Course Description

This course will focus on the theory of organic chemistry (or chemistry of molecules containing carbon) from the viewpoint of structure/reactivity relationships. Topics covered will be bonding, functionality, reactivity, synthesis, spectroscopy, and nomenclature. Homework and Exams will constitute the majority of the points earned in class.

Course Materials


Online: Term subscription to Sapling Learning Course for this class. [http://www.saplinglearning.com](http://www.saplinglearning.com)

Equipment: **NON**-programmable scientific calculator

Turning Technologies clicker or ResponseWare mobile app

**Recommended:**


Prentice Hall Molecular Model Set for Organic Chemistry (or an equivalent molecular modeling kit)

*I have placed a copy of the course text and the solutions manual on reserve in Rasmusson Library. These are available for 2hr and overnight checkout.

Course Goals

To know reaction chemistry of major functional groups of organic molecules (molecules with carbon), including knowing how to write mechanisms for organic reactions and how to write organic reactions in a logical sequence to demonstrate how a molecule might be synthesized in the laboratory.

Student Learning Outcomes

At the end of this course, students should be proficient in:

1. Understanding fundamental concepts of bonding in organic functional groups.
2. Naming simple organic compounds.
3. Predicting the reactivity and writing mechanisms of reactions of aromatic compounds, phenols, aldehydes, ketones, carboxylic acids and their derivatives, and amines.
4. Knowing the fundamental structures of biological molecules such as carbohydrates, amino acids, proteins, and lipids.
5. Understanding basic concepts of stereochemistry and apply it to reaction chemistry.
6. Interpreting the IR, mass, and NMR spectra of simple organic molecules in order to arrive at a structure.
7. Writing out synthetic pathways using the correct order of reactants and reagents in order to arrive at a target molecule.

**Course Structure**

The coursework will follow the textbook in the order described on the Tentative Lecture Schedule. The instructor will lecture on the theoretical aspects of organic chemistry, using a combination of slides and whiteboard, providing copies of notes to the students via Blackboard. Clickers will be used in class to assess student understanding of concepts.

**Evaluation and Grade Assignment**

**Point Breakdown:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Sapling Learning HW:</td>
<td>275</td>
</tr>
<tr>
<td>(11 assignments @ 25 points each)</td>
<td></td>
</tr>
<tr>
<td>In class quizzes/clickers</td>
<td>75</td>
</tr>
<tr>
<td>EXAM 1 (Feb. 9th, 2015)</td>
<td>100</td>
</tr>
<tr>
<td>EXAM 2 (Feb. 27th, 2015)</td>
<td>100</td>
</tr>
<tr>
<td>EXAM 3 (Mar. 13th, 2015)</td>
<td>100</td>
</tr>
<tr>
<td>EXAM 4 (Apr. 10th, 2015)</td>
<td>100</td>
</tr>
<tr>
<td>EXAM 5 (Apr. 27th, 2015)</td>
<td>100</td>
</tr>
<tr>
<td>Final (May 5th, 2015, 1-3pm)**</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total Course Points:</strong></td>
<td><strong>1000</strong></td>
</tr>
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</table>

**Grading:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥ 900 points (≥ 90%)</td>
</tr>
<tr>
<td>B</td>
<td>800-899 points (80-89%)</td>
</tr>
<tr>
<td>C</td>
<td>700-799 points (70-79%)</td>
</tr>
<tr>
<td>D</td>
<td>600-699 points (60-69%)</td>
</tr>
<tr>
<td>F</td>
<td>≤ 599 points (≤ 60%)</td>
</tr>
</tbody>
</table>

*I may elect to lower the grade point cutoffs, but will not raise them. I will not be using +/- grading.*

**Sapling Learning Registration.** If you do not already have an account, go to [http://saplinglearning.com](http://saplinglearning.com) and click on your country at the top right, and create an account. Once logged in, find this course in the list (you may need to expand the subject and term categories) and click the link. Follow the remaining instructions for payment ($40) and access to the course homework assignments. **Registration with Sapling must occur by FRIDAY, Jan 23rd, 2015, 11:59 PM (the due date of the 1st assignment).** This is also the due date of the first homework assignment, so it is advised to register **before** then in order to allow sufficient time to complete the first assignment.

