Welcome to organic chemistry!

Dr. David M. Birney
Phone: 834-7167, Office: Chemistry 232-C
E-mail: david.birney@ttu.edu

Course web site, start at: http://www.depts.ttu.edu/chemistry/, then look at faculty/birney.
Office hours are 12:30 PM - 1:30 PM, Tuesday, Wednesday and Thursday, or by appointment.

A Study Guide/Solutions Manual is also available.
A set of molecular models is strongly recommended.
The American Chemical Society “Official Guide” (study guide) for organic chemistry examinations is strongly recommended. (Models and the “Official Guide” will be available in class for purchase from the ACS student affiliates.)

Course Purpose
This course is the first semester of a thorough foundation course in organic chemistry. It introduces students to the structure of organic molecules and begins the study of their reactivity, within the context of functional groups. This course will satisfy the Technology and Applied Science Core Curriculum requirement.

Core Curriculum Competency Statement
Students graduating from Texas Tech University should be able to: demonstrate understanding of how Technology and Applied Science affects society and the environment; and demonstrate understanding of the relationship of ethics and technology.

Learning outcome: The fully successful student will realize the following specific learning outcomes:

1) Identify and draw $\sigma$ and $\pi$ bonding, hybridization, geometry, conjugation, resonance structures, formal charges and functional groups in organic molecules

2) Name organic molecules and corresponding functional groups and draw their structures.

3) Identify and draw various isomers including cyclic and acyclic conformational, structural and stereoisomers and explain the energetic and reactivity consequences related to these isomers.

4) Identify and predict reagents and products for the synthesis and reactions of alkyl halides, alkenes, alkynes including acid/base, $S_N1$, $S_N2$, E1, E2, alkene additions and explain the mechanisms of these reactions.

5) Demonstrate understanding of how Technology and Applied Science affects society and the environment; and demonstrate understanding of the relationship of ethics and technology.
**COURSE SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Suggested problems</th>
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<tbody>
<tr>
<td></td>
<td><strong>Structure and Bonding, Chapter 1</strong></td>
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<tr>
<td>M. Aug. 28</td>
<td>Lecture, hand out Quiz #1</td>
<td>37, 40-46, 49-58, 60, 62, 64-68, 76-79,</td>
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<tr>
<td>W. Aug. 30</td>
<td>Lecture</td>
<td>85, 86</td>
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<td></td>
<td><strong>Acids and Bases, Chapter 2</strong></td>
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<tr>
<td>F. Sept. 1</td>
<td>Lecture, <strong>Quiz 1 due</strong></td>
<td>33, 35, 36, 38-42, 46, 48-51, 53, 54,</td>
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<tr>
<td>M. Sept. 4</td>
<td><strong>No Class, Labor Day</strong></td>
<td>56, 60, 61, 71, 75-77</td>
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<td>W. Sept. 6</td>
<td>Lecture</td>
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<td>F. Sept. 8</td>
<td>Lecture</td>
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<td></td>
<td><strong>Functional Groups, Chapter 3</strong></td>
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<tr>
<td>M. Sept. 11</td>
<td>Lecture</td>
<td>23, 26-30, 32-34, 36-48, 51-53</td>
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<tr>
<td>W. Sept. 13</td>
<td>Lecture, <strong>Quiz 2.</strong> last day to</td>
<td>drop for refund, no penalty</td>
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<td></td>
<td><strong>Mass Spectrometry and Infrared Spectroscopy, Chapter 13</strong></td>
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<td>F. Sept. 15</td>
<td>Lecture</td>
<td>24, 28, 38-46, 54-56</td>
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<td>M. Sept. 18</td>
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<td>W. Sept. 20</td>
<td>Lecture</td>
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<tr>
<td>W. Sept. 20</td>
<td>Review, 5:30 PM, room 113</td>
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<tr>
<td>F. <strong>Sept 22</strong></td>
<td><strong>EXAM I</strong></td>
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<td><strong>Alkanes, Chapter 4</strong></td>
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<tr>
<td>M. Sept. 25</td>
<td>Lecture</td>
<td>34-36, 39, 41, 44-51, 55-63,</td>
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<td>W. Sept. 27</td>
<td>Lecture</td>
<td>65-67, 70, 72</td>
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<td>F. Sept. 29</td>
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<td><strong>Stereochemistry, Chapter 5</strong></td>
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<td>M. Oct. 2</td>
<td>Lecture</td>
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<td>W. Oct. 4</td>
<td>Lecture</td>
<td>64, 72</td>
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<tr>
<td>F. Oct. 6</td>
<td>Lecture, <strong>Quiz 3</strong></td>
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<td>M. Oct. 9</td>
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<td><strong>Understanding Organic Reactions, Chapter 6</strong></td>
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<td>W. Oct. 11</td>
<td>Lecture</td>
<td>24, 26-28, 31, 33-36, 38, 41,</td>
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<td>F. Oct. 13</td>
<td>Lecture</td>
<td>43, 46-50, 54-57</td>
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<td>M. Oct. 16</td>
<td>Lecture</td>
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<td><strong>Alkyl Halides and Nucleophilic Substitution, Chapter 7</strong></td>
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<td>W. Oct. 18</td>
<td>Review, 5:30 PM, room 113</td>
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<td>F. <strong>Oct. 20</strong></td>
<td><strong>EXAM II</strong></td>
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<td>M. Oct. 23</td>
<td>Lecture</td>
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<td>W. Oct. 25</td>
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<tr>
<td>F. Oct. 27</td>
<td>Lecture</td>
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Alkyl Halides and Elimination Reactions, Chapter 8

