



Department of Biomedical Sciences  
Physiotherapy Degree Programme  
Biological Sciences Syllabus

Academic year 2020-2021. Academic term: first semester of the first year  
Course coordinator: Dr Stefania Vetrano

**BIOCHEMISTRY (2 ECTS)**

<b>Dr Riccardo Sarti</b>	Master's degree in Mathematics from La Sapienza University of Rome. Master's degree in Chimie Analytique, Physique et Théorique from the Université Pierre et Marie Curie and the Ecole Normale Supérieure in Paris. Bachelor's degree in Chemistry from the University of Pisa and the Ecole Normale Supérieure di Pisa. Adjunct professor at Humanitas University since 2016. Email: <a href="mailto:riccardo.sarti@hunimed.eu">riccardo.sarti@hunimed.eu</a>
<b>Objectives</b>	The biochemistry module aims to provide essential knowledge of chemistry and biochemistry that are necessary to integrate these basic sciences with biology and microbiology. The learning objectives also include providing students with the scientific basis of other disciplines that use principles of chemistry and biochemistry, such as physiology and pharmacology.
<b>Teaching methods</b>	The course will be conducted through lectures (in-person and online, synchronous and asynchronous), with exercises and in-depth analysis in small groups. Students will also be given exercises to be carried out outside of class hours, the correction of which can be the subject of a group discussion during the following class. The teaching material will be available on the Hunimed LMS website.
<b>Teaching material</b>	Lecture slides M. Samaja e R. Paroni "Chimica e Biochimica per le lauree triennali dell'area biomedica" Piccin Editore.
<b>Content</b>	<p>1) <b>General Chemistry:</b> periodic table, polarity, geometry, moles, colligative properties, acids and bases, redox.</p> <p>2) <b>Organic Chemistry:</b> classes of organic compounds, isomers, biological examples.</p> <p>3) <b>Biochemistry:</b> biological macromolecules, metabolism, enzymes, detailed metabolic pathways, muscle contraction.</p>

**BIOLOGY (1 ECTS)**

<b>Dr Stefania Vetrano</b>	Specialised in Clinical Pathology and PhD in Experimental Pathology and Neuropathology, she works as a research biologist in the Digestive Immunopathology Laboratories of the Department of Biomedical Sciences, Humanitas University.
----------------------------	---

	Email: <a href="mailto:stefania.vetrano@humanitasresearch.it">stefania.vetrano@humanitasresearch.it</a> ; <a href="mailto:stefania.vetrano@hunimed.eu">stefania.vetrano@hunimed.eu</a>
<b>Objectives</b>	Provide basic knowledge of the structure of the eukaryotic cell, in its fundamental structural components, necessary for the life cycle, to oversee macromolecular synthesis, and to interact with the external environment. The module provides an overview of the mechanisms of transmission of genetic information and an overview on genetic diseases.
<b>Teaching methods</b>	The course will be conducted through lectures (face-to face and online).
<b>Teaching material</b>	Lecture slides Solomon, Berg, Martin. Elementi di biologia cellulare. Edises (VI edizione) 2013. Zoppi, Colombi. Biologia e Genetica del Muscolo. Edises 2012.
<b>Content</b>	
<p><b>1) Eukaryotic cell</b> Components and structural and functional organisation of the eukaryotic cell, the lipid bilayer, membrane proteins, membrane transport, intracellular compartments, the nucleus - endoplasmic reticulum - Golgi apparatus - mitochondria - lysosomes - peroxisomes - ribosomes. Comparison of different cell types such as epithelial, muscle, nerve and blood cells.</p> <p><b>2) The cytoskeleton</b> Functions and reticular organisation - Actin filaments - Microtubules - Intermediate filaments</p> <p><b>3) Cellular communication systems</b> The cell-cell junctions - The cell-extracellular matrix junctions - Messengers - Vesicular transport - Endocytosis and Exocytosis</p> <p><b>5) Structural organisation and replication of DNA</b> DNA as the repository of genetic information - the central dogma of molecular biology - structural organisation of DNA - replication mechanism and function of the proteins involved in DNA repair</p> <p><b>6) Transcription, translation and regulation of gene expression</b> The process of transcription, mRNA maturation, genetic code. Mechanism of translation. Main mechanisms of regulation of gene expression.</p> <p><b>7) Cell cycle</b> The phases of the cell cycle - Mitosis - Control mechanisms of the cell cycle - Meiosis</p> <p><b>8) Elements of Genetics</b> Karyotype - Chromosome abnormalities - Point mutations - Mendelian inheritance of genes - General characteristics of sex-linked hereditary diseases - Genetic diseases of muscles</p>	

