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Faculty of Experimental Sciences

GENERAL SPECIFICATIONS

BACHELOR'S DEGREE IN CHEMISTRY

Subject Data

Name:
BIOMOLECULAS
English name:
BIOMOLECULES

Code:	**Type:**
757509208	Fundamental subject

Hours:

	Total	**In class**	**Out class**
Time distribution	150	60	90

ECTS:

Standard group	**Small groups**			
	Classroom	**Lab**	**Practices**	**Computer classroom**
4	0	2	0	0

Departments:	**Knowledge areas:**
Chemistry Prpf. J.C. Vilchez Martin	Biochemistry and Molecular Biology
Year:	**Semester**
Second year	Second semester

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TEACHING STAFF

Name:	E-mail:	Telephone
Inés Garbayo Nores	garbayo@uhu.es	89953

Others Data (Tutoring, schedule...)

- Tutoring: Monday 12-14h; Tuesday 12-14h and 16-18h
- Office: EXP P4N514
- Mail: garbayo@uhu.es
- Phone 959219953

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SPECIFIC INFORMATION OF THE COURSE

1. Contents description:

1.1 In English:

Biomolecules is the first unit related to Biochemistry studied in the second semester of 2nd year of Bachelor's degree of Chemistry. This unit will cover the structure, reactivity and properties of biomolecules and the building blocks from which these molecules are assembled. Carbohydrates, lipids, proteins and nucleic acids represent essential biomolecules present in all biological systems. Interactions between biomolecules will be covered and the chemical tools for studying biomolecules highlighted.

1.2 In Spanish:

Corresponde a la primera asignatura que se imparte en el Titulo de la Materia "Bioquímica", está situada en el segundo cuatrimestre de 2° curso, de tal manera que ya los alumnos han visto conceptos importantes de la asignatura como es el caso de los grupos funcionales y su reactividad, necesario para comprender la funcionalidad de las biomoléculas en las células.

2. Background:

2.1 Situation within the Degree:

A person with a bachelor's level education in chemistry is well prepared to assume professional positions in industry, education, or public service. The behavior of molecules determines the sort of world we live in. Chemists who understand these phenomena are very well equipped to tackle problems faced by modern society. A significant knowledge of biomolecules and biochemistry is required in a number of related professions including pharmacy, medical technology, nuclear medicine, molecular biology, biotechnology, pharmacology, toxicology, hazardous waste management and forensic science.

2.2 Recommendations

Although there are no prerequisites to attend it, it is recommended that the student have previous knowledge of the structure and the basic functions of cells. Moreover, taking into account that most up-to-date sources of information in the field of Biochemistry are in English, it is highly recommended that the students who study this subject have a basic knowledge of this language

3. Objectives (as result of teaching):

- To understand the origin of live from biochemical molecules.
- To know biochemical pathways.
- To know levels of molecular hierarchy and organization.
- To acquire basic knowledge of the structure, properties and chemical reactivity of basic biomolecules and their interaction with other molecules.
- To acquire practical training to determine and characterize main biomolecules.

4. Skills to be acquired

4.1 Specific Skills:

- C 24: To have knowledge of levels of molecular organization of biomolecules in living organisms.
- C10: To have knowledge of the structural aspects of chemical elements, compounds and stereochemistry.
- C12: To have knowledge of nature and behavior of functional groups in organic molecules.
- C15: To have knowledge of the structure and reactivity of main biomolecules and biological processes.
- C2: To have knowledge of chemical reactions and characteristics associated.
- C21: To have mathematical knowledge to understand and express with scientific rigor physicochemical functions.
- C23: To develop numerical methods to solve problems.
- C26: To solve mathematical differential equations.
- C27: To develop algorithms to solve problems with the computer.
- C36: To have the capacity of analysis and synthesis
- P4: To handle standard chemical instrumentation for structural studies and separations.
- P5: To be able to interpretate data from observations and measurements at the laboratory.
- Q1: To have the ability to demonstrate knowledge and understanding of essential concepts, principles and theories of chemistry.
- Q2: To solve qualitative and quantitative problems.
- Q4: To have the ability to recognize and perform good practices in scientific and professional work.
- Q5: Competence to present and defend, in written and oral form, scientific reports to a specialized audience.
- Q6: Skill to process in a computer chemical data and information.