M. Oct. 30 Lecture, last day to drop 26, 28-34, 38, 41, 42, 44, 46, 49, 52, 54-61, 65,
W. Nov. 1 Lecture 67, 70
F. Nov. 3 Lecture, Quiz 4
M. Nov. 6 Lecture \[
\begin{align*}
&\begin{array}{c}
\text{CH}_3 \\
\text{CH}_3
\end{array} \quad \text{H}_3\text{C} - \text{C} - \text{Cl} \\
&\begin{array}{c}
\text{CH}_3 \\
\text{H}_2\text{O}
\end{array} \quad \Delta \\
&\begin{array}{c}
\text{CH}_3 \\
\text{H}_3\text{C} - \text{C} - \text{CH}_2
\end{array} + \text{HCl}
\end{align*}
\]

Alcohols, Ethers and Epoxides, Chapter 9

W. Nov. 8 Lecture 39, 41, 43, 46-48, 51-54, 57, 60, 61, 66, 67, 71-
F. Nov. 10 Lecture 75, 79, 81, 83
M. Nov. 13 Lecture \[
\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}
\]

Alkenes, Chapter 10

W. Nov. 15 Lecture 34, 37, 39-41, 47, 50, 52-55, 57, 60, 64, 66-70,
W. Nov. 15 Review, 5:00 PM, room 101 75-77
F. Nov. 17 Exam III
M. Nov. 20 Lecture \[
\text{CH}_2=\text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}_2\text{SO}_4} \text{CH}_3\text{CH}_2\text{OH}
\]
W. Nov. 22 Thanksgiving, no class
F. Nov. 24 Thanksgiving, no class
M. Nov. 27 Lecture

Alkynes, Chapter 11

W. Nov. 29 Lecture 26, 28-32, 34, 36-44, 46, 48, 52, 54-68
F. Dec. 1 Lecture
M. Dec. 4 Lecture
W. Dec. 6 Catch-up, review
W. Dec. 6 Review, 5:30 PM, room 113

FINAL EXAMINATION:
Friday, December 8th, 2017, 10:30 AM to 1:00 PM, room TBA (common exam time.)

Suggested problems: Working problems is essential to your mastery of organic chemistry. You should work all the problems in each chapter as you read it. In addition, the syllabus lists a number of selected problems from the end of each chapter that are appropriate to the topics that will be covered in class. These are not to be turned in. Some questions on the quizzes and exams will be taken directly from homework and tutorial questions; the others will be similar in style and content.

Study suggestions: Read the suggested material prior to class; you will have an advantage from the start. Consciously develop your repertoire of principles and reactions. Use molecular models. You will have to do some memorization, but be sure you understand and can apply specific reactions as well as the general principles. Review old exams and quizzes. Study with a friend; form a study group.