**Clicker Registration.** It is the student’s responsibility to bring the clicker to each class, replace it if lost, verify that it is registered correctly on the instructor’s database, and keep it supplied with fresh batteries. Either the “LCD” version of the clicker or the smartphone application give feedback that the response was registered and thus help students to know their result was counted. **Clicker IDs must be registered through Blackboard** ([http://classes.uaf.edu](http://classes.uaf.edu)) **by SUNDAY, Jan 31st, 2015 11:59 PM.** To register your clicker, click “Tools” on the left panel once in the blackboard site for this class, and then onto Turning Technologies. Current total
clicker score will be communicated frequently (at least weekly) via Blackboard. Scores are based on participation, counted out of 75% of questions asked, to allow for absences, tech issues, battery issues, etc. For example, if 80 clicker questions are asked throughout the term and 50 clicks are registered by the student, then the clicker score would be \( \frac{50}{0.75 \times 80} = 83\% \), and then that percentage will be normalized to the total clicker points for the course (75). Thus, if a clicker score is 83%, then total clicker points attributed to a student’s grade would be 62 out of 75 total possible clicker points. Percentage score for clicker grade is capped at 100%.

**Notes and Policies**

**Attendance.** A university classroom is an adult environment and, therefore, attendance at lectures is entirely up to you. However, participation is expected and graded via clickers, and it is unlikely that you will perform well in this class without attending course sessions. It is strongly recommended that you attend all lectures.

**Exams.** No electronic devices are to be used during exams other than a non-programmable scientific calculator. You must turn in your exam before leaving the room. You may not leave the room and then come back and continue to work on the exam. Use of molecular models are allowed and encouraged during all exams. *Use of cell phones or electronic devices other than a non-programmable scientific calculator during exams constitutes cheating and will result in an F in the course as per the policy of the Chemistry Department (see below: Honor code).*

**ACS Final exam.** The final exam will be the ACS Organic Chemistry exam, covering material from the entire 2-semester sequence of organic chemistry (CHEMF321 & CHEMF322). As this is a standardized test, scores from this exam may be adjusted depending on overall class performance, but only in a student’s favor.

**Make-up exams** are only allowed in the event of a legitimate excuse as determined by the instructor. If you anticipate an absence from an exam, bring it to my attention before the exam date, or in the case of unexpected absences, as soon as possible.

**Late assignments** are not accepted. Students are given a full week (or more depending on the assignment – see Tentative Lecture Schedule below) to complete assignments, which are scheduled in order to coordinate with lectures and the exam schedule.

**Mobile Devices.** Mobile devices must be turned to silent or “vibrate” mode during class. Mobile devices are not allowed during exams.

**Honor Code.** Chemistry Department policy states that any student caught cheating on graded work will be assigned a course grade of F. Course drop forms will not be signed in these cases.

**Instructor-Initiated Withdrawals.** Up until Friday, Mar 13th, 2015 the instructor has the right to withdraw a student who has not participated substantially in the course. Any of the following criteria constitute non-participation:

- Exam I or II missed without an excused absence, or
- Completion of fewer than 6 of 8 assigned homework assignments, or
- Less than 50% of clicker questions without excused absence(s)
Tips for Success in Organic Chemistry.

The course will move quickly and material is cumulative – i.e., new concepts build upon previous ones. Thus, it is important to keep up with the course on a daily basis. Some strategies for success:

1. Attend class.
2. Ask questions! Chances are if you have a question, there are others in the class who are wondering the same thing.
3. Do the listed readings in the text before coming to class. This will help you make the most of class time and better formulate questions you may have on the material.
4. Complete homework assignments on a timely basis; do not wait until the last minute. Homework problems are designed to review core concepts from class. Even though the homework assignments need to be completed online, writing out the homework assignments on paper in addition may also aid in understanding.
5. Utilize molecular model kits. They are always allowed on exams.
6. Work the textbook problems – they are not assigned as homework specifically so that you can work through them and the solutions manual to help reinforce concepts.
7. Practice, practice, practice – Write out mechanisms and the problem sets, utilize the ACS organic chemistry study guide and other posted supplemental materials. There are many reactions and mechanisms to learn, but organic chemistry is not simply a memorization exercise. It is important to recognize the patterns across reactions and understand why a particular reaction proceeds the way it does. This will make it easier it will be to synthesize concepts and apply the material when it comes to exams.

Support & Accommodations

Disabilities Services. The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. Students with documented disabilities who may need reasonable academic accommodations should discuss these with me during the first two weeks of class. I will work with the Office of Disabilities Services (*208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities. You will need to provide documentation of your disability to Disability Services.