4.2 General, Basic or Transversal Skills:

- CB1: To have knowledge in general areas of study and from advanced textbooks.
- CB2: To know how to apply knowledge to work in a professional way.
- CB3: To have the ability to interpret relevant data in order to make judgments about social, scientific or ethical issues.
- CB4: To be able to transmit information, ideas, problems and solutions to specialized and non-specialized audiences.
- CB5: To develop learning skills necessary to deepen in studies with a high degree of autonomy.
- CG1: To develop learning skills and knowledge, to apply it at profesional work. To be able to interpret relevant data to make judgments on a variety of topics and being able to transmit them to specialized and non-specialized audience.

5. Training Activities and Teaching Methods

5.1 Training Activities:

1. Theoretical and practical group.
2. Laboratory teaching group.
3. Tutorial activities in group
4. Individual work.

5.2 Teaching Methods::

- Face-to-face classes related to the theoretical and practical contents (problems) of the course, using didactic resources such as transparencies, ppt presentations and videos.
- Laboratory practices in small groups, discussion of results and presentation of final report.
- Use of the computer classroom to reinforce previously acquired theoretical and practical knowledge previously acquired.
- Seminars to solve problems.
- Tests and resolution of theoretical and practical questions.

5.3 Development and Justification:

Theoretical classes: Resources used are blackboard, projector, computer projections and photocopies with figures, diagrams and tables.

Problem classes. Standard problems are solved, with emphasis on the understanding of the understanding of the solving mechanism and highlighting the relation of the problems with practical applications.

Practical classes (laboratory) Knowledge acquired in theory classes will be applied and discussed.

Work at class in small groups where students will be guided with activities to reinforce and assimilate contents.

Seminars in small groups where students will be guided to reinforce and assimilate contents.

6. Detailed Contents
Unit 1. Introduction to Biochemistry. Concept and branches. Introduction to structural Biochemistry. Bioelements and Biomolecules. Life on Earth. Levels of molecular and cellular organization. **Unit 2.** Carbohydrates. Introduction and Classification. Three-dimensional structure of monosaccharides. Reaction of aldoses and ketoses. Cyclization of monosaccharides. Glycosidic bonds. Disaccharides and Polysaccharides. **Unit 3.** Lipids. Classification. Fatty acids. Waxes. Triglycerides. Phosphoglycerides. Sphingolipids. Terpenoids. Eicosanoids. **Unit 4.** Amino Acids and Peptides. Structure and classification of amino acids. Acid-base properties of amino acids. Peptide bond. Peptide sequencing methods. **Unit 5.** Proteins. Classification and physiological function. Structural levels of proteins. Ramachandran diagrams. Fibrous Proteins, Keratins, Collagen. Globular Proteins. Myoglobin and Hemoglobin. **Unit 6.** Nucleic acids. Composition of nucleic acids. Structure of nucleosides and nucleotides. Typesnucleic acids. **Unit 7.** Supramolecular structures. Cellular organization of DNA. Biological membranes. The lipid bilayer. Membrane proteins. Fluid mosaic model. Kinds of transport. **Practice 1.** Microbial growth. Growth rate. Beta-carotene content. **Practice 2.** Determination of the chlorophyll content in spinach leaves. Dry weight. **Practice 3.** Characterization of the redox properties of sugars. **Practice 4.** Extraction of genomic DNA from cells. **Practice 5.** Determination of protein and carbohydrate in spinach leaves.

