UNIVERSITÀ DI PAVIA

## Anno Accademico 2020/2021

# CHEMISTRY OF MOLECULAR RECOGNITION

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| **Enrollment year** | 2018/2019 |
| **Academic year** | 2020/2021 |
| **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 (05/10/2020 - 14/01/2021) |
| **ECTS** | 6 |
| **Lesson hours** | 48 lesson hours |
| **Language** | Italian |
| **Activity type** | ORAL TEST |
| **Teacher** | UBIALI DANIELA (titolare) - 4 ECTS<br>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** | This course aims at providing students with:<br>-the basic knowledge for the comprehension of the structure-activity relationships (SAR) of active pharmaceutical ingredients;<br>- the basic knowledge of molecular recognition drug-chromatographic stationary phases (selectivity, resolution, efficiency).<br>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. |
| **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, π-π 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 anestethics); 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).
Tutorship aimed at assisting the students in the process learning.
Seminars might be given by visiting researchers (in the presence of and in close cooperation with the Professors) to discuss specific case-studies and stimulate the active participation of the audience.
In compliance with the regulations concerning physical distancing for the control of COVID-19 pandemic and with the aim of guaranteeing a minimum occupancy rate of the classroom, lectures will be given in the classroom to small groups on a bi-weekly rotation basis, (see https://web.unipv.it/coronavirus/ for more details). All lectures will be also available online (Kiro).

**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

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| | 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). |
| **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 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** | $lbl_legenda_sviluppo_sostenibile |