

Biological Bases of the Human Body

Code: 102993
ECTS Credits: 9

Degree	Type	Year	Semester
2500892 Physiotherapy	FB	1	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Bernardo Castellano López
Carles Gil Giro
Enrique Claro Izaguirre
Vicenç Català Cahís
Jordi Camps Polo
Judit Pampalona Sala

Prerequisites

There are no official prerequisites.
It is highly recommended that students have taken Biology in the High School.

Objectives and Contextualisation

The subject is programmed in the first year of the Degree in Physiotherapy and is part of the group of the subjects of basic training It constitutes, therefore, part of the scientific basis necessary for graduates in Physiotherapy. Its general objectives are the study of the biochemical, cellular and histological fundamentals of the human organism, as an essential foundation for the knowledge of its composition and its functions.

Competences

- Analyse and synthesise.
- Display knowledge of the morphology, physiology, pathology and conduct of both healthy and sick people, in the natural and social environment.
- Display knowledge of the sciences, models, techniques and instruments around which physiotherapy is structured and developed.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Solve problems.

- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse and synthesise.
3. Communicate using language that is not sexist.
4. Consider how gender stereotypes and roles impinge on the exercise of the profession.
5. Explain the functioning of the the human body in health in order to have a sound basis for understanding the processes that induce disease.
6. Explain the fundamental biochemical principles of the functioning of the human body.
7. Explain the theories of cell biology, envisioning the cell as a functional unit.
8. Identify life-threatening situations and perform basic and advanced life support manoeuvres.
9. Identify physiological and structural changes that can take place as a result of the injury and/or disease process in the different systems.
10. Identify situations in which a change or improvement is needed.
11. Propose new methods or well-founded alternative solutions.
12. Propose new ways to measure success or failure when implementing innovative proposals or ideas.
13. Propose projects and actions that incorporate the gender perspective.
14. Propose viable projects and actions to boost social, economic and environmental benefits.
15. Propose ways to evaluate projects and actions for improving sustainability.
16. Solve problems.
17. Weigh up the risks and opportunities of suggestions for improvement: one's own and those of others.

Content

In this area, the study of the cell is intended as a functional unit, the biochemical foundations of the cell functioning of the human body and human histology. The study of the operation of the different systems of the human body. In addition, general physiopathology will be studied and deepened in the inflammation and tissue repair processes, pain, infection, fever and aseptic condition. Basic life support, neoplastic pathophysiology, immunodeficiencies and blood groups will be also studied.

1.- BIOCHEMISTRY. (module coordinator: Carles Gil Giró, carles.gil@uab.cat)

Distributive areas:

I. Structure and Function of Biomolecules

- Water, weak acids and biological buffers.
- Amino acids, peptides and proteins.
- Three-dimensional structure of proteins.
- Proteins with structural function: Colleagen.
- Proteins with catalytic function: Enzymes.
- Hormones, embrane receptors and cell signaling.
- Nucleotides and nucleic acids.
- Glucides.
- Lipids.

II. Introduction to metabolism

- Definition of nutrients, foundations of digestion and absorption of nutrients
- General principles of bioenergetics. Role of ATP in energy transfers
- General characteristics of intermediate metabolism: catabolic and anabolic pathways

III. Metabolism of carbohydrates

- Digestion and absorption of carbohydrates
- Metabolism of carbohydrates: Glucolysis, gluconeogenesis and metabolism of glycogen
- Cycle of tricarboxylic acids
- Mitochondrial electronic transport and oxidative phosphorylation

IV. Metabolism of lipids

- Digestion, absorption and transport of lipids in the diet
- Metabolism of lipids with energy and reserve function
- Cholesterol metabolism
- Transport of lipids in the blood: lipoproteins

V. Metabolism of nitrogen compounds

- Nitrogen balance. Exogenous and endogenous origin of amino acids
- Metabolism of amino acids
- Nitrogen derivatives of amino acids

VI. Integration and control of metabolism

- Metabolic characteristics of some tissues: Liver, muscle, adipose tissue, brain
- Metabolic interrelations between the tissues during the fasting-starvation cycle
- Hormonal and metabolic changes during exercise

2.- CELLULAR BIOLOGY. (module coordinator: Maria Oliver Bonet, maria.oliver@uab.cat)

Distributive areas:

I. Levels of cell organization

- General organization of the cell
- General characteristics of prokaryotic cells
- General characteristics of eukaryotic cells

II. Membrane plasmatic and internal membranous system

- Functions of the Cell Membrane
- Chemical composition, structure and macromolecular organization of the plasma membrane. Lipids and proteins of the plasma membrane

