**CHE 2060: Principles of Organic Chemistry** Spring 2018

Lecture: MWF @ 9 am in MOR132; lab: Th 1-4 in MOR123

Moodle links to my course web site: richmond-hall.weebly.com/che-2060.html

This course is designed to introduce students to the study of organic chemistry, and serves as a comprehensive introduction to the subject. Material includes a general overview of the basic organic compounds, from alkanes to heterocyclic compounds, their bonding, structures and reactions these compounds commonly undergo. Important areas of organic chemistry will be included. *4 Credits: 3 hours of lecture, 3 hours of lab*

**Required text:**

Organic Chemistry (2005) Daley & Daley Molymod modeling kit

[www.ochem4free.com](http://www.ochem4free.com) *Google Indigo or Amazon*

**Suggested supplementary texts:**

Virtual Textbook of Organic Chemistry (1999) William Reusch

An interactive textbook covering the usual topics treated in a college sophomore-level course. Links are offered to advanced discussions of selected topics.

<http://www.cem.msu.edu/~reusch/VirtTxtJml/intro1.htm>

Virtual Textbook of OChem, another version of Reusch’s on-line text.

<http://chemwiki.ucdavis.edu/Organic_Chemistry/Virtual_Textbook_of_OChem>

****

**Also available in Hartness Library:**

Organic Chemistry, a Short Course (2003) 11/e, Hart, Craine and Hart, Houghton Mifflin
ISBN: 0-618-2153-0

Organic Chemistry as a Second Language: Translating the Basic Concepts (2004) 2/e, Klein, Wiley

ISBN: 0-471-27235-3

Pushing Electrons: a Guide for Students of Organic Chemistry (1998) 3/e Weeks and Thompson
ISBN: 0-03-020693-6

The Organic Chemistry of Biochemical Pathways (2005) McMurry & Begley, Roberts & Co.

 ISBN: 0-9747077-1-6

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Lecture** | **Topic** | **Text**  |
| 1 | 123 | **Introduction: Atomic structure & bonding**Organic is; nuclear model to BohrValence shells & orbitalsCovalent bonds, energy minima, molecular oritals | D&D, Ch 1 |
| 2 | 456 | **Bond polarity, resonance, hybrid orbitals, geometry**Lewis structures, electronegativity & bond polarityFormal charge & resonanceHybrid orbitals, VSEPR, molecular geometry | D&D, Ch 1 |
| 3 | 789 | **Hybrid orbitals, VSEPR, isomers & functional groups**VSEPR geometry & molecular geometry …//…Isomers & line-bond drawingsArrow formalism, framework C & functional groups*Review &* ***Exam 1*** | D&D, Ch 1/2 |
| 4 | 101112 | **Isomers & simple alkanes, alkenes, alkynes**Isomer properties, line-bond drawings, functional grsAlkanes & namingAlkenes & alkynes | D&D, Ch 2 |
| 5 | 131415 | **Cyclic hydrocarbons, arenes & organohalogens**Cycloalkanes (with & without subsitutents)Arenes (with & without subsistutents)Organohalogens | D&D, Ch 2 |
| 6 | 161718 | **Hydrocarbon properties & intermolecular interactions**Physical properties of organic moleculesTypes of intermolecular interactionsSolubility, surfactants & density | D&D, Ch 4 |
| 7 | 192021 | **Conformations of organic molecules**Alkane conformation Cycloalkane conformationRing stereoisomers & stability*Review &* ***Exam 2*** | D&D, Ch 3 |
| 8  | 192021 | ***Chirality***Definition & nomenclatureProperties & biological consequencesFisher projections & multiple stereocenters | D&D, Ch 11 |
| 9 | 222324 | **Acid & base chemistry in organic**Arrhenius vs. Brønsted-Lowry vs. Lewis, pH & pKaRelative acidity, effects of substituents | D&D, Ch 5 |
| 10 | 282930 | **Reactions: why, how, classification**Why reactions occur: polarity, en, acidity/basicityTerminology: nucleophiles & electrophilesWriting reactions & general overview of rxn types*Review &* ***Exam 3*** | D&D, Ch 6 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Lecture** | **Topic** | **Text**  |
| 11 | 313233 | **Substitution, addition & elimination reactions**Substitution reactionsAddition reactionsElimination reactions | D&D, Ch 6 |
| 12 | 343536 | **Nucleophilic addition to carbonyls**Reactivity of the carbonyl & guideCyanohydrin, addition of water & alcoholsReaction with nitrogen nucleophiles (transamination) | D&D, Ch 7 |
| 13 | 373839 | **Nucleophilic substitution to carbonyls**Acyl transfer mechanismSubstitution with various nucleophilesNitriles & mechanistic issues | D&D, Ch 8 |
| 14 | 404142*Lab* | **Aromaticity & aromatic substitutions**Structure, stability & naming; Hückel’s ruleHeterocyclics & multiple-ring structuresSubstitution vs. addition; nitration of benzene*Review and* ***Exam 4*** | D&D, Chs17 & 18 |
| 15 |  | ***Cumulative FINAL EXAM*** |  |

