’s Office by 4:30 pm)

Laboratory Objectives:
At the completion of CHEM 231 Laboratory, you should be able to....
- Demonstrate the proper laboratory safety when working in the lab
- Keep a neat and organized record of laboratory data in a notebook
- Demonstrate proper methods to categorize and dispose of chemical waste
- Set up apparatus for experimental techniques: reactions, distillation, filtration, etc.
- Purify organic products by recrystallization, sublimation (solids), and distillation (liquids)
- Characterize organic products by physical, chemical, and spectroscopic properties.

Tentative* Laboratory Schedule:

<table>
<thead>
<tr>
<th>DATE</th>
<th>EXP’T No.</th>
<th>EXPERIMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/26, 27</td>
<td>01</td>
<td>Check-in // Safety // Physical Constants</td>
</tr>
<tr>
<td><strong>09/02</strong></td>
<td></td>
<td><strong>LABOR DAY</strong></td>
</tr>
<tr>
<td>09/03, 09</td>
<td>02</td>
<td>Lab Safety Quiz // Synthesis of Acetanilide</td>
</tr>
<tr>
<td>09/10, 16</td>
<td>03</td>
<td>Melting Point</td>
</tr>
<tr>
<td>09/17, 23</td>
<td>04</td>
<td>Distillation</td>
</tr>
<tr>
<td>09/24, 30</td>
<td>05</td>
<td>Extraction of Analgesics from Goody’s Powder</td>
</tr>
<tr>
<td>10/01, 07</td>
<td>06</td>
<td>TLC of Analgesics</td>
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<tr>
<td>10/08,</td>
<td>07</td>
<td>Conformational Analysis of Alkanes &amp; Cycloalkanes</td>
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<tr>
<td><strong>10/14,15</strong></td>
<td></td>
<td><strong>FALL BREAK</strong></td>
</tr>
<tr>
<td>10/21</td>
<td>07</td>
<td>Conformational Analysis of Alkanes &amp; Cycloalkanes</td>
</tr>
<tr>
<td>10/22, 28</td>
<td>08</td>
<td>Lab Exam #1 // Spectroscopy**: IR and ^1H NMR//Handout Spec Problem Set 1</td>
</tr>
<tr>
<td>10/29, 11/04</td>
<td>09</td>
<td>Stereochemistry &amp; Chirality</td>
</tr>
<tr>
<td>11/05, 11</td>
<td>10</td>
<td>Dehydration of an Alcohol</td>
</tr>
<tr>
<td>11/12, 18</td>
<td>11</td>
<td>Preparation of an Ester // Problem Set 1 Due // Hand out Spec. Problem Set 2</td>
</tr>
<tr>
<td>11/19, 25</td>
<td>12</td>
<td>Ester Product Analysis</td>
</tr>
<tr>
<td>11/26, 12/02</td>
<td>13</td>
<td>Nucleophilic Substitution (S_N1 vs S_N2)</td>
</tr>
<tr>
<td>12/03, 09</td>
<td>14</td>
<td>Check-out // Finish all experiments // Lab/Spec. Exam #2 // Problem Set 2 Due</td>
</tr>
</tbody>
</table>

* Order of experiments subject to change, as well as experiments themselves
** Lecture & assignment

**Lab Attendance:**
Attendance at each laboratory session is mandatory. Only valid excuses will be accepted in order to make up labs. In the event of an anticipated excused absence, arrangements should be made to make up work prior to the absence. Students are not allowed to work by themselves when there is not a lab in session. You are expected to have read the procedure thoroughly prior to each lab and be prepared to work in the laboratory.

**Safety is very important in the laboratory.** General safety guidelines will be presented in the laboratory and should be followed at all times. Specific safety precautions for each experiment will be covered before each lab. Failure to follow safety guidelines is reason for dismissal from a lab and a grade of zero on the experiment. Additional laboratory guidelines including notebooks and reports are covered in the handouts.

**Extra Credit** (last, but not least):
…may be achieved by attending educational seminars in chemistry, biology, physics, math, computer science, and earth science, as well as by attending any MU Science Lectureship program. The “Extra Credit” can help assist a push to the next grade level, at the end of the semester after the final grade points have been calculated. A Verification of Attendance form must be signed by an attending faculty member and submitted to your instructor (me). Cards are on my bulletin board.

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**TITLE IX RESPONSIBILITIES FOR FACULTY:**

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment, comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, et seq., and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University’s Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member’s reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.

Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is available at [www.millersville.edu/titleix](http://www.millersville.edu/titleix).