CHEM 2451 ORGANIC CHEMISTRY
Syllabus for Winter Quarter 2015

Instructor: Dr. Peter J. Harrington
Office: BW 222
Phone: 303-871-2746  303-905-5491 (cell)
Email: peter.harrington@du.edu  pjh@betterpharmaprocesses.com
Office Hours: MWR 10 – 11 AM or by appointment

Required Text and Solutions Manual:
by Marc Loudon and Joseph G. Stowell

Recommended Model Kit:
Molymod #62053 Molecular Modeling Set from Indigo Instruments

Course Objective. Your primary course objective is to master the subject matter of the first
quarter of the three-quarter course in organic chemistry. An understanding of organic chemistry is
essential for mastery of subsequent undergraduate courses in biochemistry and physical
chemistry and for achieving the high test scores necessary for admission to post-graduate or
professional school. Your secondary course objective is to gain insight into the logical
progression of scientific inquiry and scientific discovery. When the goals of undergraduate, post-
graduate, and professional school are completed, this insight you have gained and an
appreciation of organic chemistry in the world within and around you will help you make well-
informed decisions in your chosen profession and as citizens, neighbors, parents, children, and
patients.

“The purpose of education is to nurture thoughtfulness. The lesser function of thinking is to solve puzzles and problems.”
Albert Einstein

Lectures. The lectures will loosely follow the progression of the textbook at a pace of
approximately one chapter per week. The lectures are presented on the board at a pace which
should allow you to take notes and think critically about the material presented. I use four ink
colors. I suggest you have four colors available to reproduce the material presented. Questions
are welcome at any time during the lecture.

Problem/Help Sessions. Thursday problem-solving sessions provide an opportunity for you to
test your command of the current lecture material.

Homework. Set aside time after every lecture to read the textbook, review your notes and
complete textbook problems. Textbook problems relevant to each lecture are posted on Canvas.
Some exam questions are taken from the textbook problems.

Science and Engineering Learning Center: Need extra help? The Science and Engineering
Learning Center is a collaborative space staffed by undergraduate and graduate teaching
assistants trained to assist students with first and second year chemistry, physics, and
engineering lecture and laboratory courses. The goal of the center is to help students grow as
problem solvers by assisting with homework sets, lab reports, and exam preparation. The center
is not one-on-one tutoring, but is rather a support system where students can get guidance from
teaching assistants as well as their peers. The center is open to all DU students. All services are
free. The Science and Engineering Learning Center is located in the north-west corner of the first
floor of the Anderson Academic Commons (west of the writing center).
CHEM 2451 ORGANIC CHEMISTRY
Syllabus for Winter Quarter 2015

Exams and Grading. There will be two 50 minute exams and one 105 minute comprehensive final exam. Each exam is worth 200 points. If your lowest 50 minute exam score is lower than your final exam score, the 50 minute exam score will be replaced by the final exam score. There are no make-up exams. If you miss a 50 minute exam for any reason, the 0 for that exam will be replaced by the final exam score. Your final grade will be based on 620 points: 600 points for the exams and 20 points for completion of the online course evaluation at the end of the quarter.
Your course grade will be determined using the following scale:

<table>
<thead>
<tr>
<th>Letter</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
<th>D-</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>92</td>
<td>88</td>
<td>84</td>
<td>80</td>
<td>76</td>
<td>72</td>
<td>68</td>
<td>64</td>
<td>60</td>
<td>56</td>
<td>52</td>
</tr>
<tr>
<td>Points</td>
<td>570</td>
<td>546</td>
<td>521</td>
<td>496</td>
<td>471</td>
<td>446</td>
<td>422</td>
<td>397</td>
<td>372</td>
<td>347</td>
<td>322</td>
</tr>
</tbody>
</table>

Grade Curve. The raw score class average for each exam is announced in class and on Canvas. If the raw score class average is below 144 points (72% C+) your grade will be curved. To illustrate, if the raw score class average is 130, 14 points will be added to your raw exam score. Your curved exam score is posted on Canvas. The maximum curved exam score is 200 points.

Exam Review/Corrections. Answer keys are posted on Canvas for each exam. The exam answer key is reviewed point-by-point during the recitation after the exams are returned. Grading corrections on exams 1 and 2 should be submitted for review within two weeks after the answer key is reviewed. Grading corrections on the final exam should be submitted for review within the first two weeks of the next quarter.

Graded Document Retention. All graded materials will be returned. Graded materials still in my possession at the end of Spring Quarter 2015 will be shredded and recycled.

