

## BIOCHEMISTRY (DIU124)

### 1. language

Italian.

### 2. course contents

Coordinator: Prof. DI STASIO ENRICO

Year Course: 1

Semester: 2

UFC: 5

Modules and lecturers:

- CLINICAL BIOCHEMISTRY (A000005) - 1 cfu - ssd BIO/10

Prof. Angelina Barini

- GENERAL BIOCHEMISTRY (A000002) - 2 cfu - ssd BIO/10

Prof. Enrico Di Stasio

- HUMAN SISTEMATIC BIOCHEMISTRY (A000004) - 1 cfu - ssd BIO/10

Prof. Enrico Di Stasio

- NUTRITIONAL SCIENCES (A000011) - 1 cfu - ssd MED/49

Prof. Maria Cristina Mele

### 3. BIBLIOGRAPHY

**Samaja –Paroni** Chimica e biochimica. Per le lauree triennali dell'area biomedica – Ed.Piccin,

**Arienti** Le basi molecolari della nutrizione.. Ed.Piccin

**L. Spandrio** Biochimica Clinica - ed.Sorbona,Milano,2005 (testo obbligatorio)

**M.Ciacci G.Lippi** Biochimica clinica e Medicina di Laboratorio- ed.SES ,2018 (testo facoltativo)

Mandatory material for the exam. Power point presentations on the following topics: cell membranes, transmembrane transport mechanism of the main nutrients, water functions, nutritional aspects of carbohydrates, proteins, lipids, vitamins and minerals. Material and notes for Clinical Biochemistry lessons

It is necessary for the student to have a Biochemistry text, chosen from those recommended or another text after approval by the teacher.

### 4. LEARNING OBJECTIVES

The course aims to provide the student with the skills necessary to know and understand the molecular basis of life, the biochemical and molecular processes of metabolic pathways as well as the role and importance of the laboratory in the diagnostic framework of the main metabolic disorders.

**Knowledge and understanding - (Dublin 1)** At the end of the course the student must demonstrate knowledge and understanding of the biochemical basis of biological processes, the relationships between structure and function and metabolic pathways in the main classes of biological macromolecules (carbohydrates, lipids and proteins), the functions of macro and micronutrients, the mechanisms of integration and metabolic regulation and the laboratory instruments that allow their clinical monitoring.

**Applied knowledge and understanding - (Dublin 2)** At the end of the course the student must demonstrate that he is able to apply the acquired knowledge to interpret and explain biological

phenomena in a biochemical key, the functioning of organs and tissues and the molecular basis of main pathophysiological mechanisms inherent in the bioenergetics of macro and micronutrients and methods of detection through laboratory tests

**Making judgments - (Dublin 3)** At the end of the course the student must know how to autonomously discuss and critically analyze the molecular mechanisms underlying the metabolism of biomolecules and use the theoretical knowledge acquired and the reading of laboratory tests for the elaboration of nutritional plans/ dietary. Judgment autonomy will be stimulated, during the delivery of the frontal lessons, with the request to the students to provide their own interpretation of biochemical problems. At the time of the exam, the student will also be evaluated for the level of independent judgment achieved.

**Communication skills - (Dublin 4)** At the end of the course the student must be able to exhibit and explain their biochemical knowledge in the field of energy metabolism and laboratory analyzes even to non-expert interlocutors with logical rigor, proper language and correct scientific terminology .

**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 independently drawing from texts, scientific articles and online platforms

## 5. prerequisites

It is necessary that the student has knowledge of Physics, Chemistry and Biochemical Propaedeutics and have taken the related exams. Furthermore, basic knowledge of biology is extremely useful.

## 6. TEACHING METHODS

The teaching is delivered through lectures and the use of slides presented in the classroom by video projection.

**Knowledge and understanding (Dublin 1):** The teaching tools aimed at achieving results concern all frontal teaching activities, guided reading followed by practical application, demonstrations of images, videos, diagrams, discussion of clinical cases which focus on understanding the basic mechanisms for the biochemistry of nutrition, the metabolism of micro and macronutrients and the methods of monitoring by performing biochemical tests

**Applying knowledge and understanding - Applying knowledge and understanding (Dublin 2):** The teaching tools aimed at achieving results are the interpretation of scientific data, retrieval of bibliographic information and theoretical-practical insights as well as interactive discussions in order to verify the student's ability student to develop simple dietary plans, on the basis of basic biochemical knowledge, for the correct distribution of macro and micronutrients in the various physiopathological states.

