CHEM 232
ORGANIC CHEMISTRY 2
Spring Semester: 2021

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Office Hours: (via ZOOM)
Tuesday, 1:00 – 2:00 pm
Wednesday, 3:00 – 5:00 pm
Thursday, 10:00 am – 12:00 noon
(or, by appointment)

This “Remote” Spring Semester course will be offered “synchronously” on Mondays, Wednesdays, & Fridays, from 10:00 – 10:50 am.

Course Description:
Chemistry 232 is a continuation of Chemistry 231 (Organic Chemistry 1). It will focus on the structure, property, reactivity, mechanisms, and synthesis of unsaturated compounds (diene and aromatic compounds), as well as carbonyl compounds including aldehydes, ketones, carboxylic acids and derivatives; along with amines, phenols, and complex compounds with multiple functionality. Includes an introduction to natural and synthetic polymers and biomolecules, including fats, oils, amino acids, and carbohydrates. Thorough integration of structural relationships to spectral properties using FT-IR, $^1$H-NMR, and $^{13}$C-NMR spectroscopy, as well as mass spectrometry instrumentation and derived data. (3-50 minute lectures, MWF / 3 hours lab, MT). Prereq: Grade of C, or better (non-chemistry majors), in CHEM 231; Grade of C, or better (chemistry majors), in CHEM 231.

Required Materials:
- Molecular Model Set for Organic Chemistry
- 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). Not required for online course!

Course Objectives:
At the completion of CHEM 232, 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 of organic reactions
• Design syntheses of organic products
• 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!!!
• Work lots of problems!!! Then do more problems.
• Get help when needed!!! Don’t be afraid to ask question, or to come see me for help!

LECTURES: All lectures are “synchronous” via the Multi-Modal classroom, Roddy 149. All lectures will also be video recorded and uploaded onto D2L for future reference. I will supplement some of the chapters by uploading material onto D2L.

Tentative Chem 232 Course Calendar
Spring 2021

<table>
<thead>
<tr>
<th>Textbook Chapter</th>
<th>Tentative Topics</th>
<th>Exam Dates</th>
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</thead>
<tbody>
<tr>
<td>Chapter 13</td>
<td>Alcohols and Phenols</td>
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<tr>
<td>Chapter 14</td>
<td>Ethers and Epoxides; Thiols and Sulfides</td>
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<tr>
<td>Chapter 17</td>
<td>Conjugated Pi Systems and Pericyclic Reactions</td>
<td>Exam 1: Fri., 02/12</td>
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<tr>
<td>Chapter 18</td>
<td>Aromatic Compounds</td>
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<tr>
<td>Chapter 19</td>
<td>Aromatic Substitution Reactions</td>
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<tr>
<td>Chapter 20</td>
<td>Aldehydes and Ketones</td>
<td>Exam 2: Fri., 03/12</td>
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<tr>
<td>Chapter 24</td>
<td>Carbohydrates (select sections)</td>
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<tr>
<td>Chapter 21</td>
<td>Carboxylic Acids and Their Derivatives</td>
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<tr>
<td>Chapter 22</td>
<td>Alpha Carbon Chemistry: Enols and Enolates</td>
<td>Exam 3: Fri., 04/09</td>
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<tr>
<td>Chapter 23</td>
<td>Amines</td>
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<tr>
<td>Chapter 25</td>
<td>Amino Acids, Peptides, and Proteins (select sections)</td>
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<tr>
<td>Chapter 26</td>
<td>Lipids (select sections)</td>
<td>Exam 4: Fri., 04/30</td>
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<tr>
<td>Chapter 27</td>
<td>Polymers (select sections)</td>
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Chapters 15, & 16 (select sections, i.e., 2D NMR) will be discussed in both lecture and lab, and they may be included on appropriate exams.

Attendance Policy / Exam 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
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! It is important to realize that Make-up exams may differ in style/questions from the original exam.

*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./exam = 400 pts.) **45 %**
- **Final comprehensive exam** (100 pts.) **20 %**
- 3 quizzes (3 x 25 pts/quiz = 75 pts.) **15 %**
- Laboratory: Reports /Assignments / Problem Sets / Misc. (~ 200 + pts.) **20 %**

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100 %

- **Tentative Exam Dates:** Fridays: **02/12/21 (#1); 03/12/21 (#2); 04/09/21 (#3); 04/30/21 (#4)**
- **Tentative Quiz Dates:** Fri: **01/29/21 (#1); Fri: 02/26/21 (#2); Fri: 03/26/21 (#3)**
- **Final Exam Date:** Thursday, MAY 06, 2021: 8:00 – 10:00 am: RODDY 149

**NOTE:** *In the event of adverse weather and a class is canceled, a scheduled exam will be given the next time the class meets!*

Last day to withdraw from a course & receive a W grade: Monday, 04/05/21, by 11:59 pm
*(withdrawal form must be submitted online by 11:59 pm)*

**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
- B’+ 77.5 – 79.9
- C 70.0 – 77.4
- C’ 68.0 – 69.9
- C+ 66.0 – 67.9
- C’+ 62.0 – 65.9
- D 60.0 – 61.9
- D’ < 60.0
- F< 60.0

**Out of Class Assistance:**
If you do not understand a problem or concept, please do not hesitate to ask in class, stop by my office, or schedule an appointment to meet with me.
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:  **NO CELLPHONES!**
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. 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.

