

CHEM 202

Fundamentals of Organic Chemistry

Sample Syllabus

Description

CHEM 202 is a one-semester, comprehensive course that introduces the students to the fundamental principles of organic chemistry including relationships between the molecular structure of organic compounds and their macroscopic properties. Some of the principles are illustrated with a variety of examples from nature and everyday life. The course covers the following topics: alkanes; alkenes, including polymers; alkynes; benzene and aromaticity; alcohols and phenols; ethers; aldehydes; ketones; carboxylic acids and their acyl derivatives; amines; alkyl halides; nomenclature; stereochemistry, including conformational analysis and chirality. Chemical reactions of the functional groups will be discussed along with the mechanistic details, including stereospecificity, of some of these processes. Biological molecules such as carbohydrates, lipids, steroids, peptides/proteins and nucleic acids, along with their importance in living systems, will be surveyed.

To achieve these goals, we will study the structure and function of organic molecules with emphasis on their physical properties and chemical reactivities. An understanding of the structure and function of various functional groups is essential to master the content of this course.

Objectives

When you successfully complete this course, you will be able to:

- Draw chemical structures for any given chemical formula and be able to name the molecules based on IUPAC nomenclature rules.
- Identify and draw constitutional and conformational structural isomers for a given formula or structure, including stereoisomers and geometric isomers and understand the relationship between them.

- Describe bonding- ionic, covalent, hydrogen bonding and van der Waals bonding and understand the concept of hybridization leading to single and multiple covalent bonding.
- Differentiate between bonding, non-bonded interactions and inductive effects in the determination of physical properties such as bond polarity, boiling points and solubility.
- Name all classes of molecules. Nomenclature of alkanes, alkenes, alkyl halides, aromatic compounds, alcohols, ethers, aldehydes, ketones, carboxylic acids and derivatives of carboxylic acids is important.
- Write chemical reactions and know chemical reagents, reactants and products for reactions of alkanes, alkyl halides, alcohols, ethers, aromatic compounds, aldehydes, ketones, amines, carboxylic acids and derivatives.
- Write stepwise reaction mechanisms for nucleophilic substitution reactions (SN1 and SN2), elimination reactions (E1 and E2), electrophilic aromatic substitutions, nucleophilic acyl substitution reactions and addition reactions, including polymerizations.
- Identify enantiomers and diastereomers (meso), optical activity, racemes; E/Z geometrical isomers for unsaturated compounds.

Materials

- Fundamentals of Organic Chemistry, by John McMurry, and Eric Simanek. 7th edition. Thomson Brooks/Cole. Date published 2011. ISBN-13: 9781439049716.
- Fundamentals of Organic Chemistry Study Guide and Solutions Manual, by McMurry, Susan. 7th edition. Illustrated. Some students find this useful. Thomson Brooks/Cole. Date published: 2011. ISBN-13: 9781439049723. (optional)
- Models: A molecular model set is often useful. Recommended Set - Molecular Model Set A for Organic Chemistry [Allyn & Bacon (Prentice Hall)]. ISBN: 9780205081363. (optional)

Course Schedule

Week	Topic(s)
1	Structure and Bonding

2	Functional Groups and Conformations
3	Alkene Structure, Isomerism & Reactions
4	Additions to Alkenes, Reaction Mechanism
5	Aromatic Compounds, Aromaticity, Reactions & Mechanisms
6	Stereochemistry, Chirality-enantiomers, Diastereomers, and Meso compounds
7	Alkyl Halides
8	Midterm Exam
9	Alcohols, Phenols, Ethers
10	Aldehydes and Ketones
11	Carboxylic Acid and Derivatives
12	Amines
13	Carbohydrate Structure and Function
14	Amino acids, Peptides, Proteins. Lipids and Nucleic acids
15	Final Exam

Lesson Structure

Each Lesson contains narrated introductory slides (the PowerPoint slides have an audio component), a quiz, and slides from Office Hours.

Non-proctored, Non-timed Quiz Assignments (220 points)

(13 x 20 points each / Drop the two lowest / 60 minutes per attempt)

Each lesson will conclude with a quiz which is based on the learning goals listed at the end of the Narrated Introductory Slides. If you know how to solve the homework problems, you will be able to solve a set of

the homework problems assigned as a quiz. The best 11 quiz grades will be count. Quiz assignments will not be proctored and have to be completed by the due date and time. It will be open for one week. A Blackboard Collaborate session will be held weekly to discuss the solutions to the quiz questions.

Proctored, Timed Midterm Exam (150 points)

On materials learned in Lesson 1 - 7

Students will complete an online, multiple-choice exam consisting of questions that will be similar in scope to those given in the quiz assignments. Students are NOT allowed to refer to the lessons, the textbook, or their notes to complete the exam. Students are not allowed to consult with another person while working on the exam. Canvas allows a limited amount of time to complete the exam and students are requested to complete the exam within the time allotted.

Proctored, Timed, Comprehensive, Final Exam (200 points)

Students will complete an online, multiple-choice exam consisting of questions that will be similar in scope to those given in the homework assignments. This exam will be proctored, and students are not allowed to refer to the lessons, the textbook, or their notes to complete the exam. Students are not allowed to consult with another person while working on the exam. Canvas allows a limited amount of time to complete the exam and students are requested to complete the exam within the time allotted.

Grading

Assignment	Course Points
Midterm	150
Quizzes (13 at 20 points each, lowest 2 scores dropped)	220
Final Exam	200
Total	570

Grade Scale

Letter Grade	% of Course Points
A	92-100%
A-	90-91%
B+	88-89%
B	82-87%
B-	80-81%
C+	78-79%
C	70-77%
D	60-69%
F	< 60%

Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating Disabilities

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The [Student Disability Resources \(SDR\) website](#) provides contact information for every Penn State campus . For further information, please visit [Student Disability Resources website](#).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: [See documentation guidelines](#) . If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

Counseling and Psychological Services

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

- [Counseling and Psychological Services at University Park \(CAPS\)](#): 814-863-0395
- [Counseling and Psychological Services at Commonwealth Campuses](#)
- Penn State Crisis Line (Available 24 hrs, 7 days a week): 877-229-6400
- Crisis Text Line (Available 24 hrs, 7 days a week): Text LIONS to 741741

Educational Equity / Report Bias

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