**Making judgments (Dublin 3):** The student is guided in critical and in-depth reflection on the problems related to the interpretation of laboratory data, the main metabolic pathways and to develop independent judgment in relation to the choice of simple diet plans linked to specific alterations of human homeostasis.

**Communication skills - Communication skills (Dublin 4):** The communication skills will be acquired by the student within the individual courses and put to the test by requiring the ability to autonomously express specific problems with appropriate scientific language

**Ability to learn - Learning skills (Dublin 5):** Teachers encourage in-depth study of the basic notions of biochemistry of nutrition to structure personalized diets on the macro and micronutrient needs of patients through the use of advanced textbooks, bibliographic research and interaction

with qualified personnel.

## 7. OTHER INFORMATIONS

Professors are available for information on the course and for clarifications on the lessons by making an appointment by e-mail or, if for a quick request, at the end of the lessons.

## 8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

A final oral and written exam on the topics of the course is foreseen. The written test will focus on the topics covered in the corresponding courses. During the oral exam, questions will be asked, at least two per credit, relating to the integration of one's knowledge in the field of metabolisms of the main molecules of biological interest. The student's preparation will be evaluated on the basis of the ability to describe biochemical processes in a clear and scientifically rigorous way and to know how to connect the various topics, demonstrating an understanding of the biochemical logic. Each of the teachers, on the basis of the criteria set out, expresses an evaluation out of thirty and the final grade is the average of the individual grades weighted for the respective credits. To obtain honors, the student must answer without any errors or incompleteness to all the questions posed during the exam.

For the purpose of attributing the final grade, the commission will evaluate the following aspects:

**Knowledge and understanding (Dublin 1):** The objective of the assessment is to evaluate the student's ability to understand what is required and respond appropriately

**Applied knowledge and understanding - Applying knowledge and understanding (Dublin 2):** The assessment evaluates the student's ability to know how to contextualize the object of the request in the different pathophysiological frameworks and recognize and distinguish the nutritional importance of the main macro and micronutrients.

**Making judgments (Dublin 3):** The student's independence of judgment is verified through his ability to integrate knowledge of basic biochemistry with its application in the nutritional field.

**Communication skills (Dublin 4):** The student's communication skills will be assessed on the basis of understanding the terminology used during the test.

**Ability to learn - Learning skills (Dublin 5):** In the test there will be questions that allow you to measure the student's learning skills by exposing their conclusions with consequential logic of the concepts covered.

## 9. program

### <GENERAL BIOCHEMISTRY>

Recall of the main concepts of the chemistry course concerning the thermodynamics of biological systems. The chemistry of carbon. Functional groups. Carbohydrates, Lipids, Proteins: structure and function. Enzymes: general properties and regulation of activity. Metabolism of carbohydrates, lipids and proteins. Main mono, di and polysaccharides, glycolysis and Krebs cycle. Oxidative phosphorylation. -oxidation of fatty acids. Ketone bodies. Metabolic fate of amino groups: the urea cycle. The transport of oxygen (hemoglobin) and the blood buffer systems.

### <HUMAN SYSTEMATIC BIOCHEMISTRY>

Integration of the main metabolisms of carbohydrates, lipids and proteins in the different tissues. Interaction networks between organs in maintaining the basal homeostasis of the human organism and outline of the biochemical mechanisms underlying the pathophysiological phenomena in the main metabolic disorders with particular attention to the role of nutrition in the coordinated management of these situations

### <CLINICAL BIOCHEMISTRY>

Collection of biological samples, technical methods and causes of pre-analytical error, Clinical

biochemistry of carbohydrates, laboratory diagnosis of diabetes, hypoglycemia, Dosage of plasma proteins, Hydroelectrolyte balance, trace elements, The laboratory in liver and pancreatic diseases, The laboratory in kidney disease, physicochemical examination of urine and urine sediment, lipids and lipoproteins. The laboratory in cardiovascular diseases, Hormones: classifications, transport, mechanism of action, The laboratory in diseases of the hypothalamus and pituitary, The laboratory in diseases of the Thyroid and Parathyroid, The laboratory in diseases of the cortex and medulla of the Adrenal and gonads , Autoimmunity and laboratory

### **<NUTRITIONAL SCIENCES (NUTRIENTS)>**

Cell membranes, transmembrane transport mechanism of the main nutrients, water functions, nutritional aspects of carbohydrates, proteins and lipids. Metabolism and nutritional function of vitamins and minerals.