Course Outline  Chemistry 2E03  2015  Introduction to Organic Chemistry

Location: HSC 1A1, Tuesdays, Wednesdays, and Fridays, 12:30-1:20pm

Instructor: Dr. Anthony Chibba (Office ABB 456; email: chibbaa@mcmaster.ca)

Tutorials: Highly recommended, but not mandatory. The registrar will assign you to a specific tutorial, but feel free to come to others, as well.

| T01 | Th | 15:30 - 16:20 | ABB 271 |
| T02 | Th | 10:30 - 11:20 | BSB 136 |
| T03 | Mo | 14:30 - 15:20 | ABB 271 |
| T04 | Mo | 13:30 - 14:20 | ABB 164 |

Tutorials this year will consist of three components:
1. review of previous week’s content (~15 min)
2. discussion of posted questions dealing with specific concepts from the previous week
3. discussion of (unposted) questions that combine two or more concepts from previous week(s)

Office Hours: Tuesday, Friday 11:30-12:20 in room ABB 456 (Anthony Chibba)
Wednesday, Friday 1:30-2:20 in room ABB 307 (Anthony Chibba or TA)


See the Intro Lecture for more details on these course materials.

Lectures: We will cover Chapters 1-5, 7-11, 13, 15, 16, 21, 24, 25, 27. Early chapters will be covered in about one hour, in review format, as much of this material has already been covered in Chem 1AA3. I may need to reduce coverage of later chapters, depending on time available.

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<th>Chapter</th>
<th>Topic</th>
<th>Lectures</th>
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<td>2</td>
<td>Molecular Representations</td>
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<td>3</td>
<td>Acids and Bases</td>
<td>1</td>
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<td>Alkanes and Cycloalkanes</td>
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<td>Stereoisomerism</td>
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<td>7</td>
<td>Substitution Reactions</td>
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<td>8</td>
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<tr>
<td>9</td>
<td>Brief review: Addition Reactions of Alkenes</td>
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<tr>
<td>10</td>
<td>Brief review: Alkynes</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Radical Addition to Alkenes</td>
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<td>Alcohols and Phenols</td>
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<td>15</td>
<td>Spectroscopy (IR and MS)</td>
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<td>Text</td>
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<td>16</td>
<td>NMR Spectroscopy</td>
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<td>Carboxylic Acids and Derivatives</td>
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<td>24-25</td>
<td>Amino Acids, Peptides and Carbohydrates</td>
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<tr>
<td>27</td>
<td>Synthetic Polymers</td>
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</table>

Chapters 1-5, 9 and 10, and 15 and 16 will only be reviewed briefly. Content may be adjusted during the term depending on time available.

**Assignments:** There will be 2 assignments that will be posted on Avenue, and that you will need to print, complete and hand in to the drop-off boxes in ABB by the posted deadline. Late assignments will not be accepted as the solutions will be posted shortly after the deadline.

**Tests:** There will be 2 tests in the course. They will be scheduled for the first week of October and the second week of November during an evening time slot (Date/Time TBA, 50 min each.)

**Final Exam:** The final exam (2.5 hrs) will cover material from the entire course.

**Mark Breakdown:**

I-Clicker: 6% (register your iclicker online with your **Student Number**)!)
2 Hardcopy Assignments: 14% total
2 Midterm Tests: 30% total
Final Exam: 50%

The weight of any component (iclicker, assignment 1 and 2, midterm 1 and 2) you do not complete will automatically be moved to the Final exam – no MSAF required.

As well, the grade in any of these components (iclicker, assignment 1 and 2, midterm 1 and 2) will only be used to calculate the final course grade if they are better than your final exam score. The point of this approach is to encourage you to submit an assignment and write a midterm even if you are not sure you have prepared enough – you cannot lose. Beware though: organic chemistry requires cumulative learning – do not plan on coasting until the final exam.

**Notes:** Any assignments, tests or exams written in pencil will not be eligible for re-grading.

**Prerequisite:** Chem 1AA3.

**Website:** Information on the course (including class notes, assignments, solutions, etc.) will be posted on Avenue to Learn A discussion board will also be available for you to post questions and answer questions from your peers.

**Getting Help:** if you need extra help with the course, feel free to contact your TAs or the course instructor during help/office hours in ABB 307. You may also go to the help
hours for CHEM 2OA3, which are also help in ABB 307.

**Academic Dishonesty:**

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.

2. Improper collaboration in group work.

3. Copying or using unauthorized aids, tests, and examinations.

**Course Description:**

Organic chemistry is of vital importance to the petrochemical, pharmaceutical, polymer and textile industries, where a prime concern is the synthesis of new organic molecules and polymers. Knowledge of the structure, functionality, and reactivity of organic molecules is critical for the understanding of numerous and disparate phenomena, from biological and biochemical processes (enzyme-substrate interactions), to medicine (pharmaceuticals), to the properties of materials (polymers). This course covers the basic and fundamental principles of organic chemistry, allowing the student to begin to understand the language of organic chemists. A broad overview of the properties and characteristics of organic molecules is provided, and several key reactions and reaction mechanisms are discussed.
Some of the topics covered include:

Bonding and Hybridization

Methane, CH₄
Understanding Reactivity (Lewis acid – Lewis base)

Conformational Analysis of butane

Stereochemistry
Reactions and Synthesis

\[
\begin{align*}
\text{OH}^- & \rightarrow R-\text{OH} & \text{Alcohol} \\
R'O^- & \rightarrow R-\text{OR}' & \text{Ether} \\
\text{SH}^- & \rightarrow R-\text{SH} & \text{Thiol} \\
R'S^- & \rightarrow R-\text{SR}' & \text{Thioether} \\
\text{CN}^- & \rightarrow R-\text{C}≡\text{N} & \text{Nitrile} \\
R'≡\text{C}≡\text{C}^- & \rightarrow R-\text{C}≡\text{C}≡\text{R}' & \text{Alkyne} \\
\text{O} & \rightarrow R-\text{OCR}' & \text{Ester} \\
\text{R}^2\text{N} & \rightarrow R-\text{NR}_3^- & \text{Quaternary ammonium halide} \\
\text{N}_3^- & \rightarrow R-\text{N}_3 & \text{Alkyl azide}
\end{align*}
\]

(R = Me, 1°, or 2°)  
(X = Cl, Br, or I)

Mechanisms

1-Butene donates a pair of electrons to the proton of HX to form an achiral carbocation.

The carbocation reacts with the halide ion at equal rates by path (a) or (b) to form the enantiomers as a racemate.