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

Contact

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Teachers

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Antonio Casamayor Gracia
Jorge Perez Valle

Prerequisites

There are no official prerequisites. However, it is advisable to review the basic contents of Biology and Chemistry of the first semester and the Baccalaureate.

Objectives and Contextualisation

This subject should allow the student to understand that biological processes, especially those related to food and health. The student must understand the structural bases of these processes, as well as the molecular basis of the transmission of genetic information and its regulation. Likewise, the student must understand the structural bases of these processes, as well as the molecular bases of the transmission of genetic information and its regulation. The specific training objectives are to know and understand:
- The structure and function of proteins, carbohydrates, lipids, nucleotides, and vitamins.
- The structure of nucleic acids and the processes of replication, transcription, and translation.
- The foundations and applications of the main biochemical and molecular biology techniques.

Competences

- Adopt an ethical stance and attach importance to quality in work.
- Analyse, summarise, resolve problems and make professional decisions.
- Apply knowledge of the basic sciences to food science and technology.
- Apply the scientific method to resolving problems.
- Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
- Develop individual learning strategies and planning and organisation skills.
• Display knowledge of nutrients, of their bioavailability and function in the organism, and the bases of nutritional balance.
• Display knowledge of the physical, chemical, biochemical and biological properties of raw materials and foods.
• Search for, manage and interpret information from different sources.
• Stay abreast of new knowledge, adapt to new situations and develop creativity.
• Use IT resources for communication, the search for information within the field of study, data processing and calculations.

Learning Outcomes

1. Adopt an ethical stance and attach importance to quality in work.
2. Analyse, summarise, resolve problems and make professional decisions.
3. Apply the fundamental principles and the applications of biochemistry to food biotechnology.
4. Apply the scientific method to resolving problems.
5. Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
6. Describe mechanisms of transmission and regulation of genetic information in the cell.
7. Describe the reactions of reaction, kinetics and enzyme regulation.
8. Develop individual learning strategies and planning and organisation skills.
9. Establish the metabolic role of vitamins, oligoelements and other essential nutrients.
10. Explain the structures and properties of the principal biological molecules.
11. Search for, manage and interpret information from different sources.
12. Stay abreast of new knowledge, adapt to new situations and develop creativity.
13. Use IT resources for communication, the search for information within the field of study, data processing and calculations.

Content

PART 1. THE CHEMISTRY OF LIFE

Unit 1.- Introduction to the chemistry of living beings. Biomolecules. Properties of water and importance of the

Unit 2.- Constituents of proteins: amino acids. Structure and properties.

Unit 3.- The amino acid sequence of proteins. The peptide bond. The primary structure of proteins. Sequencin

Unit 4.- Three-dimensional structure of proteins. Secondary structure. The α-helix and the β-sheet. Tertiary st

Unit 5.- Fibrous proteins. α-keratin, collagen and others.
Unit 6.- Oxygen-transport proteins. Structure of myoglobin and hemoglobin. The center of oxygen binding. Coo

Unit 7.- Catalytic proteins: enzymes. General properties. Classification. Substrates and coenzymes or cofactors.

Unit 8.- Enzyme kinetics. The Michaelis-Menten equation. Meaning of $K_m$ and $V_{max}$. Effects of pH and temperatur

Unit 9.- Mechanisms of regulation of enzymatic activity: Regulation of enzyme concentration. Allosteric enzym

Unit 10.- Vitamins and trace elements. Structure, function, requirements and avitaminosis.


Unit 13.- Nucleotides and derivatives. Purines and pyrimidines and their nucleotides. The nucleotides as enzym

PART 2. REPLICATION, TRANSCRIPTION, SYNTHESIS OF PROTEIN:


Unit 15.- DNA replication. Semiconservative replication. DNA polymerases. Okazaki fragments. DNA replication.

Unit 16.- RNA and transcription. RNA polymerase and synthesis of RNAs. Prokaryotes and eukaryotic promote
Unit 17.
The genetic code. The nature of the code and its main features. The base triplets. tRNA as an adapter in protein synthesis.


Unit 20.-
Introduction to food biotechnology. Introduction to recombinant DNA techniques. Biotechnological applications.

LABORATORY PRACTICES.
Practice 1. Separation of a mixture of amino acids by ion exchange chromatography and identification by thin layer chromatography.
Practice 2. Enzymes: determination of the Km.
Practice 3. Bioinformatic applications in bibliographic research.
Practice 4 (2 days). Applications of PCR to food biotechnology.