Cell Phones, Laptops, and Calculators in the Classroom. Turn off cell phones during class. Laptops are permitted during lecture and recommended during problem sessions. Cell phones, laptops, and calculators must be turned off and put away during exams.

Lecture and Testing Accomodations. If you have a disability/medical issue protected under the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act and need to request accommodations, please make an appointment with the Disability Services Program (DSP); 303.871.2372/ 2278/ 7432; located on the 4th floor of Ruffatto Hall; 1999 E. Evans Ave. Information is also available on line at http://www.du.edu/disability/dsp. See the Handbook for Students with Disabilities.

Honor Code of the University of Denver. To review your rights and responsibilities with respect to the Honor Code of the University of Denver, visit the website for the Office of Student Conduct at: www.du.edu/honorcode

I reserve the right to modify the syllabus and lecture schedule as necessary.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Chapter</th>
<th>Pages</th>
</tr>
</thead>
</table>
| 5 January | Introductions/Syllabus  
Lewis Dot Structures  
VSEPR Theory  
Resonance Structures/Hybridization  
Polarity of Bonds and Molecules  
Molecular Orbital Theory | Chapter 1 | pp. 1 - 45 |
| 7       | Continued                                                             |          |         |
| 9       | Continued                                                             |          |         |
| 12      | Continued                                                             |          |         |
| 14      | Nomenclature Alkanes and Cycloalkanes  
Boiling Point/Melting Point/Solubility  
Intermolecular Attractive Forces  
Bond Rotation/Newman Projections  
Torsional and Steric Strain | Chapter 2 | pp. 46 - 86 |
| 16      | Continued                                                             |          |         |
| 19      | NO CLASSES  MLK Day                                                  |          |         |
| 21      | Continued                                                             |          |         |
| 23      | Continued                                                             |          |         |
| 26      | Lewis and Bronsted Acids and Bases  
Ka and pKa  
Arrows for Reactions/Resonance  
Predicting Acidity/Basicity  
Kinetics and Thermodynamics | Chapter 3 | pp. 87 – 121 |
| 28      | Continued                                                             |          |         |
| 30      | Alkene Structure and Bonding  
Stereoisomerism  
Nomenclature Alkenes/Cycloalkenes  
Addition of H₂  
Heats of Formation and Hydrogenation  
Alkene Stability Order  
Addition HX and H₂O/HA  
Markovnikov’s Rule  
Carbocation Stability/Rearrangement  
Energy Diagrams/Hammond’s Postulate | Chapter 4 | pp. 122 -177 |
<p>| 2 February | Continued                                                             |          |         |
| 4       | EXAM 1  Chapters 1 – 3                                               |          |         |
| 6       | Chapter 4 Continued                                                  |          |         |
| 9       | Continued                                                             |          |         |</p>
<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>23</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>27</td>
</tr>
<tr>
<td>2 March</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12-15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
</table>
| 11   | Radical Chain Mechanism for HBr  
Radical Stability Order  
Addition of X₂ and X₂/H₂O  
Oxymercuration/Reduction  
Hydroboration/Oxidation |
| 13   | Continued |
| 16   | Continued |
| 18   | Enantiomers/Asymmetric Carbons  
Plane of Symmetry  
Nomenclature Enantiomers  
Polarimetry/Optical Rotation  
Diastereomers/Meso Compounds |
| 20   | Continued |
| 23   | Cycloalkanes: Torsional and Angle Strain  
Cyclohexane Chair/Boat Conformations  
Axial and Equatorial/1,3-Diaxial Strain  
Cyclohexanes with Two Substituents  
Bicyclic/Spirocyclic Compounds  
Stereochemistry as Tool for Mechanisms |
| 25   | Continued |
| 27   | Continued |
| 2 March | Continued |
| 4    | Exam 2 Chapters 4 – 7 |
| 6    | Nomenclature Alkyl Halides/Alcohols/  
Thiols/Ethers/Sulfides on 3/5  
Bronsted Acidity and Basicity  
Grignard and Organilithium Reagents  
Alkane Free Radical Halogenation |
| 9    | S_n2 Kinetics/Mechanism  
Alkyl Halide α and β substitution  
Nucleophilicity  
Basicity/Size/Solvation |
| 11   | Continued |
| 12-15| FINAL EXAM date/time on Web Central  
Chapters 1 – 9 |

Chapter 5  pp. 178 - 225

Chapter 6  pp. 226 - 267

Chapter 7  pp. 268 - 322

Chapter 8  pp. 323 – 376

Chapter 9  pp. 377 - 399