



SYNTHESIS OF DRUGS

Enrollment year	2017/2018
Academic year	2020/2021
Regulations	DM270
Academic discipline	CHIM/08 (PHARMACEUTICAL CHEMISTRY)
Department	DEPARTMENT OF DRUGS SCIENCES
Course	MEDICINAL CHEMISTRY AND PHARMACEUTICAL TECHNOLOGY
Curriculum	PERCORSO COMUNE
Year of study	4°
Period	(01/03/2021 - 18/06/2021)
ECTS	6
Lesson hours	68 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	BAVARO TEODORA - 1 ECTS UBIALI DANIELA - 5 ECTS
Prerequisites	To attend this course, knowledge of inorganic chemistry, organic chemistry and medicinal chemistry is required.
Learning outcomes	Learning the basic techniques of practical organic chemistry for the obtainment of biologically active molecules of pharmaceutical interest. Learning the tools to carry out a literature search aimed at designing a chemical synthesis. Learning the main safety standards to be adopted in chemical laboratories for the prevention of accidents.
Course contents	Contents: lectures (3,5 CFU, 28 hours) and laboratory training (2,5 CFU, 40 hours), strictly interconnected. Laboratory training: students will directly experiment the basic methods and techniques routinely used to synthesize active pharmaceutical ingredients (APIs) and to isolate bioactive compounds from vegetable

sources.

Programme: synthesis of known small molecules (also by biocatalysis), use of separative techniques (liquid-liquid extraction, crystallization, distillation, chromatography, evaporation, filtration), use of equipments routinely found in organic chemistry laboratories.

Students are expected to work in groups (no more than 5 students/group). Students are required to register daily the experimental activities in a personal lab notebook according to the guidelines provided during the course.

Note: lectures and lab training about the use of enzymes (biocatalysis) in organic synthesis are scheduled. Biocatalysis mostly occurs in aqueous media and under mild reaction conditions (pH, temperature, pressure), thus answering most of the 12 Principles of Green Chemistry (replacement of hazardous processes and products), and being considered as a Sustainable Chemistry.

The concept of sustainability ("meeting the needs of the present without compromising the ability of future generations to meet their needs"), when applied to chemistry, results into a new paradigm of chemistry addressing the efficiency of the use of resources, raw materials and energy, through the design of reactions that produce less by-products. Several key concepts of sustainable development are comprised in the methodologies used for product and process design in the framework of the chemical industry. Biocatalysis is characterized by less waste and losses, as well as by a lower environmental and energy impact.

The contents of this module meet the goals #12, #13, #14 and #15 of the 2030 Agenda (<https://asvis.it/agenda-2030/>).

IMPORTANT NOTICE: due to the health emergency (COVID-19 pandemic), lab training will be reduced by 50% as decided by the Consiglio Didattico. On-site lab training will be carried out as a single seat mode. Lab training (8 h/student) will be organized on a rotation basis to guarantee all students the access to the lab, consistently with the maximum capacity of the lab (as it has been re-defined by the measures adopted by the University of Pavia to halt the COVID-19 spread). The remaining lab training (12 h/student) will be delivered remotely as a "smart lab". To enhance student-teacher interaction, the cohort of attending students (> 100) will be organized on a rotation basis (2 groups).

Lab training is mandatory. The presence will be verified by roll call, signature at the entrance of the laboratory, signature of the "autocertificazione", health tracking app (on-site lab training); in the case of "smart lab", the presence will be verified through the Zoom Report System.

Teaching methods

Lectures and lab training. One lecture (seminar) will be given by a researcher from pharmaceutical industry.

Reccomended or required readings

AA.VV. "Vogel, chimica organica pratica" Casa Editrice Ambrosiana Milano

D. L. Pavia, G. M. Lampman, G. S. Kriz "Il laboratorio di chimica organica" Edizioni Sorbona Milano

K. Faber "Biotransformations in Organic Chemistry – A textbook"

Springer Ed.

Assessment methods

Oral exam.

One midterm exam ("pre-appello") is scheduled at the end of the course (lectures and laboratory training).

Final exam: 1) first option: passing the midterm exam and the laboratory training;

2) second option: if a student has not taken the midterm exam or has failed it, he/she must take the whole exam (Chimica e Analisi Farmaceutica 3, 12 CFU) on scheduled exam sessions. Also in this case, a positive evaluation in the laboratory training is mandatory to be admitted to the final exam.

Further information

Slides used during lectures can be downloaded from the website Kiro. Tutorial videos about the main techniques of organic synthesis and scientific papers (both in English) are also available in Kiro. Registration to the laboratory training is mandatory and must be done by signing up the form in Kiro by the reported deadline. Communications/notices to the students will be uploaded in Kiro, too.

Sustainable development goals - Agenda 2030

[\\$ibl legenda sviluppo sostenibile](#)