
COURSE: Organic Chemistry

ACADEMIC YEAR:2016-2017

TYPE OF EDUCATIONAL ACTIVITY: Basic

TEACHER: Professor Rocco Racioppi

e-mail: rocco.racioppi@unibas.it

website:

Phone: 0971205494 (Prof. Racioppi)

mobile (optional):

Language: Italian (English on request)

ECTS: 6 (6 of lessons)	n. of hours: 48 (48 of lessons)	Campus: Potenza/Matera Department of Science Program:Pharmacy	Semester: I
-------------------------	---------------------------------	---	-------------

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Upon completion of this course, students will be able to predict bonding and three-dimensional structure, including chirality of organic compounds. Students will be able to predict the reactivity of specific functional groups, and construct efficient, simple mechanistic pathways for the synthesis of a given compound.

After having completed the course, the student should:

- 1) Demonstrate knowledge of fundamental content in the basic areas of organic chemistry,
- 2) Understand the relationship between structure and function of molecules,the major classes of reactions, reaction energetics and mechanisms,
- 3) Integrate knowledge with critical thinking to solve synthetic problems.
- 3) How to determine structure via various spectroscopic techniques.
- 4) Articulate scientific information through oral communication.
- 5) Articulate scientific information through written communication.

PRE-REQUIREMENTS

In order to understand Organic Chemistry, the student should have good knowledge of the basic principles of General and Inorganic Chemistry, of Physics and Physical Chemistry.

SYLLABUS

This subject deals primarily with the basic principles to understand the structure and reactivity of organic molecules. There will be seven lectures per week.

1. **Structure and Bonding.** Review of general chemistry, atoms, bonds, and molecular geometry
 2. **Polar Covalent Bonds, Acids and Bases.** Electronegativity, formal charge, resonance structures, definitions and strengths of acids and bases, calculating K_a , organic acids and bases
 3. **Alkanes and Stereochemistry.** Functional groups, isomers, alkyl groups, IUPAC naming rules, common names, properties of alkanes, conformations and Newman projections, fuels and petroleum refining
 4. **Cycloalkanes and Their Stereochemistry.** Naming, cis-trans isomerism, stability, ring strain, polycyclic molecules
 5. **Stereochemistry at Tetrahedral Centers.** Chirality, optical activity, rules for specifying R and S configurations, diastereomers.
 6. **Overview of Organic Reactions.** Major classes of organic reactions, introduction to mechanisms, radicals, polar reactions, equilibria, rates and energy changes, bond dissociation energies, energy diagrams
 7. **Alkenes:** Structure and Reactivity. Carbon-carbon double bonds, electrophilic addition reactions, industrial preparation and use of alkenes, naming, stereoisomerism, the Hammond Postulate, carbocations.
 8. **Alkenes:** Reactions and Synthesis. Elimination reactions, halogenation, addition of water, reductions and oxidations of alkenes, synthesis of cyclopropane, chain-growth polymers, reaction stereochemistry
 9. **Alkynes:** An Introduction to Organic Synthesis. Naming, preparation of alkynes by elimination reactions of dihalides, addition reactions of HX and X_2 , hydrations, reductions, oxidative cleavage, organic synthesis
 10. **Organohalides:** Names and properties of alkyl halides, their preparation from alkanes and alkenes, resonance stabilization, Grignard reagents, organometallic coupling
 11. **Reactions of Alkyl Halides:** Nucleophilic Substitutions and Eliminations. SN_2 , SN_1 , biological substitution reactions, Zaitsev's Rule, E2 reaction and deuterium isotope effect, E2 reactions and cyclohexane conformations
 12. **Structure Determination:** Mass Spectrometry and Infrared Spectroscopy. Determining the structures of new molecules is critical to progress in chemistry and biochemistry fields. This course will give an overview of the various types of spectroscopy available. Topics to be introduced will include: Spectroscopy and the electromagnetic spectrum, mass spectrometry, infrared spectroscopy, and nuclear magnetic resonance.
 13. **Structure Determination:** Nuclear Magnetic Resonance Application to small molecule C-H mapping
 14. **Conjugated Compounds and Structure Determination.** Stability of conjugated dienes, the Diels-Alder cycloaddition reactions, diene polymers, natural and synthetic rubber, conjugation, color, and the chemistry of vision
-

15. **Benzene and Aromaticity.** Structure and stability of benzene, the Huckel $4n+2$ rule, pyridine and pyrrole, polycyclic compounds.

16. **The Chemistry of Benzene:** Electrophilic Aromatic Substitution, Bromination, the Friedel-Crafts reaction, substituent effects, oxidation of aromatic compounds, reduction reactions, nucleophilic aromatic substitutions

17. **Alcohols:** Naming, properties, preparation, alcohols from carbonyl compounds, reduction, Grignard reaction

18. **Ethers and Epoxides; Thiols and Sulfides.** Naming, properties, reactions of ethers, acidic cleavage, Claisen rearrangement, ring opening, spectroscopy

19. **Amines and Heterocyclic Compounds.** Naming, structure and properties, basicity, synthesis, Hofman Elimination, reduction reactions

TEACHING METHODS

≅ Theoretical lessons. Use of Molecular Model Kit.

EVALUATION METHODS

Oral examination

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- G. Solomons, *Chimica Organica*; Zanichelli

INTERACTION WITH STUDENTS

At the beginning of the course the teacher will describe the educational goals, the syllabus and the examination methods to the students and ask for the institutional emails of the attending students. All course information will be send to the provided email addresses.

Office hour: on monday and on tuesday from 11.30 to 13.30; alternatively, by email appointment

EXAMINATION SESSIONS (FORECAST)

27/02/2017; 19/06/2017; 24/07/2017; 04/09/2017; 25/09/2017; 06/11/17.

SEMINARS BY EXTERNAL EXPERTS YES ☐ NO ☒

FURTHER INFORMATION

Students are strongly encouraged to attend all lessons.
