



Indiana University

Course: CHEM-T 530 Organic Spectroscopy

Format: Online

Date: 8/24/2020 - 12/18/2020

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Course Description

Determination of molecular structure is one of the central themes of organic chemistry. For this purpose, chemists today rely almost exclusively on spectral methods or spectroscopy. Organic spectroscopy is introduced in undergraduate organic chemistry classes, but students only see the proverbial 'tip of the iceberg' in their undergraduate classes. This course is intended to give students a more complete picture of how spectroscopic methods are used to elucidate the structure of complex organic molecules. Topics that will be covered include infrared (IR), mass spectroscopy (MS), nuclear magnetic resonance (NMR), and UV-visible spectroscopy. In this course, we will first develop basic understanding of various theories behind IR, MS, and NMR spectroscopy, and then we will concentrate on the interpretation of spectra and the information they can provide about details of molecular structure.

Learning Outcomes

Upon completion of this course, students will be able to:

- Describe the physical and chemical changes that occur at the molecular level during a MS, IR, or NMR experiment.
- Identify different functional groups present in organic compounds using IR spectra.
- Explain common terms in NMR spectroscopy such as chemical shift, coupling constant, and anisotropy, and describe how they are affected by molecular structure.
- Analyze and interpret 1D- ^1H and ^{13}C NMR as well as 2D NMR to determine chemical structure of organic compounds.
- Explain major fragmentation patterns of organic compounds using mass spectra.
- Integrate all spectral data (MS, IR, and/or NMR) of a compound to elucidate the structure of an organic molecule.

Learning Materials

Introduction to Spectroscopy, 5th ed. by Pavia, et al. (ISBN 978-1-285-46012-3).

Spectrometric Identification of Organic Compounds, 8th ed. by Silverstein, et al. (ISBN 978-0-470-61637-6).

Assessment

Exams	30%
Quizzes	15%
Assignments	20%
Discussion	15
Final Exam	20%