Laboratory Objectives:
*At the completion of CHEM 232 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:**  
Mon, 1:00 – 3:50 pm (232.50C); Tues, 9:00 – 11:50 am (232.50A) Caputo 331

<table>
<thead>
<tr>
<th>Date</th>
<th>No.</th>
<th>Experiment</th>
<th>Due Date</th>
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</thead>
<tbody>
<tr>
<td>01/25, 26</td>
<td>----</td>
<td><strong>Check-in</strong></td>
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<tr>
<td>02/01, 02</td>
<td>01</td>
<td>Reducing Agents (Virtual JoVE Video about LiAlH₄ &amp; NaBH₄); followed by Modified Experiment: <strong>Reduction of Vanillin:</strong> 2-Part Experiment; Part 1 (12 pts.), Read Experiment and use data supplied to do calculations on Report Sheet: Part 2 (38 pts.), <strong>Practice Problems</strong>, use the Video and Background Information described in the Experiment’s</td>
<td>02/08,09</td>
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<tr>
<td>02/08, 09</td>
<td>02</td>
<td>Oxidation of an Alcohol &amp; <strong>Review for Exam #1</strong></td>
<td>02/16</td>
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<td><strong>02/15</strong></td>
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<td><strong>NO CLASS</strong> (Break #1)</td>
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<td>02/16, 22</td>
<td>03</td>
<td>Diels-Alder Reaction: Synthesis of cis-5-norbornene-endo-2,3-dicarboxylic anhydride</td>
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<td>02/23; 03/01</td>
<td>04</td>
<td>Hydrolysis of Diels-Alder Adduct: Preparation of cis-5-norbornene-endo-2,3-dicarboxylic acid</td>
<td>03/02, 08</td>
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<tr>
<td>03/08, 09</td>
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<td><strong>Review for Exam #2</strong></td>
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<tr>
<td>Date</td>
<td>Week</td>
<td>Activity Description</td>
<td>Date</td>
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<td>03/15, 16</td>
<td>05</td>
<td>Nitration of an Aromatic Ring (Electrophilic Aromatic Substitution)</td>
<td>03/29, 30</td>
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<tr>
<td>03/22, 23</td>
<td>06</td>
<td>Molecular Modeling // The use of “SPARTAN” to calculate/analyze the nitration products &amp; intermediates. Data will be provided so that you may do the calculations and answer the questions.</td>
<td>03/29, 30</td>
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<td>03/29, 30</td>
<td>07</td>
<td>Synthesis of an Ester from an unknown acid &amp; unknown alcohol</td>
<td>04/12, 13</td>
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<tr>
<td>04/05, 06</td>
<td>.....</td>
<td>Review for Exam #3</td>
<td>04/19, 20</td>
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<tr>
<td>04/12, 13</td>
<td>08</td>
<td>Grignard Chemistry: Preparation of Benzoic Acid</td>
<td>04/26, 27</td>
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<tr>
<td>04/19, 20</td>
<td>09</td>
<td>Use of Benzil in an Aldol Condensation</td>
<td>04/27, 27</td>
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<tr>
<td>04/26, 27</td>
<td>.....</td>
<td>Review for Exam #4</td>
<td>05/04-07</td>
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<tr>
<td>05/04-07</td>
<td>.....</td>
<td>Final Exam Week</td>
<td>05/04-07</td>
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* 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.

**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.
OFFICE HOURS: New office hours are listed at the top of this syllabus. Office hours will begin on Thursday, 01/21/2021, morning from 10:00 am – 12:00 noon via ZOOM, and, of course, e-mail!

LABORATORY: I will upload data for certain Labs on D2L, data that you normally would/should have gotten if you did the experiment. You will then fill in the Report Sheets, calculations, conversions, theoretical yields, percent yields, etc.

Resource contacts available for students during these trying times as we transition to remote instruction for the Spring 2021 semester:

• Help Desk hours: Monday - Thursday 7 a.m. – 7 p.m., Friday 7 a.m. – 5 p.m.
  How to contact the Help Desk:
  • via email help.desk@millersville.edu
  • via the web https://millersvilleuniversity.sysaidit.com
  • For Immediate needs only - via phone 717-871-7777

• IT web site URL: https://wiki.millersville.edu/display/ittac

• D2L support number:
  o 24x7 365 days/year 1-877-325-7778 or https://community.brightspace.com/millersville/s/