



## CHEMISTRY OF MOLECULAR RECOGNITION

Enrollment year	2019/2020
Academic year	2021/2022
Regulations	DM270
Academic discipline	CHIM/08 (PHARMACEUTICAL CHEMISTRY)
Department	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
Course	BIOTECHNOLOGY
Curriculum	Chem- Pharma-Tech
Year of study	3°
Period	1st semester (01/10/2021 - 14/01/2022)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	UBIALI DANIELA (titolare) - 4 ECTS DE LORENZI ERSILIA - 2 ECTS
Prerequisites	To attend this course, a basic knowledge of inorganic chemistry, organic chemistry, biochemistry, and chemistry of biomolecules is required.
Learning outcomes	<p>This course aims at providing students with:</p> <ul style="list-style-type: none"><li>-the basic knowledge for the comprehension of the structure-activity relationships (SAR) of active pharmaceutical ingredients;</li><li>- the basic knowledge of molecular recognition drug-chromatographic stationary phases (selectivity, resolution, efficiency).</li></ul> <p>At the end of the course, students are expected to have learned the relevance and biological significance of the structure of proteins (receptors, enzymes, transport proteins, structural proteins), nucleic acids, lipids, and carbohydrates toward drug-target interaction.</p>
Course contents	Molecular recognition is a fundamental step in essentially any biological

process. Enzyme catalysis, cellular signaling, protein-protein association, protein crowding, and the non-covalent binding of a receptor with a ligand molecule, to name only a few, involve the recognition between two or more molecular binding partners, leading either to their association or to their rejection.

In order to have molecular recognition phenomena, molecules must interact (establishing noncovalent bonds between them: hydrogen bonding, coordinative bonding, hydrophobic forces,  $\pi$ - $\pi$  interactions, van der Waals forces, electrostatic and/or electromagnetic effects) and exchange information (as a result of the selectivity of the formed bonds). The study of specific interactions between a host molecule and a complementary guest molecule, which results in a host-guest complex, will be the core of this course, being molecular recognition the basis of both 1) medicinal chemistry and 2) pharmaceutical analysis.

1) Medicinal chemistry. Definitions (drug, drug discovery, drug target, drug design), physico-chemical properties of molecules (chemical bonds, intermolecular forces, ionization, lipophilicity etc.).

Drug targets: receptors (cholinergic and adrenergic systems; opioids; local anesthetics); enzymes (i.e. acetylcholinesterase, cyclooxygenases, dihydrofolate reductase, thymidylate synthase, ACE, polymerases); nucleic acids; lipids; carbohydrates.

2) Pharmaceutical analysis. High performance liquid chromatography (HPLC): basic concepts and instrumental aspects. Qualitative and quantitative analysis applied to biotechnological drugs.

#### Teaching methods

Lectures (6 CFU=48 hours).

All lectures will be also available online (Kiro).

Tutorship activity is available for the module Pharmaceutical analysis

#### Reccomended or required readings

"Introduzione alla Chimica Farmaceutica" G. L. Patrick, EdiSES, Napoli  
"Foye's Principi di Chimica Farmaceutica" D. A. Williams & T. L. Lemke, Piccin, Padova

Cavrini V., Andrisano V., PRINCIPI DI ANALISI FARMACEUTICA 3a ed., Esculapio; Skoog, Holler, Nieman, PRINCIPLES OF INSTRUMENTAL ANALYSIS, Harcourt Brace; Saini G., Mentasti E, FONDAMENTI DI CHIMICA ANALITICA (analisi chimica strumentale), UTET; Snyder L.R., PRACTICAL HPLC METHOD DEVELOPMENT, Wiley

#### Assessment methods

Final exam on scheduled exam sessions (oral, MOD1+MOD2).

Students may take the oral exam of MOD1 (CFU 4) as a midterm exam ("pre-appello") at the end of the lectures. In this case, if the student has passed the midterm exam, he/she will take the exam MOD2 (CFU 2) on scheduled exam sessions in order to complete the whole assignment. Midterm exam (MOD1, CFU 4) can be taken only once, upon a certified attendance to the course (75%, roll call through the app "frequenza in presenza").

#### Further information

Slides used during lectures can be downloaded from the website Kiro. Tutorial videos and scientific papers (both in English) are also available in Kiro. Registration to the midterm exam is mandatory and must be

	<p>done by signing up the form in Kiro by the reported deadline.          Communications/notices to the students will be uploaded in Kiro, too.          The podcasts are available in Google Drive</p>
<p><b>Sustainable development goals - Agenda 2030</b></p>	<p>The contents of this module comply with the goal 3 of the 2030 Agenda (<a href="https://asvis.it/agenda-2030/">https://asvis.it/agenda-2030/</a>), about the topic "supporting research and development of vaccines and drugs against communicable or non-communicable diseases"</p> <p><a href="#"><u>\$ibl legenda sviluppo sostenibile</u></a></p>