<b>MICROBIOLOGY (1 ECTS)</b>	
<b>Dr Marta Monari</b>	Specialised in Microbiology and Virology, Master II level in Molecular Virology, she works as Head of the Clinical Analysis Laboratory at the Istituto Clinico Humanitas. Email: <a href="mailto:marta_noemi.monari@humanitas.it">marta_noemi.monari@humanitas.it</a>
<b>Objectives</b>	Provide essential knowledge of microbiology and virology with a focus on healthcare related infections and a special focus on nosocomial infections and their

	prevention
<b>Teaching methods</b>	Lectures and slides. At the end of each lesson there will be a class discussion and questions concerning the topic will be answered.
<b>Teaching material</b>	Lecture slides Microbiologia e Microbiologia Clinica. Per i corsi di laurea in professioni sanitarie. R. Cevenini, V. Sambri. Ed. Piccin Elementi di Microbiologia Clinica. G. Morchiaro, A. Goglio, A. Grigis. Ed. Sorbona.
<b>Content</b>	
<p><b>1) The relationship between the human organism and microorganisms</b> Introduction to microbiology: definition of the concept of infection and infectious disease; defence mechanisms of the organism; epidemiology of diseases</p> <p><b>2) Bacteria and viruses, mycetes, protozoa and helminths</b> Differentiation of the characteristics of bacteria and viruses, mycetes, protozoa and helminths: bacterial cell structure, replication, pathogenicity factors; viruses: general characteristics, replication, and pathogenesis of infections; characteristics of mycetes, protozoa and helminths</p> <p><b>3) Characteristics of infectious diseases</b> Meaning of disease and infection. Mechanisms by which pathogens cause disease and routes of transmission: definition of normal, pathogenic and opportunistic microbial flora; definition of frequency of disease, severity or duration of disease, host-pathogen interaction; analysis of disease stages and predisposing factors, mode of transmission and definition of reservoir.</p> <p><b>4) Microbial infections of skin and eyes</b> Understanding the action of the skin as the body's barrier and in-depth analysis of the main microbial related infections</p> <p><b>5) Respiratory tract infections</b> Structure and function of the respiratory system with focus on related infections and bacterial and viral diseases of the upper and lower respiratory system</p> <p><b>6) Central nervous system infections</b> Characteristics and significance of central nervous system infections and bacterial, viral and fungal infections of the central nervous system</p> <p><b>7) Infections of the gastrointestinal and reproductive system</b> Overview of the main causes of gastrointestinal and urinary tract diseases: distinction between resident microbial flora of the gastrointestinal tract and main bacterial and viral pathogens. Resident pathogens of the genito-urinary tract and main bacterial and viral infections related to this apparatus</p> <p><b>8) Introduction to nosocomial infections and their prevention</b> The Center for Disease Control and Prevention (CDC) estimates that 5-15% of all hospitalised patients in the US are likely to contract a nosocomial infection. Hospital infections are the fourth leading cause of death in developed countries. Microorganisms present in hospitals, definition of compromised host, transmission chains and infection control systems</p> <p><b>9) Limiting the impact of infections with vaccines</b> Vaccines are one of the most effective and versatile methods of fighting diseases: gaining an</p>	

understanding of vaccination programmes and their impact on health and reducing the number of cases.

### **Examination for the Biological Sciences course**

The examination will be a multiple-choice test delivered via the LMS platform with LockDown browser on or off campus.

There are 3 sections (one for each module) structured as follows:

- Biochemistry: 20 questions; time available 20 minutes; 1.5 points per question; pass mark: 18 points.

- Biology: 10 questions, time available 10 minutes, 3 points per question, pass mark: 18 points.

- Microbiology: 10 questions, time available 10 minutes; 3 points per question, pass mark: 18 points.

Multiple-choice questions will have 4 answer options, only one of which will be correct. 0 points will be awarded for incorrect answers or unanswered questions.

For each module there will be a final mark over 30, after which a weighted average will be made according to the ECTS.

In order to pass the examination the student must achieve a pass mark in each module. However, if he/she only achieves a pass mark in 2 out of 3 modules, it is at the discretion of the lecturers to decide whether to repeat the exam for the failed module at the next exam session.

Honours are obtained with a mark of 30/30 in each module.

(Chairman of the Examination Committee: Dr Stefania Vetrano)