OSC010 – FULL-YEAR SEQUENCE OF ORGANIC CHEMISTRY (WITH LABS)

Credit Hour Recommendation: 8-12 Semester Hours
Prerequisites: General Chemistry I & II for the major with lecture and lab (OSC008 and 009)
Suggested Textbook Topics: Lecture: A standard modern organic chemistry text designed for chemistry and ancillary science majors.
Related TAGs: Biology, Chemistry
Course Description: A full two semester sequence of organic chemistry lecture and lab (8-12 semester hours) pitched at the majors' level. Topics covered include theories of bonding, nomenclature, stereochemistry, spectroscopy, acid-base chemistry, and a broad range of reactions of the major organic functional group classes with an emphasis on both reaction mechanisms and synthesis. Includes societal applications of organic chemistry. The two semesters of lab involve techniques for the separation and purification of organic compounds, and compound characterization using both NMR and IR spectroscopy. A broad range of organic transformations will be conducted, including multi-step synthesis.
Organic Chemistry lecture and lab (8-12 semester hours) transfer as a full-year sequence only. All experimental organic chemistry lab work will be performed in a traditional hands-on lab setting.[1] All non-sequence coursework is to be reviewed on a course-by-course basis by the receiving institution. Note: These outcomes were aligned with the American Chemical Society (ACS) recommendations in mind.
Students must be proficient in all of the following core competencies:
1. Theories of structure and bonding in organic compounds including Lewis structures, resonance, valence bond theory/hybridization, and molecular orbital theories

[1] An American Chemical Society Public Policy Statement on the Importance of Hands-on Laboratory Science can be found at: https://www.acs.org/content/acs/en/policy/publicpolicies/education/computersimulations.html

2. Acid-base reactions of organic compounds
3. Stereochemistry, isomerism and conformational analysis
4. Nucleophilic substitution and elimination reactions
5. Chemistry of alkenes and alkynes
6. Chemistry of aromatic compounds (including aromaticity, electrophilic aromatic substitution, and nucleophilic aromatic substitution)
7. Chemistry of alcohols, ethers, alkyl halides and epoxides
8. Chemistry of aldehydes and ketones – addition reactions
9. Chemistry of carboxylic acids and derivatives – nucleophilic acyl substitution
10. Enol and enolate chemistry, condensation reactions
11. Chemistry of dienes, including Diels-Alder reaction
12. Free radical chemistry
13. Chemistry of amines
14. Spectroscopy and its use in the structural elucidation of organic compounds (including 1H and 13C NMR, IR, and mass spectrometry)

Students must have developed:

15. Familiarity with IUPAC nomenclature
16. An ability to propose reaction mechanisms and associated energy vs. reaction coordinate diagrams, using structural representations and curved arrows representing electron movement, with application of these skills to new situations
17. An ability to design syntheses, use of retro-synthetic analysis
18. An understanding of stereochemical implications in organic reactions and mechanisms
19. An appreciation for a variety of applications of organic chemistry in society, including biological and synthetic polymers and biologically/medicinally relevant organic chemistry

Lab Course Learning Outcomes:
Students must be proficient in all of the following core competencies:

20. In the organic chemistry laboratory, the student should perform and master the basic techniques for: (i) the separation and purification of organic compounds (recrystallization, distillation, and column chromatography); (ii) the analysis of organic compounds (TLC, gas chromatography)[1]; and (iii) the characterization of organic compounds (melting and boiling points, IR spectroscopy (hands-on) and NMR (analysis of spectra collected using a student's

own samples is strongly recommended, e.g., *via* hands-on student experiments or through use of an auto sampler system; alternatively, the use of standard spectra is permitted).

21. Students should conduct a broad range of organic transformations which illustrate topics drawn from the organic chemistry lecture sequence, including multi-step syntheses (including purification and characterization of synthetic intermediates).
22. Students should learn how to keep a laboratory notebook and write reports detailing their experiments.
23. Students should understand and practice safe laboratory techniques.

[1] An institution may elect to replace the requirement for hands-on GC analysis with a requirement that students use (hands-on) one of the following alternative instrumentally-based methods for chromatographic separation and/or analytical characterization of organic composition, purity and/or structure: GC-MS, LC, LC-MS, and NMR spectroscopy.

CHEMISTRY TAG: FULL-YEAR SEQUENCE OF ORGANIC CHEMISTRY
FACULTY PARTICIPANTS
Spring-Fall 2016

Name	**Institution**
Paul Sampson (Lead)	Kent State University
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