

COURSE SYLLABUS

Organic Chemistry

2526-1-E3006Q004

Aims

The course aims at providing a wide basic knowledge of organic chemistry. This is relevant both to the general scientific culture and to the comprehension of the structure/properties relationship in plastic materials for glasses and contact lenses.

The course is divided in two topics. In the first, the basic concepts of organic chemistry together with basic concepts on the nature and reactivity of the main functional groups will be provided to the student. In the second, the organic materials for optical devices (glasses and contact lenses) and with their properties and synthetic strategies will be analysed.

O1 – knowledge and understanding

To the student, it is requested to show an adequate comprehension and skills of organic chemistry:

1. To recognize the nature of bonds in organic molecules and the organic functional groups.
2. To recognize the possible interactions between molecules based on the nature of functional groups (physical state and solubility in water).
3. To apply nomenclature rules to simple organic molecules and related to the type of functional groups present in the organic molecules
4. To individuate the potential electrophilic or nucleophilic reactive sites in an organic molecule and to analyze the reactivity of a functional group.
5. The knowledge of the principal organic materials with application in the ophthalmic field and the understanding of principal protocols for their preparation.

O2 – Applying knowledge and understanding

The student, during the assessment, has to demonstrate an adequate capability of applying the knowledge and understanding of the provided concepts:

1. To individuate the principal functional groups, to recognize their principal reactivity and show a sufficient skills with the rules of nomenclature of organic molecules
2. To recognize the possible interactions between organic molecules according to the nature of chemical

bonds

3. To recognize the nature of organic materials used in ophthalmic and contact lenses.
4. To recognize the processes used in the preparation of polymeric materials their classification and use in the ophthalmic field.

O3 – Making judgements

To be able in individuating the principal functional groups, to define their reactivity. To recognize the principal polymeric materials used in the ophthalmic field.

O4 –Communication skills

To be able in illustrating and identifying the peculiar reactivity characteristic of functional groups and those of principal plastic materials used in the ophthalmic field.

O5 –Learning skills

To be able in applying the acquired knowledge to the comprehension of behaviour of simple organic molecules and to be able in understanding the evolution of the materials used in the ophthalmic field.

Contents

The basic concepts of organic chemistry will be provided to the student together with basic concepts on the nature and reactivity of the main functional groups. Basic aspects on the materials used in the preparation of optical and ophthalmic devices. These latter aspects are of primary importance to understanding to properties of ophthalmic devices and, hence, fundamental from professional point of view.

Detailed program

General aspects and introduction to Organic Chemistry.

Nature and type of the chemical bond: hybridization, molecular orbitals, electronic delocalisation and aromaticity concept. Structure and molecular formula, molecule representations. Isomerism: structural, conformational, geometrical.

Functional groups: concept and type of reactivity (electrophile, nucleophile and radical concept); classification of the organic compounds.

Nomenclature, physic, chemical, and reactivity properties of principal organic compounds and their preparation: aliphatic, unsaturated and aromatic hydrocarbons; halogen derivatives, alcohols, ethers, amines, aldehydes, ketons, carboxylic acids and their derivatives (esters, amides, acylic chlorides).

Introduction to polymerisation. Synthesis and characteristics of common hard resins: CR39, polycarbonate, PMMA, polyurethanes, hydrogels. Contact lens (CL) production. Classification, nomenclature, and composition of materials used in contact lens industry. Chemical and physical properties of contact lenses: transparency, refractive index, stability, glass transition, hydration, wettability, oxygen permeability.

Prerequisites

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To attend the inorganic chemistry module is required for an adequate comprehension of the concept proposed in the course.

Teaching form

24 two-hour lectures, in person, Delivered Didactics.
Lessons are taught in Italian.

Textbook and teaching resource

Textbook "Fondamenti di chimica organica" by J. G. Smith (a cura di A. Capperucci e S. Menichetti)
Notes provided by the lecturer

Semester

The organic chemistry module is provided during the second semester.

Assessment method

Oral assessment is used to verify the level of mastery reached by the student. This will be done by asking questions to the students inherently the topics taught during lectures. First questions will revolve around the second part of the course, and a sufficient mastery of this part is compulsory to conclude the assessment with a question on the first part. The final mark, agreed by both examiners, is the average of evaluations obtained during the two examinations.

The assessment is held in Italian, but it can be held in English on request.

Intervals of evaluation:

- 18-19: the student is prepared on a small number of program topics, their dissertation and analysis abilities are limited and only emerge after questioning and help from the examiner; their ability to expose and lexicon used is not always correct, and they lack critical thinking;
- 20-23: the student is prepared on a fair number of program topics, their dissertation and analysis abilities are limited; they use a correct but inaccurate lexicon, and they are hesitant during exposition;
- 24-27: the student is prepared on a good number of program topics, they are autonomous during discussion and show critical thinking abilities; they are capable to apply knowledge to real cases, and make use of correct lexicon;
- 28 – 30/30L: the student preparation on program topics is complete and exhaustive, their are capable of fully autonomous dissertation and critical thinking, they display full fluency and well-structured lexicon.

Office hours

on appointment

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | AFFORDABLE AND CLEAN ENERGY