- Transport of small molecules, macromolecules and particles. Endocytosis, pinocytosis, phagocytosis, exocytosis

- Glycocalyx

- Internal compartmentation: internal membranous system, membrane flow, protein trafficking between compartments

- Smooth and rough endoplasmic reticulum. Structure and functions

- Golgi apparatus: Structure and functions

III. Mitochondria and peroxisomes

- External and internal membranes and mitochondrial intermembrane space. Mitochondrial Array

- Function and Biogenesis

- Transport of mitochondrial proteins

- Mitochondrial diseases

- Morphology of Peroxisomes. Structure, composition and function. Peroxisomal diseases

IV. Cytosol and Cytoskeleton

- Structural organization of the cytosol. Functions

- Synthesis and folding of proteins. Modifications of proteins. Ubiquitination

- Actin filaments: Structure and chemical composition. Actin stable and unstable filaments. Functions

- Microtubules. Structure and chemical composition. Stable and stable microtubules. Functions

- Intermediate Filaments: Structure and chemical composition. Type and location

V. Cell adhesion

- Membrane adhesion and cellular molecules

- Types of Unions: occlusives, anchorage, cell-cell adhesives, matrix cell adhesives, and communicants

VI. Core. Nuclear activity

- Nuclear envelope. Nuclear matrix and matrix

- Nucleoplasm. Structure and organization of the chromatin of the nucleus: hereditary material

- Chromatin activity: Transcription and maturation, replication

VII. Mitosis and Meiosis

- Mitotic division. Phases of mitosis: Prophase, prometaphase, metaphase, anaphase, telophase

- Chromosomic condensation cycle. Cycle of fragmentation and assembly of the nucleus wrap. Cytokinesis

- Meiosis; comparison between mitosis and meiosis. Premeiotic interface

- First meiotic division. Prophase I: stages. Organization of chromatin. Role of chiasma. Synapsis and meiotic recombination

- Second meiotic division

- Introduction to Genetics and Inheritance. Set of characters that transmit individuals to offspring
- Introduction to Genetics and Inheritance. Set of characters that transmit individuals to offspring depending on the segregation of the genome and genetic laws.

3.- HISTOLOGY. (module coordinator: Bernardo Castellano, bernardo.castellano@uab.cat)

Area distribution:

I. Introduction to the tissues of the human body

- Introduction to Histology. Definition of tissue.
- Classification of the basic tissues
- Histological processing

II. Nervous system

- Central nervous system (CNS) and peripheral (SNP)
- Basic structure of the CNS: white substance and gray substance
- Main areas of the CNS and its organization
- Description of the main constituent elements of the SNP: spinal and visceral ganglia, plexus and nerves

III. Locomotive apparatus

- Structure of the bones and joints
- Tendons and fascia
- Skeletal muscular fibers and their types
- Neuromuscular joints

IV. Cardio-respiratory system

- Components of the cardiovascular system
- Blood and lymph vessels
- Organization of the cardiac wall
- Elements of the driving system of the heart
- Components of the respiratory system: trachea, bronchial system and lungs

V. Genitourinary tract

- Microscopic structure of the kidney
- Urinary tracts: tunics
- Histological structure of the male and female genital tract

Methodology

As stated in the table.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Class practices	7	0.28	2, 1, 3, 5, 7, 9, 10, 17, 15, 11, 12, 13, 14, 16, 4
LABORATORY PRACTICES (PLAB)	8	0.32	2, 1, 3, 9, 10, 17, 15, 11, 12, 13, 14, 16, 4
Specialized seminars	11	0.44	2, 1, 3, 6, 7, 10, 17, 15, 11, 12, 13, 14, 16, 4
Theory	40	1.6	2, 3, 6, 7
Type: Autonomous			
Elaboration of dossiers	19	0.76	2, 1, 3, 6, 7, 10, 17, 15, 11, 12, 13, 14, 16, 4
Individual study	134	5.36	2, 1, 6, 7, 10, 16

Assessment

In this subject, each thematic block (Biochemistry, Cell Biology and Histology) is evaluated independently in two (2) evaluations. The first evaluation will be done at the end of each thematic block. The final evaluation will be done at the end of the course. All those who do not comply with this premise must take a second exam.

Students who want to improve their mark on the midterm exams may also apply for this call. Applying for the grade improvement call is only possible for students who have passed the course. From the second enrollment onwards, repeat students will only have to be evaluated in the final exam.

Evaluation system:

THEORY: Written evaluation using objective tests, multiple selection items or essay tests Restricted questions with an approximate global weight between 70 and 80%.

PRACTICE: Evaluation of practical sessions and practical cases using objective tests

Writings, test tests for restricted questions, which are complemented with item proofs

Multiple choice or alternate response items with an approximate weight of between 10 and 25%.

