CHIMICA, BIOLOGIA (RC000002)

1. language

Italian

2. course contents

Coordinator: Prof. ALESSANDRO LUPI

Year Course: 1°

Semester: 1°

UFC: 4

Modules and lecturers:
APPLIED BIOLOGY (RMC027) - 2 ufc - ssd BIO/13
Prof. Pasquale Filippelli
GENERAL, INORGANIC and ORGANIC CHEMISTRY (RMC026) - 2 ufc - ssd BIO/10
Prof. Alessandro Lupi

3. BIBLIOGRAPHY

Insegnamento di Biologia / Biology module
P. Bonaldo, C. Crisafulli, R. D'Angelo, M. Francolini, S. Grimaudo, C. Rinaldi, P. Riva, M.G.
Romanelli.: *Elementi di Biologia e Genetica; ed. EDISES*
James D. Watson, Tania A Baker, Stephen P Bell, Alexander Gann, Michael Levine, Richard
Losick.: *Biologia molecolare del gene; ed. Zanichelli*

Insegnamento di Chimica Generale, Inorganica ed Organica / General, Inorganic and Organic Chemistry module
Tiziana Bellini. *Chimica medica e propedeutica biochimica con applicazioni cliniche* Zanichelli 2017
Ivano Bertini, Claudio Luchinat, Fabrizio Mani. *Chimica.* Seconda edizione Casa Editrice Ambrosiana. Distribuzione esclusiva Zanichelli 2011

It is necessary for the student to have a text, either one of the recommended ones or another text after teacher's approval.

4. LEARNING OBJECTIVES

The course aims to provide students with the necessary skills to know and understand the molecular basis of life and the biochemical processes underlying the functioning of the human organism.

Knowledge and understanding - (Dublin 1) *On completion of the course, the student*

must demonstrate knowledge and understanding of the basics of chemistry (chemical elements and reactions) and biological processes.

Applied knowledge and understanding - (Dublin 2) *At the end of the course the student must demonstrate to be able to apply the acquired knowledge of biology and chemistry to interpret and explain biological phenomena; he must demonstrate that he is able to use what he has learned for the understanding of other disciplines and for practical application in analytical and research laboratories, being aware that this knowledge is fundamental for understanding the application of specific techniques in the field of biomedical diagnostics and research.*

Autonomy of judgement - (Dublin 3) *At the end of the course the student should be able to independently discuss and critically analyse the cellular and molecular mechanisms underlying life processes. Autonomy of judgement will be stimulated during lectures through discussion of relevant issues. At the time of the examination, the student will also be assessed for the level of autonomy of judgement achieved.*

Communication skills - (Dublin 4) *At the end of the course the student must be able to expose and explain their knowledge - even to non-expert interlocutors - with logical rigor, proper language and scientific terminology. The student must also be able to recognize and write the structural formulas of the main biomolecules.*

Ability to learn - (Dublin 5) *At the end of the course the student must be able to evaluate their knowledge and skills and, consequently, to implement and/or update them by independently drawing on texts, scientific articles and online platforms.*

5. prerequisites

It is necessary for the student to have a basic knowledge of Mathematics, Physics, Chemistry and Biology.

6. TEACHING METHODS

The teaching of the course consists of lectures with the aid of Power Point presentations (Dublin 1). During the lessons, students are involved in active participation through exercises and discussions (Dublin 2). Students thus begin to acquire autonomy in interpreting the importance of the mechanisms underlying biology and the chemistry of life (Dublin 3); they also acquire discipline-specific terminology and the ability to communicate to others (Dublin 4).
Finally, students are invited to test the subject matter by studying the recommended texts and to express their doubts and curiosity in the following lesson. The disciplines will be taught in order to create the basis and interest for subsequent studies (Dublin 5).

7. OTHER INFORMATIONS

Should the health situation so require, it may possibly be necessary to provide part or all of the lectures online, both in streaming and recorded via Teams and/or Blackboard platforms. The teachers are available for information on the course and for clarification on the lessons by appointment via e-mail or, if for short questions, at the end of the lessons.

8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

A written examination with multiple-choice questions, possibly supplemented by an oral examination, on the course topics is planned. The student's preparation will be assessed on the basis of the ability to describe biological and chemical processes in a clear and scientifically rigorous manner and to be able to connect the various topics, demonstrating an understanding of biochemical logic. The student achieves a mark of 30/30 by answering exactly all the questions asked and possibly the praise if the judgement of the Committee is unanimous. Should the health situation require it, it may be necessary to carry out the learning tests by on-line mode, via Teams and/or Blackboard platforms.

9. program

BIOLOGY

Hierarchical scale of biological structures and organisms The living structure and organisms. Prokaryotic and eukaryotic cell; viruses; bacteriophages and other organized forms of living matter. Autotrophic and heterotrophic organisms. The main molecules of biological importance. Cell metabolism. Nucleus and nuclear components; chromosomes; gene; genome; euchromatin and heterochromatin; the transmission of genetic information: replication, transcription, translation, regulation of gene expression. Cell and organism reproduction. Cell cycle. Mitosis. Meiosis. Gametogenesis.

GENERAL, INORGANIC AND ORGANIC CHEMISTRY

Atomic structure and periodic table. Electronic configuration. Quantum numbers and orbitals. Isotopes. Radioactive decays. Chemical bonds. Electronegativity. Structure of molecules. Molecules and chemical reactions. Acid-base reactions. Oxidation number. Redox reactions. Thermodynamics: quantities and laws. The states of aggregation of matter: solid, liquid and gaseous states. Properties of gases and liquids. Law of ideal gases. Aqueous solutions of electrolytes. Definition of mole. Definitions of the concentration of a solution. Colligative properties of solutions. Osmotic pressure and its biological effects. Physiological solutions. Definition of osmolarity. Acids, bases and salts. Acid-base theories. Strong and weak acids. Dissociation constant, pKa. Ionic product of water and pH. Buffer solutions. Properties of the carbon atom. Sp^2 and sp^3 hybridization. Nomenclature, chemical-physical characteristics and reactivity of the main types of compounds in organic chemistry: hydrocarbons, alcohols, aldehydes and ketones, esters, carboxylic acids, nitrogen compounds, aromatic compounds. Isomerism. Compounds of biological interest: amino acids, proteins, carbohydrates, lipids and phospholipids, nucleotides and nucleic acids.