SEMINARS
Seminar 1: Chromatographic techniques.
Seminar 2: Spectrophotometric techniques.
Seminar 3: Enzymatic analysis.
Seminar 4: Discussion of a scientific article.
Seminar 5: PCR, cloning, recombinant protein expression.
Seminar 6: Sequence of DNA, microarrays.
Methodology

The methodology of the learning process combines the theoretical classes where the teacher exposes the most relevant aspects of each subject and the active self-learning by the student on topics of interest.

The subject is based on the following activities:

- Presental lectures with ICT support explaining the basic concepts of the subject.
- Seminars and problem solving: Presentation by the teacher of specific topics and discussion in small groups.
- Laboratory practices: Acquisition of work skills in the laboratory and experimental understanding of concepts explained in face-to-face classes and seminars.
- Autonomous work of the student, individually or in groups, for the preparation of topics proposed by the teacher or the student. This work involves the search and selection of information in various sources of scientific databases. Presentations are public, they must include multimedia material and ICT support and are followed by a discussion.

Activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type: Directed</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Laboratory practices</td>
<td>12</td>
<td>0.48</td>
<td>2, 4, 3, 1, 8, 10</td>
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<tr>
<td>Seminars and problem solving</td>
<td>6</td>
<td>0.24</td>
<td>2, 4, 3, 9, 10</td>
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<tr>
<td>Theoretical lectures</td>
<td>31</td>
<td>1.24</td>
<td>2, 4, 3, 1, 7, 6, 9, 10</td>
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<tr>
<td><strong>Type: Supervised</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Self-learning preparation</td>
<td>22.5</td>
<td>0.9</td>
<td>3, 1, 11, 5, 7, 6, 8, 9, 10, 13</td>
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<tr>
<td><strong>Type: Autonomous</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Study and bibliographic searching</td>
<td>74</td>
<td>2.96</td>
<td>2, 4, 3, 11, 7, 6, 8, 9, 10, 13</td>
</tr>
</tbody>
</table>

Assessment

The maximum score is 10 points. Students will pass the subject with an overall score of 5.0 or higher.

The evaluation system is organized in three modules. The final qualification is obtained with the sum of the qualifications of the different modules, with the conditions described below.

- **Module 1. Theory, seminars and problems.**
  - Evaluation system: test with multiple choice answers.
  - Weight in the global rating: 70%.
  - Competences evaluated: CE1, CE2, CE11, CT1, CT2, CT9

Students may opt for partial tests of the syllabus. There will be two partial tests throughout the semester. The first will be held at the end of the first part of the subject, and the second at the end of the second part. Each test will consist of approximately 20-25 type-test questions for each partial. Seminar questions will be included.

The scheme includes the different possibilities:
1) In the case of obtaining a minimum of 4.5 in both partial exams, the mean of the two scores will be calculated. The student will have to agree with the teacher which partial exam is to be retaken.

2) If the average of the two partial exams is less than 5, the student will have to retake the partial exam with a score less than 4.5.

3) In case the student has to retake the two partial exams, the exam will be of all the subject (Module 1: theory + laboratory practices).

- Module 2. Laboratory practices:
  - Laboratory practices are mandatory. The student who has not completed them will be qualified as Not Presented or Failed, depending on their situation.
  - Assessment system: Multiple choice test about the activities carried out during the practices as an independent exam.
  - Weight in the global rating: 10% (Maximum score: 1.0)
  - Competences evaluated: CE1, CE2, CE11, CT2, CT8, CT9

  - These self-learning tasks are compulsory and, therefore, the student who does not present the papers will be graded as Not Presented or Failed, depending on their situation.
  - Evaluation system: Papers presented.
  - The written and oral presentation will be evaluated, as well as the competence when discussing the topic.
  - Weight in the global rating: 20% (Maximum score: 2.0)
  - Skills evaluated: CE1, CE2, CE11, CT4, CT5, CT6, CT8, CT10

Retake exam

In the retake exam the student will be able to take the failed partial exam or both (obligatory or voluntarily). The mark will represent 70% of the note mark, which will be added to the marks obtained in Modules 2 and 3 as indicated above. Any student regardless of the score obtained in the partial tests may choose to examine the entire program in the retake exam to obtain a higher mark. In this case, the mark will be the one from the last exam.

Non-gradable: A student is not gradable if he has participated in assessment activities that represent ≤ 15% of the final grade.

Assessment Activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Weighting</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning Outcomes</th>
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<tr>
<td>Exam of laboratory practices</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>2, 4</td>
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<tr>
<td>Partial and final exams</td>
<td>70</td>
<td>2</td>
<td>0.08</td>
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<tr>
<td>Presentation and discussion of self-learning project</td>
<td>20</td>
<td>2.5</td>
<td>0.1</td>
<td>2, 4, 3, 11, 5, 7, 6, 9, 10, 12, 13</td>
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Bibliography

Basic bibliography:


Main textbooks:


Others: