



Course Syllabus

CHEM 2425 – Organic Chemistry II

Revision Date: 8/19/2013

Catalog Description: Advanced principles of organic chemistry will be studied, including the structure, properties, and reactivity of aliphatic and aromatic organic molecules; and properties and behavior of organic compounds and their derivatives. Emphasis is placed on organic synthesis and mechanisms. Includes study of covalent and ionic bonding, nomenclature, stereochemistry, structure and reactivity, reaction mechanisms, functional groups, and synthesis of simple molecules. THIS COURSE IS INTENDED FOR STUDENTS IN SCIENCE OR PRE-PROFESSIONAL PROGRAMS. This laboratory-based course accompanies CHEM 2325, Organic Chemistry II. Laboratory activities reinforce advanced principles of organic chemistry, including the structure, properties, and reactivity of aliphatic and aromatic organic molecules; and properties and behavior of organic compounds and their derivatives. Emphasis is placed on organic synthesis and mechanisms. Includes study of covalent and ionic bonding, nomenclature, stereochemistry, structure and reactivity, reaction mechanisms, functional groups, and synthesis of simple molecules.

Lecture hours = 3 Lab hours = 3

Prerequisites: CHEM 2323 and CHEM 2123, or CHEM 2423 Organic Chemistry I (Lecture and Laboratory)

Semester Credit Hours: 4

Lecture Hours per Week: 3

Lab Hours per Week: 3

Contact Hours per Semester: 112

State Approval Code: 40.0504.52 03

Core Components and Related College Student Learning Outcomes

This course counts as part of the academic requirements of the Panola College Core Curriculum and an Associate of Arts or Associate of Science degree. Yes No: If no, skip to Instructional Goals.

The items below marked with an X reflect the state-mandated outcomes for this course **IF this is a CORE course:**

- Critical Thinking Skills – to include creative thinking, innovation, inquiry and analysis, evaluation and syntheses of information
 - CT1: Generate and communicate ideas by combining, changing, or reapplying existing information
 - CT2: Gather and assess information relevant to a question
 - CT3: Analyze, evaluate, and synthesize information
- Communication Skills – to include effective development, interpretation, and expression of ideas through written, oral, and visual communication
 - CS1: Develop, interpret, and express ideas through written communication

- CS2: Develop, interpret, and express ideas through oral communication
- CS3: Develop, interpret, and express ideas through visual communication
- Empirical and Quantitative Skills – to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions
 - EQS1: Manipulate and analyze numerical data and arrive at an informed conclusion
 - EQS2: Manipulate and analyze observable facts and arrive at an informed conclusion
- Teamwork – to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal
 - TW1: Integrate different viewpoints as a member of a team
 - TW2: Work with others to support and accomplish a shared goal
- Personal Responsibility – to include the ability to connect choices, actions, and consequences to ethical decision-making
 - PR1: Evaluate choices and actions and relate consequences to decision-making
- Social Responsibility – to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities
 - SR1: Demonstrate intercultural competence
 - SR2: Identify civic responsibility
 - SR3: Engage in regional, national, and global communities

Instructional Goals and Purposes:

Organic Chemistry is a two semester sophomore level course in the study of organic compounds and reactions. The second semester, Chemistry 2425, concentrates on the study of the reactions of organic chemistry. The study proceeds through the organic functional groups from alcohols to amino acids. Special attention is given to the classic synthesis reactions and named reactions. Mechanisms are stressed throughout and the problem solving is extended to include the mechanisms. Both semesters have a required laboratory component for credit. The laboratory meets once a week for four hours, with options for additional time, as needed. Laboratory exercises include experiments primarily to illustrate technique, experiments to perform synthesis and analysis, and exercises to provide experience in model development for both structure and theory. The lab is well equipped, with instruments for spectroscopy and chromatography experiments. A formal laboratory notebook is kept by each student. There is heavy emphasis on safety, proper handling and waste disposal of chemicals.

General Course Objectives:

1. Understand and be able to explain the general principles, laws, and theories of chemistry that are discussed and presented throughout the semester
2. Use critical thinking and logic in the solution of problems
3. Apply learned chemistry skills to new situations
4. Demonstrate an understanding of chemistry through technological advancement
5. Apply chemical principles in the laboratory setting
6. Develop independent and cooperative learning skills
7. Recognize and acquire attitudes that are characteristic of the successful worker regardless of the major field of study
8. Develop an awareness of the value of chemistry in our daily living

Learning Outcomes: [from the ACGM catalog]

After studying all materials and resources presented in the course, the student will be able to:

1. Correlate molecular structure with physical and chemical properties of aliphatic and aromatic organic molecules.
2. Predict the mechanism and outcome of aliphatic and aromatic substitution and elimination reactions, given the conditions and starting materials.
3. Predict the chirality of reaction products based on enantiomeric and diastereomeric relationships.
4. Describe reaction mechanisms in terms of energetics, reaction kinetics, and thermodynamics.
5. Use spectroscopic techniques to characterize organic molecules and subgroups.
6. Perform chemical experiments, analysis procedures, and waste disposal in a safe and responsible manner.
7. Utilize scientific tools such as glassware and analytical instruments to collect and analyze data.
8. Identify and utilize appropriate separation techniques such as distillation, extraction, and chromatography to purify organic compounds.
9. Record experimental work completely and accurately in laboratory notebooks, and communicate experimental results clearly in written reports.
10. Correlate molecular structure with physical and chemical properties of aliphatic and aromatic organic molecules.
11. Predict the mechanism and outcome of aliphatic and aromatic substitution and elimination reactions, given the conditions and starting materials.
12. Predict the chirality of reaction products based on enantiomeric and diastereomeric relationships.
13. Describe reaction mechanisms in terms of energetics, reaction kinetics, and thermodynamics.
14. Use spectroscopic techniques to characterize organic molecules and subgroups.

Course Content:

Students in all sections of this course will learn the following content:

1. Describe detailed mechanisms for common reactions: addition, elimination, substitution, free radical, and condensation.
2. Name and draw structures for organic molecules containing oxygen and sulfur sigma bonded to carbon atoms.
3. Describe sources, preparations and reactions of these substances.
4. Identify these substances using spectroscopic methods.

- Describe properties of organic acids and nitriles, name these substances, and draw their structures.
- Name, draw structures and describe reactions for organic molecules containing carbonyl compounds.
- Identify amine and amide functional groups and describe in detail their important reactions, including reaction mechanisms.
- Classify and describe the following classes of biomolecules: carbohydrates, amino acids, peptides, proteins, lipids, heterocycles, and nucleic acids.
- Describe metabolic pathways from an Organic Chemistry perspective.
- Describe pericyclic reactions.
- Identify types of polymers and the mechanisms for their productions.

Methods of Instruction/Course Format/Delivery: Lecture, class discussion, lecture activities, canvas quizzes, reading and homework problem assignments, and laboratory experimentation

Assessment:

- Homework- completion of assigned reading and problems from the textbook
- Lecture Activities – participation in classroom discussions and practice problems, completion of quizzes
- Laboratory Experiments – Laboratory experiments are to be completed each week during the laboratory period. Participation in the experiment is worth 40 points. A quiz about each experiment is given at the beginning of the lab period each week and is worth 10 points. Laboratory reports are due by the end of the lab period and are worth 50 points.
- Unit Exams – Four unit exams are given throughout the semester that are worth 100 points each. No one coming in late may start an exam after the first person has left. One unit exam may be made up at the end of the semester at a time designated by the instructor.
- Final Exam – completion of a comprehensive test at the end of the semester.

Course Grade:

The grade for this course will be based on...

- Homework and lecture activities 20%
- Labs 25%
- Unit Exams 40%
- Final Exam 15%

Letter grades are as follows:

A	90 - 100
B	80 - 89
C	70 - 79
D	60 – 69
F	Below 60

Texts, Materials, and Supplies:

1. *Organic Chemistry 8th ed.* By L.G. Wade
2. Sapling Learning (homework registration necessary for online homework)
3. *Experiments in Organic Chemistry 3rd ed.* Richard K. Hill, John Barbaro
4. *Laboratory Notebook*
5. SCIENTIFIC CALCULATOR (no cell phones) (it does NOT need to be graphing)

Other:

- For current texts and materials, use the following link to access bookstore listings: <http://www.panolacollegestore.com>
- For testing services, use the following link: <http://www.panola.edu/elearning/testing.html>
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Administration Building or go to <http://www.panola.edu/student-success/disability-support-services/> for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook, *The Pathfinder*: <http://www.panola.edu/student-success/documents/pathfinder.pdf>