

Course Unit	Biology and Biochemistry	Field of study	Biology and Biochemistry
Bachelor in	Agronomic Engineering	School	School of Agriculture
Academic Year	2023/2024	Year of study	1
Type	Semestral	Semester	1
Level	1-1	ECTS credits	6.0
Code	9086-813-1101-00-23		
Workload (hours)	162	Contact hours	T - TP - PL - TC - S - E - OT - O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Ana Maria Antão Gerales

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Detail structural and functional aspects of cell biology. Acquire basic skills in the field of optical microscopy.
2. To identify the distinct types of macromolecules and understand their biological functions. To distinguish the main proteins, lipids and carbohydrates
3. Understand the energetic metabolism of the cell.

### Prerequisites

Before the course unit the learner is expected to be able to:  
not applicable

### Course contents

Cell theory, concept of Live. Virus. Cellular organization and classification. Prokaryotic and eukaryotic cell. Eukaryotic cells, chemical composition, structure and function of cellular structures. Concepts, structural and functional properties of biological molecules: Proteins, carbohydrates and lipids. Energetic metabolism of the cell.

### Course contents (extended version)

1. Theory and Cellular concept of Live. The case of the virus.
  - The cellular organization and classification of living beings. Prokaryotes and eukaryotes
  - Introduction to microscopy. Manipulation of optical microscope.
  - Structural and morphological differentiation of cells of different taxonomic groups.
2. Organization of the eukaryotic cell.
  - Chemical composition, structure and functions of the main cellular organelles.
  - Cell wall of the different taxonomic groups.
  - Plasma membrane and the unitary membrane theory.
  - Observation of phenomena of transport through the cell membrane in plant/animal.
3. Hyaloplasm or cytoplasm. Cell structures present in the cytoplasm.
  - Morphofunctional relations between: endoplasmic reticulum, Golgi complex and lysosomes
  - Ribosomes and protein synthesis.
  - Vacuoles
  - Plastids. Chloroplasts and Photosynthesis. Observation of Amyloplasts, chromoplasts, chloroplasts.
  - Nucleus: Mitosis and Meiosis. Observation of mitosis and meiosis in plant cells.
4. Biomolecules: Importance and functions.
5. Proteins.
  - Aminoacids: Structure, nomenclature, classification, chemical properties.
  - Structure and function of proteins. The peptidic bond. Structural levels.
  - Fibrous proteins (silk, keratins, collagen). Globular proteins (hemoglobin).
6. Hydrocarbons. Classification. Major classes of sugars and of non-sugars.
  - Monosaccharides (chemical composition, nomenclature, stereochemistry and occurrence).
  - Cyclization of monosaccharides. Glycosidic linkage and disaccharides (maltose, lactose and sucrose).
  - Homopolysaccharides. The relationship between their structure and function.
  - Specific examples of storage (starch, glycogen) and structural (chitin, cellulose) polysaccharides
7. Lipids
  - Classification Fatty acids: structure and properties.
  - Simple lipids (terpenes and steroids) and complex (triaclyglycerides and phosphoglycerides).
  - Lipoproteins
8. Energetic metabolism of the cell. Cell location and cellular mechanisms
  - Glycolysis, and Pentose phosphate way.
  - Oxidative Decarboxylation of pyruvic acid
  - the Tricarboxylic Acid Cycle. Electron transport chain and oxidative phosphorylation
  - Energetic balance of the cellular respiration.

### Recommended reading

1. Azevedo, C. & C. E. Sunkel (2012). *Biologia molecular e celular*. 5ª edição. Lidel, Lisboa.
2. Purves, W. , Orians, G. , Heller, H. e Sadava, D. (2020). *Life – The science of biology*. 12th Ed. Sinauer Associates, Inc. ; W. H. Freeman. Estados Unidos da América.
3. Nelson, D. L. , Cox, M. M. (2022). *Princípios de Bioquímica de Lehninger* (8ª ed. ). Artmed Editora.
4. Voet, D. (2014). *Fundamentos de Bioquímica* (4ª ed. ). Artmed Editora

### Teaching and learning methods

One hour theoretical lessons twice a week. Expositive methodology, using the media resources. Provision of study materials via e-learning. Two hour practical lessons once a week. Practical laboratory work using educational and scientific laboratory equipment.

### Assessment methods

1. Alternative 1 - (Regular) (Final)
  - Intermediate Written Test - 40% (Biology-50%(Practical exam) Biochemistry-50%(Practical exam). Minimum mark 9, 5 values)
  - Intermediate Written Test - 60% (Biology-50%(Practical exam) Biochemistry-50%(Practical exam). Minimum mark 9, 5 values)
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary)

**Assessment methods**

- Final Written Exam - 60% (Theoretical written exam of Biology (50%) and Biochemistry (50%). Minimum 9. 5.)
  - Final Written Exam - 40% (Practical written exam of Biology (50%) and Biochemistry (50%). Minimum 9. 5.)
3. Alternative 3 - (Regular, Student Worker) (Special)
- Final Written Exam - 60% (theoretical written exam of Biology (50%) and Biochemistry (50%). Minimum 9. 5.)
  - Final Written Exam - 40% (Practical written exam of Biology (50%) and Biochemistry (50%). Minimum 9. 5.)

**Language of instruction**

Portuguese

**Electronic validation**

Ana Maria Antão Gerales	Sandra Sofia Quinteiro Rodrigues	Albino António Bento	Paula Cristina Azevedo Rodrigues
21-01-2024	22-01-2024	23-01-2024	23-01-2024