Assessment: Pay close attention to the attached schedule; there will be no make-up quizzes or exams! If there is an appropriate reason (including University sponsored events) one exam may be excused. In the event of illness, a physician’s note will be required. There will be three exams during the semester, in addition to the final exam. The final exam will be a cumulative exam, covering material from the entire two semesters. Six quizzes will be offered worth 20 points each; the best five will be counted. The first will be take-home and open book, four will be in-class, and the last will be a writing assignment. Answer keys will be posted in the display cabinets by my office. Quizzes and exams from previous years will be available.
Grading: Three hour exams at 100 points each = 300 points
Sum of four quizzes (4 x 25) = 100
Final examination = 200*
Total = 600 points

*It may be to your advantage to have the final count as 300 points, and to drop your lowest hour exam score. If this is so, it will be done in the final calculation of your grade. Thus,

540 - 600 points = A
480 - 539 points = B
420 - 479 points = C
360 - 419 points = D
0 - 359 points = F

The grade of incomplete will be given only if you cannot continue in the course due to circumstances beyond your control and have been earning a passing grade up until this point. You must meet with Dr. Birney to discuss an incomplete.

Any students who, because of a disability, may require special arrangements in order to meet course requirements should contact their instructor as soon as possible to make the necessary accommodations. Students should present appropriate verification from AccessTECH in the Student Counseling Center in West Hall. No requirement exists that accommodations be made prior to the completion of this approved university process.

Regrading: (Question authority!) When exams are returned you should review the answer key to learn from your mistakes. In doing so, if you feel that a question may have been graded in error, you are likewise encouraged to discuss that with me. However, you must not write on the exam and you must ask for the regrade within four weekdays of when the exams are returned.

Any student who because of a disability may require special arrangements in order to meet course requirements should contact Dr. Birney as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Religious Holy Day: A student who intends to observe a religious holy day should make that intention known to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination/quiz or complete an assignment scheduled for that day within a reasonable time after the absence.

Academic dishonesty: The attempt of students to present as their own any work not honestly performed is regarded as a most serious offense and renders the offenders liable to serious consequences, ranging from zero on a given assignment to a final grade of F and academic suspension.

TTU Resources for Discrimination, Harassment, and Sexual Violence: Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, https://www.depts.ttu.edu/scc/ (Provides confidential support on campus.) TTU Student Counseling Center 24-hour Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, rise.ttu.edu (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742-3931, http://www.depts.ttu.edu/ttpd/ (To report criminal activity that occurs on or near Texas Tech campus.)
Do not forget what you have learned before! You will need to remember everything from the beginning of this class at the end, because you will use it and depend on it at the end of the class. And the same is true for next semester. It is also true for what you learned in General Chemistry! The topics discussed below are covered in the CHEM 1307-1308 sequence and are important to the organic chemistry sequence.

1. Lewis dot structures and the octet rule are covered in detail in 1307. You should be able to draw Lewis dot structures of molecules with a central atom, as well as ones with two central atoms (e.g. methane, formaldehyde, ethene, ethyne).

2. VSEPR is discussed as a tool for deciding molecular geometries. Interestingly, there seems to be a variety of vocabulary in use; shape, molecular geometry (for positions of atoms) electronic geometry (including the location of lone pairs).

3. In 1307, atomic orbitals and hybrid orbitals are discussed and used to make bonds, both sigma and pi. Specifically, you will have seen orbital interaction energy diagrams to make $\sigma$ and $\pi$ bonds, as well as antibonding orbitals. Of particular relevance to organic chemistry, you should know that two side-by-side p-orbitals overlap to make a $\pi$ bond.

4. Bronstead acid-base chemistry is discussed extensively and calculations involving pKa’s should be familiar to you. Lewis acids and bases are also discussed, but primarily by way of providing definitions.

5. Redox reactions are discussed in terms of adding or taking away electrons. The point is usually made explicit that this is an electron transfer.

6. First-order and second-order kinetics are discussed. You will have seen differential and integrated rate laws. Referring to these reactions as unimolecular and bimolecular may be less familiar.

7. Intramolecular forces are discussed, including van der Waals, (London dispersion), dipole-dipole, ion-dipole and hydrogen bonds (although a comment was made that the term “dipole moment” is not always defined, that “polar molecules” is sometimes used instead). These are usually covered in the last lecture of 1307.

8. You will have seen $\Delta G$, $\Delta H$, $\Delta S$, and know how to calculate $\Delta G$ from $\Delta G_f$ of reactants and products. You should also know $\Delta G = -RT\ln K_{eq}$, although this may or may not be an equation you have memorized. You will have seen rates as related to activation energy, but not $\Delta G^\ddagger$. You should understand $\Delta S$ in the qualitative sense of increasing disorder, as in one molecule making two is favored by entropy.

9. In 1307, you studied the water solubility of ionic compounds. Specifically, you should understand that the ions separate and are solvated by hydrogen bonds to water.