Attendance and active participation in class and seminars, with an approximate global weight of 5%.

Failure to attend any or all of the parts of the final exam will correspond to a final grade of "No evaluable".

- Evaluation of Biochemistry:

THEORY:

- Final exam, which can represent between 70-100% of the final mark. This exam includes a multi-answer test and a part of conceptual questions / problems. The average of the two sides gives the note of the exam.

SEMINARS:

- Continuous assessment exercises associated with the seminars, which can represent between 0-30% of the final note. Only the continuous evaluation note will be considered when it is higher than the grade of the final exam, and therefore helps to increase the final grade.

The final mark of the Biochemistry module will have a value of 33.3% of the mark of the subject.

- Evaluation of cell biology:

THEORY:

- The evaluation consists of a first partial exam, type of multi-answer test, which corresponds to 60% of the mark. If the grade is less than 5, a final test is performed. This final test can be a test-type exam or a conceptual short question exam. This final exam can also be taken by students wishing to improve the grade marks obtained in the first exam. In this case, taking this exam implies renouncing to the mark obtained in the first test-type exam.

CLASSROOM PRACTICE:

- The evaluation of the bibliographic work on diseases corresponds to 40% of the mark. The team work carried out in the public oral presentation of one of the proposed diseases (40% of the total activity), the degree of assumption of contents of the disease developed by the student group will be valued (40% of the total of the activity), and the degree of knowledge of contents of the other illnesses developed in the same academic course by the other groups (20% of the total of the activity) - This last point will be qualified on the basis of a 12 multi-answer questions test conducted shortly after the oral presentations. In cases of second enrollment or later, it is not necessary to retake this activity, as long as the grade has been equal to or higher than 5. In these cases, the grade obtained in the bibliographic work on diseases in previous years will be applied in the calculation of the final grade. That is, the activity note is saved to repeaters. Important: The mark obtained in the first part (or in the recovery exam) must be at least 5 in order to average the mark of the activity on diseases.

The final grade of the Cell Biology module will have a value of 33.3% of the grade of the subject.

- Evaluation of Histology:

THEORY:

- Partial exam, true / false type test, and interpretation of images, which corresponds to 50% of the note. To pass this exam it is a requirement to obtain at least a grade of 5.

CONTINUOUS ASSESSMENT ACTIVITIES:

-Moodle: Continuous assessment exercises associated to seminars to be solved through the Moodle platform, which correspond to 10% of the mark.

-Practices: Continuous assessment exercises will be performed during the laboratory practices, about theory and image interpretation. These exercises will correspond to 40% of the mark.

The mark of the continuous assessment part will average with the final test final mark, always when this last note (final exam type test) is at least 4.

To pass the continuous assessment activities (Moodle+lab practices) at least a global mark of 4 should be obtained.

To pass the Histology module (Partial exam + continuous assessment activities) the corresponding minimal requirements should be accomplished. When a student does not pass the continuous assessment evaluation, a final exam, with the same features of the partial exam, will be made.

The final grade of the Histology module will have a value of 33.3% of the mark of the subject.

(The teaching methodology and the evaluation of this guide may suffer changes according to possible restrictions ordered by health authorities)

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of the practical sessions	10-25%	3	0.12	2, 1, 3, 5, 6, 7, 9, 8, 10, 16
Written evaluation using tests	70-80%	3	0.12	2, 1, 3, 5, 6, 7, 9, 8, 10, 17, 15, 11, 12, 13, 14, 16, 4

Bibliography

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- BIOQUIMICA. LIBRO DE TEXTO CON APLICACIONES CLINICAS. Devlin. Ed. Reverté, 4ª ed. 2004 -
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- INTRODUCCIÓN A LA BIOLOGIA CEL.LULAR. Alberts et al. Ed. Panamericana, 2ª ed. 2008 -
- MOLECULAR BIOLOGY OF THE CELL. Alberts et al. Ed. Garland Science, 6ª ed. 2015 -
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- INTRODUCCIÓN AL CUERPO HUMANO. FUNDAMENTOS DE ANATOMÍA Y FISILOGIA. Tortora y Derrickson. Ed. Panamericana, 7ª ed. 2008 3
- HISTOLOGIA Y BIOLOGIA CELULAR. Kierszenbaum y Tres. Editorial Elsevier Saunders, 2016, 4ª edición.
- ROSS. HISTOLOGIA: TEXTO Y ATLAS. Pawlina W. ED. WOLTERS KLUWER HEALTH, 2020, 8ª Edición.

Software

There is not a need of specific software in this subject