



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2021/2022
MASTER'S DEGREE (MSC)	CHEMISTRY AND PHARMACEUTICAL TECHNOLOGIES
SUBJECT	CHEMISTRY OF NATURAL BIOACTIVE SUBSTANCES
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	20518-A scelta dello studente
CODE	19166
SCIENTIFIC SECTOR(S)	CHIM/06
HEAD PROFESSOR(S)	PALUMBO Professore Associato Univ. di PALERMO PICCIONELLO ANTONIO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	4
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	PALUMBO PICCIONELLO ANTONIO Monday 9:00 12:00 studio docente, viale delle scienze ed.17 Tuesday 9:00 12:00 studio docente, viale delle scienze ed.17 Wednesday 9:00 12:00 studio docente, viale delle scienze ed.17 Thursday 9:00 12:00 studio docente, viale delle scienze ed.17 Friday 9:00 12:00 studio docente, viale delle scienze ed.17

DOCENTE: Prof. ANTONIO PALUMBO PICCIONELLO

PREREQUISITES	Basics of Organic Chemistry
LEARNING OUTCOMES	<p>Knowledge and understanding: The biosynthetic pathways leading to the formation of the major classes of secondary metabolites, the chemical and structural characteristics and the most important biological properties of class of natural products will be described in detail. During the lessons some examples of synthesis of natural products will be described and discussed.</p> <p>Applying knowledge and understanding: At the end of the course, the student should be able to classify the natural products in the context of the types proposed, identifying the biogenetic metabolic pathway. He/She must also be able to highlight the chemical properties of the functional groups as well as the fundamental of synthesis.</p> <p>Making judgements: The student must be able to predict the metabolic pathway of natural substances And to foresee the general aspects of the synthesis</p> <p>Communication skills: Ability to use an appropriate scientific language for the description of natural molecules and biosynthetic processes.</p> <p>Learning skills: Capacity of autonomous understanding of the scientific texts related to the biosynthesis and the synthesis of natural molecules .</p>
ASSESSMENT METHODS	<p>Oral examination in a seminar form followed by a maximum of three open questions. The student will have to present a powerpoint presentation of a maximum of 15 minutes, in which he/she will have to present the general aspects concerning biogenesis and synthesis of a bioactive compound of his/her choice. This exposure will be followed by a maximum of three questions on the general themes presented, aimed at ensuring knowledge of the general aspects of the subject. Voting is out of 30 and is derived from the average of the seminar and oral exam evaluation and is considered insufficient if the student proves difficult to focus the proposed arguments, lack of knowledge and extreme limitation in the show.</p> <p>The threshold of sufficiency (18/30) is reached if the capacities' Student arguments allow the examiner to ascertain one Knowledge and understanding of the topics at least in their general lines. As the degree of detail of the knowledge demonstrated by the student increases Within the framework subject to verification, will increase the proportionately Positivity of evaluation. The maximum score is obtained in case of excellent Mastery and critical-interpretative competence of the contents of the course, Associated with an expedited exhibition ability by security in use Of the appropriate scientific terminology.</p>
EDUCATIONAL OBJECTIVES	Objective of the course is the knowledge of the biosynthetic pathways leading to the main classes of natural products. Knowledge of the synthetic techniques of secondary metabolites.
TEACHING METHODS	Lectures
SUGGESTED BIBLIOGRAPHY	<p>Per la biogenesi di sostanze naturali: P. M. Dewick, Chimica, biosintesi e bioattività' delle sostanze naturali, Piccin. ISBN 978-88-299-2234-5</p> <p>Per le metodologie di Sintesi: Carey, Advanced organic synthesis B, Plenum. ISBN 0-306-43457-1</p> <p>Lucidi di Lezione.</p> <p>Testo di consultazione per il reperimento del materiale seminariale</p> <p>K. C. Nicolaou, E. J. Sorensen Classics in Total Synthesis: Targets, Strategies, Methods. ISBN 3-527-29231-4</p> <p>Letteratura aggiornata fornita dal docente.</p>

SYLLABUS

Hrs	Frontal teaching
3	introduction to the course and explanation of how to conduct exams. Main enzymatic reactions and comparison with the classical laboratory reactions
5	Acetate biogenetic pathway and examples of related metabolites. Polyketides, naphthoquinones and anthraquinones. Fatty acids - structure, biosynthesis, -oxidation. Saturated and unsaturated fatty acids. Phospholipids. Prostaglandins
5	Mevalonic acid biogenetic pathway and examples of related metabolites. Terpenes - Classification. Mevalonic acid and hemiterpenes. Monoterpenes. Sesquiterpenes . Diterpenes . Triterpenes. Carotenoids
2	Steroids - Transformation of lanosterol into cholesterol. Natural steroids. Phytosterols. cardiac poisons: metabolites from digitalis. Saponins. Marker degradation. Corticosteroids. Progestins. Androgens. Estrogens
4	Shikimic acid biosynthetic pathway. Examples of related metabolites. Biosynthesis of aromatic amino acids. Phenylalanine derivatives from cinnamic acid. Phenylpropanoids. Lignans. Lignins. Flavonoids. Isoflavones.

SYLLABUS

Hrs	Frontal teaching
5	Alkaloids. Alkaloids from ornithine and lysine: nicotine and anabasine, cocaine. Alkaloids from tyrosine: catecholamines. Isoquinoline alkaloids: morphine. Indole alkaloids: lysergic acid. Purines
2	Peptides: non-ribosomal peptides, lipodepsipeptides, penicillins, cephalosporins and beta-lactam antibiotics
16	Asymmetric synthesis: carbonyl addition, aldolic reaction, oxidation, reductions. Manipulation of functional groups and protecting groups
6	Examples of synthesis of bioactive natural molecules. Bibliographical research and database usage (Scifinder, Scopus, Main Publishers).Metabolomics and identification of natural products by means of GC/MS and HPLC/MS