7. Bibliography
7.1 Basic Bibliography:
1. Berg, J.M., Tymoczko,J.L., Stryer, L. 2012. Biochemistry. 7ª ed. Freeman. 2. Mathews, Ch.K., van Holde, K.E. 2012. Biochemistry English 4ed. 3. Nelson, D.L. i Cox, M.M. 2013. Lehninger Principles of Biochemistry. 6th ed. W.H. Freeman & Co. 4. Voet, D., Voet, J.G. 2010. Biochemistry. 4ª ed. Wiley.
7.2 Additional Bibliography:

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1. Cuestiones sobre Bioquímica. Autor: Macarulla y Marino. Editor: Reverté.
2. Problemas de Bioquímica. Autores: Cárdenas et al. Editor: Alhambra.

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8. Systems and Assessment Criteria

8.1 System for Assessment:

- Final exam.

- Practical work at the laboratory with final report.

- Continuous evaluation.

8.2 Assessment Criteria and Marks:

8.2.1 Examinations Convocatory I

CONTINUOUS EVALUATION:
The system of continuous evaluation of the subject will be divided into the following components:
The skills acquired in each unit will be evaluated jointly with 3 different activities: (i) a written test (exam); (ii) practical work at the laboratory and (iii) other academic activities.
(i) There will be a written test (exam) to measure knowledge acquired. The score obtained at the exam will represent 70% of the total score. The exam will have some theoretical questions and problems. Attendance at the exam is mandatory to be evaluated. Students are required to obtain a minimum of 4 of a total score of 10 to make the final average grade.
(ii) Score obtained with practical work of laboratory (attendance + written report) will represent 10% of the total score. Attendance at the practical work is mandatory to be evaluated.
(iii) Score obtained with academic activities will be evaluated as a continuous evaluation and will represent 20% of the total score.

FINAL EVALUATION:
Those students that have not properly followed the course or those that choose to have a single assessment will sit a final exam. The single final evaluation will consist of a written test in which 70% of the score will correspond to questions related to the contents of the theory program and the practical exercises or problems and the remaining 30% to the contents explained in the laboratory practices.

8.2.2 Examinations Convocatory II

There will be only a single final evaluation that will consist of a written test in which 70% of the score will correspond to questions related to the contents of the theory program and the practical exercises or problems and the remaining 30% to the contents explained in the laboratory practices.

8.2.3 Examinations Convocatory III

There will be only a single final evaluation that will consist of a written test in which 70% of the score will correspond to questions related to the contents of the theory program and the practical exercises or problems and the remaining 30% to the contents explained in the laboratory practices.

8.2.4 Extraordinary Convocatory
There will be only a single final evaluation that will consist of a written test in which 70% of the score will correspond to questions related to the contents of the theory program and the practical exercises or problems and the remaining 30% to the contents explained in the laboratory practices.

8.3 Single Final Evaluation:
There will be only a single final evaluation that will consist of a written test in which 70% of the score will correspond to questions related to the contents of the theory program and the practical exercises or problems and the remaining 30% to the contents explained in the laboratory practices.

9. Indicative weekly teaching organization:

Date	**Theory groups**	**Small groups**				
		Problems	Laboratory	Outgoing classes	Informatics	
01-02-2023	2	1	0	0	0	
06-02-2023	2	1	10	0	0	
13-02-2023	2	1	10	0	0	
20-02-2023	2	1	0	0	0	
27-02-2023	2	1	0	0	0	
06-03-2023	2	1	0	0	0	
13-03-2023	2	1	0	0	0	
20-03-2023	2	1	0	0	0	
27-03-2023	2	1	0	0	0	
10-04-2023	2	1	0	0	0	
17-04-2023	2	0	0	0	0	
24-04-2023	2	0	0	0	0	
01-05-2023	2	0	0	0	0	
08-05-2023	2	0	0	0	0	
15-05-2023	2	0	0	0	0	
TOTAL hours	30	10	20	0	0	