|  |
| --- |
| **Worksheet lab exercises** |
| Electron configuration of the non-metal atoms common in organic compounds |
| Lewis dot structures of small organic compounds  |
| Line-bond drawing  |
| VSEPR molecular geometry  |
| Pushing electrons in resonance structures |
| Naming alkanes, -enes,-ynes  |
| Modeling molecular conformations |
| Stereochemistry & chirality |
| Identifying reactive groups, nucleophiles & electrophiles |
| Identifying types of organic reaction mechanisms |

|  |
| --- |
| **Wet lab exercises:** |
| Synthesis of a polymer |
| Fractional distillation of alcohol from wine |
| Suite of aspirin lab exercises |
| Extraction of caffeine |
| Base extraction of benzoic acid from acetanilide |
| Biodiesel production (with viscosity testing) |

 *[NOTE: The instructor reserves the right to change the syllabus at any time.]*

**Grading policy:**

Exams = 10% each (total 40%)Cumulative Final Exam = 10%\*

Take-home quizzes = 15%
Homework = 10%

Flips = 5%

Lab Reports or Exercises = 20%

**Due dates and grading notes:**

* ***No*** late work will be accepted. However, acknowledging that we can all have a bad day, I will drop one zero for the semester.
* Flip questions are due at the start of class.
* Homework problems are due at the next class meeting (2 days or weekend).
* Lab reportsare due at our next lab meeting (1 week later) and are accepted only 2 days after this due date; grades drop by 3.3 points per day for each of those two late days.
* Quizzes are take-home. You’ll generally have at least 2-3 days to complete each. I’ll drop the lowest quiz grade of the semester only if it is not a zero. I don’t offer make up quizzes.
* Make up exams will be provided if you have a valid reason and if you contact me before the exam or immediately after the exam.
* You may replace you hourly exam grades with your grade for the corresponding section of the **cumulative** **final exam**, if the latter grade is higher. However, zeros are not replaced so you should plan to take each hourly exam.

**Grading scale:** A+ 97 – 100 C+ 77 – 80

 A 94 – 96 C 74 - 76

 A- 91 – 93 C- 71 - 73 B+ 87 – 90 D+ 67 - 70

 B 84 – 86 D 64 - 66

 B- 81 – 83 D- 61 – 63

 F 0 - 60

**FINAL NOTE:**Students with disabilities, whether physical, psychological, or learning, who believe that they may need accommodations in this class are encouraged to contact the Learning Specialist as soon as possible to ensure that such accommodations are implemented in a timely fashion. Please meet with Robin Goodall to verify your eligibility for accommodation and/or academic assistance related to your disability. She can be found in the second floor atrium of Conant, at extension 1278, or by email (rgoodall@vtc.edu).