DIPARTIMENTO DI SCIENZE

COURSE:
ORGANIC CHEMISTRY OF BIOLOGICAL PROCESSES

ACADEMIC YEAR: **2018-2019**

TYPE OF EDUCATIONAL ACTIVITY: Free choice

TEACHER: Prof. Brigida Bochicchio

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Language: **Italian**

ECTS: 6 (6 of lessons)	n. of hours: 48 (48 of lessons)	Campus: **Potenza** Dept./School: **Dipartimento di Scienze** Program: **Chemistry (L-27)**	Semester: II (from 01.03.2019 to 20.06.2019.2019)

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

- *The main object of the course is to interpret the main biological and biochemical processes in terms of organic chemistry. The course is mainly focused on the comprehension of the mechanism of action of enzymes.*

After having completed the course, the student must be able to :

- *1) demonstrate knowledge of mechanism of action of main enzymes;;*
- *2) articulate scientific information through oral communication;*
- *3) articulate scientific information through written communication;*

PRE-REQUIREMENTS

The student should have good knowledge of the basic principles of Organic Chemistry I and II.

SYLLABUS

- *Introduction to Bioorganic chemistry (**2h**)*
- *Proximity Effects in Organic Chemistry: o*-Carboxy-phenyl β-D-glucoside; 4-(4'-imidazolyl) butanoic phenyl ester (**2h**);
- *Other Basic Concepts: Electrostatic interactions and Hydrophobic forces in proteins (**2h**);*
- *Proteins. α-L-aminoacids and chirality. Chemical structure of natural α-L-aminoacids (**1h**);*
- *Primary, secondary, tertiary, quaternary structure of proteins. Secondary structures in peptides and proteins; dihedral angles and Ramachandran map (**4h**);*
- *Determination of secondary structure of proteins through FTIR (**1h**), CD (**5h**), NMR (**1h**), Crystallography, Molecular Dynamics (**2h**);*
- *SPPS of peptides; orthogonality of protecting groups; protecting and activating groups in SPPS (**5h**);*
- *Chemistry of the living cells; ATP as activator of carboxyl function of α-aminoacids: hippuric acid formation, transfer ribonucleic acid (tRNA) and aminoacyl-tRNA formation, S-adenosyl methionine formation (**1h**);*
- *Analogy between Organic Reactions and Biochemical Transformations: SPPS and in-vivo synthesis of proteins (**1h**);*
- *Nonribosomal peptide bond formation: antibiotic gramicidin S (**1h**);*
- *Asymmetric Synthesis of α-aminoacids: Kagan's synthesis of L-aspartate monomethyl ester (**1h**);*
- *Corey's method; asymmetric synthesis of D-alanine (**1h**);*
- *Introduction to Enzymes: intramolecular catalysis; multifunctional catalysis and simple models (**2h**);*
- *α-Chymotrypsin: mechanism of action (**1h**); experimental evidences; tetrahedral intermediates and Rogers and Bruice models (**2h**);*
- *Metalloenzymes: carboxypeptidase A and carbonic anhydrase: the role of Zinc. Mechanism of action of carboxypeptidase A on peptide and ester substrates. Experimental evidences of mechanisms: metanolysis. Breslow's bioorganic models (**2h**);*
- *Bioisosteric groups: acetylcholine, carbachol, muscarine; Molecular Adaptation and synthesis of agonists, antagonists, antimetabolites. Nomenclature of nucleosides and nucleotides (**2h**). 5-Fluorocytosine and citosyne; thymidine and 1-β-D-2'-deoxyribofuranosyl-5-iodo-uracil, adenoside arabinoside and deoxyadenosine: acyclovir (**2h**);*

- *Bioorganic Chemistry of Phosphate groups and Polynucleotides; Basic Considerations; Energy Storage; DNA and RNA: stability; Hydrolytic Pathways in the hydrolysis of fosfodiesters (**2h**);*
- *Pseudorotation: "five preference rules" (**1h**);*
- *Mechanism of action of ribonuclease A enzyme. "In-line" and "adjacent" mechanism; Breslow and Labelle model (**2h**);*
- *Other Hydrolitic Enzymes: lysozyme. Mechanism of action. Experimental evidences (**2h**).*

TEACHING METHODS

Theoretical lessons. Classroom tutorials, Laboratory tutorials, Technical visits of pharmaceutical companies (if applicable) and lessons from experts in the field (if applicable).

EVALUATION METHODS

The aim of the final examination is to evaluate the level of achievement of the educational goals. The final examination consists of an oral examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- - HERMANN DUGAS, BIOORGANIC CHEMISTRY, SPRINGER.
- - A. LILJAS, L. LILJAS, J. PISKUR, G. LINDBLOM, P. NISSEN, M. KIELDGAARD. TEXTBOOK ON STRUCTURAL BIOLOGY. WORLD SCIENTIFIC.
- ORIGINAL SCIENTIFIC PAPERS
- TEACHER'S NOTES COURSE WILL BE AVAILABLE FROM A SHARED FOLDER (E-LEARNING) WHOSE LINK WILL BE FURNISHED TO THE ST-DENTS ATTENDING THE CLASSROOM.

INTERACTION WITH STUDENTS

At the beginning of the course the teacher will describe the educational goals, the syllabus and the examination meth-ods to the students. They will give to the teacher their institutional e-mail addresses. All course information will be sent only to the institutional e-mail addresses.

Office hour: on Wednesday and Thursday from 16.00 to 17.00; alternatively, by email appointment

EXAMINATION SESSIONS (FORECAST)[1]

04/02/2019; 11/03/2019; 17/06/2019; 15/07/2019; 16/09/2019; 14/10/2019;11/11/2019

SEMINARS BY EXTERNAL EXPERTS YES x NO

FURTHER INFORMATION

Students are strongly encouraged to attend all lessons.

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.