Veteran Support Services.
Walter Crary is the Veterans Service Officer at the Veterans Resource Center, 111 Eielson Building. 474-2475. (wecrary@alaska.edu)
Fairbanks Vet Center 456-4238. VA Community Based Outpatient Clinic at Ft. Wainwright is 361-6370.
## Tentative Lecture Schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Readings</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Jan 16</td>
<td>Ch 16: Aromatics</td>
<td>16.1 - 16.15</td>
<td>HW 1 Assigned: Ch 16 Sapling</td>
</tr>
<tr>
<td>M</td>
<td>Jan 19</td>
<td><em>Alaska Civil Rights Day</em> – NO CLASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Jan 21</td>
<td>Ch 17: Electrophilic aromatic substitution</td>
<td>17.1 - 17.8</td>
<td>HW 2 Assigned: Ch 17 Sapling</td>
</tr>
</tbody>
</table>
| F   | Jan 23| Ch 17: Friedl-Crafts
*Deadline to add/register for courses* | 17.9 - 17.11 | HW 1 Due 1155pm                                  |
| M   | Jan 26| Ch 17: Nucleophilic aromatic substitution, reactions of benzene derivatives | 17.12 - 17.16 |                                                  |
| W   | Jan 28| Ch 18: Introduction to carbonyls and synthesis         | 18.1 - 18.10 | HW 3 Assigned: Ch 18 Sapling                     |
| F   | Jan 30| Ch 18: Nucleophilic addition of carbonyls
*Drop deadline for 100% tuition refund* | 18.11 - 18.16 | HW 2 Due 1155pm                                  |
| M   | Feb 2 | Ch 18: Condensation reactions of carbonyls              | 18.17 - 18.20 |                                                  |
| W   | Feb 4 | Ch 19: Intro and reactions of amines                    | 19.1 - 19.10 | HW 4 Assigned: Ch 19 Sapling                     |
| F   | Feb 6 | Ch 16-18 Examples & problems                            |              | HW 3 Due 1155pm                                  |

**M** Feb 9  **EXAM 1 (Ch 16-18)**

| W   | Feb 11| Ch 19: Reactions of amines, continued                  | 19.11 - 19.12 |                                                  |
| F   | Feb 13| Ch 19: Amine synthesis                                 | 19.18 - 19.20 |                                                  |
| M   | Feb 16| Ch 20: Carboxylic acids - Introduction and synthesis   | 20.1 - 20.10  | HW 5 Assigned: Ch 20 Sapling                     |
| W   | Feb 18| Ch 20: COOH reactions                                  | 20.9 - 20.12  | HW 4 Due 1155pm                                  |
| F   | Feb 20| Ch 20: Reactions of carboxylic acids                   | 20.13 - 20.15 |                                                  |
| M   | Feb 23| Ch 21: Introduction to carboxylic acid derivatives and nucleophilic acyl substitutions | 21.1 - 21.5 | HW 6 Assigned: Ch 21 Sapling                     |
| W   | Feb 25| Ch 19-20 Examples & problems                           |              | HW 5 Due 1155pm                                  |

**F** Feb 27  **EXAM 2 (Ch 19-20)**

| M   | Mar 2 | Ch 21: Reactions of carboxylic acid derivatives        | 21.6 - 21.16  | HW 7 Assigned: Ch 22 Sapling                     |
| W   | Mar 4 | Ch 22: α substitution reactions of carbonyls          | 22.1 - 22.6   | HW 6 Due 1155pm                                  |
| F   | Mar 6 | Ch 22: Aldol condensations                             | 22.7 - 22.11  | HW 6 Due 1155pm                                  |
| M   | Mar 9 | Ch 22: Ester synthesis, Michael addition/Robinson elimination | 22.12 - 22.19 |                                                   |
| W   | Mar 11| Ch 21-22: Examples & Problems                         |              | HW 7 Due 1155pm                                  |
| F   | Mar 13| **EXAM 3 (Ch 21-22)**
*Deadline for student and faculty-initiated withdrawals* |              |                                                   |

**MWF** Mar 16-20  **Spring Break – NO CLASSES**
**UAF CHEM F322 Syllabus**  
Spring 2015  
GUERARD

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Readings</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Mar 23</td>
<td>Ch 23: Intro to carbohydrates</td>
<td>23.1 – 23.7</td>
<td>HW 8 Assigned: Ch 23 Sapling</td>
</tr>
<tr>
<td>W</td>
<td>Mar 25</td>
<td>Ch 23: Reactions of monosaccharides</td>
<td>23.8 – 23.11</td>
<td>HW 9 Assigned: Ch 23/24 Sapling</td>
</tr>
<tr>
<td>F</td>
<td>Mar 27</td>
<td>Ch 23: Reactions of monosaccharides, cont.</td>
<td>23.12 – 23.18</td>
<td>HW 8 Due 1155pm</td>
</tr>
<tr>
<td>W</td>
<td>Apr  1</td>
<td>Ch 24: Introduction to amino acids and synthesis</td>
<td>24.1 – 21.4</td>
<td>HW 8 Due 1155pm</td>
</tr>
<tr>
<td>F</td>
<td>Apr  3</td>
<td>Ch 24: Resolution and reactions of amino acids</td>
<td>24.5 – 24.7</td>
<td>HW 9 Due 1155pm</td>
</tr>
<tr>
<td>M</td>
<td>Apr  6</td>
<td>Ch 24: Peptides and proteins</td>
<td>24.8 - 24.14</td>
<td>HW 9 Due 1155pm</td>
</tr>
<tr>
<td>W</td>
<td>Apr  8</td>
<td>Ch 23-24: Examples &amp; problems</td>
<td></td>
<td>HW 9 Due 1155pm</td>
</tr>
<tr>
<td>F</td>
<td>Apr 10</td>
<td>EXAM 4 (Ch 23-24)</td>
<td></td>
<td>HW 10 Due 1155pm</td>
</tr>
<tr>
<td>M</td>
<td>Apr 13</td>
<td>Ch 25: Lipids, saponification, phospholipids</td>
<td>25.1 – 25.4</td>
<td>HW 10 Assigned: Ch 25/26 Sapling</td>
</tr>
<tr>
<td>W</td>
<td>Apr 15</td>
<td>Ch 25: Steroids, prostaglandins, terpenes</td>
<td>25.5 – 25.8</td>
<td>HW 11 Assigned: Ch 1-26 Review Sapling</td>
</tr>
<tr>
<td>F</td>
<td>Apr 17</td>
<td>Ch 26: Polymers: Synthesis, stereochemistry</td>
<td>26.1 – 26.3</td>
<td>HW 11 Due 1155pm</td>
</tr>
<tr>
<td>M</td>
<td>Apr 20</td>
<td>Ch 26: Lipids: Rubber, Nylon, BPA</td>
<td>26.4 – 26.8</td>
<td>HW 11 Due 1155pm</td>
</tr>
<tr>
<td>W</td>
<td>Apr 22</td>
<td>Ch 25-26: Examples &amp; problems</td>
<td></td>
<td>HW 10 Due 1155pm</td>
</tr>
<tr>
<td>F</td>
<td>Apr 24</td>
<td>SPRINGFEST – NO CLASS</td>
<td></td>
<td>HW 10 Due 1155pm</td>
</tr>
<tr>
<td>M</td>
<td>Apr 27</td>
<td>EXAM 5 (Ch 25-26)</td>
<td></td>
<td></td>
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<tr>
<td>W</td>
<td>Apr 29</td>
<td>Comprehensive Review: Examples &amp; Problems</td>
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</tr>
<tr>
<td>F</td>
<td>May  1</td>
<td>Comprehensive Review: Examples &amp; Problems</td>
<td></td>
<td>HW 11 Due 1155pm</td>
</tr>
<tr>
<td>M</td>
<td>May  4</td>
<td>Comprehensive Review: Examples &amp; Problems</td>
<td></td>
<td>HW 11 Due 1155pm</td>
</tr>
<tr>
<td>T</td>
<td>May  5</td>
<td>ACS COMPREHENSIVE FINAL EXAM (CH 1-26)</td>
<td></td>
<td>2 HOURS, 1-3pm</td>
</tr>
</tbody>
</table>

**Amending this Syllabus:** Before the drop date, I may slightly revise the syllabus to correct for errors that are found. Revision at a later time would require approval by all students at that time. A revised copy of the syllabus will be distributed to all students via post to Blackboard and announcement made in class. Adjustments to the tentative lecture schedule will be made throughout the course at the instructor’s discretion and if so, communicated to students via Blackboard.