



## IDENTIFYING DATA

### Food chemistry and biochemistry

Subject	Food chemistry and biochemistry			
Code	O01G041V01404			
Study programme	Grado en Ciencia y Tecnología de los Alimentos			
Descriptors	ECTS Credits 6	Choose Mandatory	Year 2nd	Quadmester 2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Rúa Rodríguez, María Luísa			
Lecturers	Fuciños González, Clara Rúa Rodríguez, María Luísa Torrado Agrasar, Ana María			
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General description	The objectives of the subject Food Chemistry and Biochemistry are the study of the composition and properties of foods (raw materials and finished products), of the chemical changes that occur in them, whether they are spontaneous or induced, as well as the most suitable conditions to preserve and deliver food to the consumer with the highest quality and safety.			
	The theoretical classes program consists of topics that study the main constituents of food, grouped by chemical families (water, amino acids and peptides, proteins, lipids, additives, etc.), placing special emphasis on those reactions in which each of them participate and simple mixtures thereof, as well as the physical-chemical properties that their presence brings to foods (functional properties).			

## Training and Learning Results

### Code

A2	Students will be able to apply their knowledge and skills in their professional practice or vocation and they will show they have the required expertise through the construction and discussion of arguments and the resolution of problems within the relevant area of study.
B2	Students will acquire and put teamwork skills and abilities into practice, whether these have multidisciplinary character or not, in both national and international contexts, becoming familiar with a diversity of perspectives, schools of thought and practical procedures.
C1	To know the physical, chemical and biological foundations of food and its technological processes.
C4	To be familiar with the physical and chemical properties of food, as well as the analytical processes that are associated with their establishment.
D1	Analysis, organization and planning skills.
D3	Ability to communicate, both orally and in writing, in local and foreign languages.
D4	Independent-learning and information-management skills.
D5	Problem-resolution and decision-making skills.
D8	Critical and self-critical thinking skills.
D11	Striving for quality with focus on awareness about environmental issues.

## Expected results from this subject

Expected results from this subject	Training and Learning Results
RA1	C1 C4
RA2	C1 C4

RA3	A2	C1 C4	D1 D4 D5 D8
RA4		C1 C4	D1 D3 D4 D5 D8 D11
RA5	A2	B2	D1 D3 D4 D5 D8 D11
RA6	A2	B2	D1 D3 D5 D8 D11
RA7	A2	B2	D1 D3 D4 D5 D8 D11
RA8	A2		D1 D3 D4 D5 D8

## Contents

### Topic

I: INTRODUCTION	Topic 1: Introduction. Objectives. Skills. Methodology of the course. Brief history of Food Chemistry and Biochemistry. Bibliography.
II: WATER	Topic 2: Water's importance in Food Chemistry. Phases of water. The role of water as a solvent in food systems. The concept of water activity. Sorption isotherms. Topic 3: Water and the deterioration of food. Labuza stability diagram. Interest for the food industry.
III: CARBOHYDRATES	Topic 4: Monosaccharides and oligosaccharides. Sensory properties. Chemical reactivity: caramelization and non-enzymatic browning (Maillard reactions). Topic 5: Polysaccharides Homo- and heteropolysaccharides. Chemical structure and main properties. Topic 6: Functional properties of simple sugars, oligo- and polysaccharides
IV: LIPIDS	Topic 7: Lipids in food. Most important lipids in foods: triglycerides, phospholipids, terpenes and steroids Topic 8: Lipid binding Description and prevention. Topic 9: Modification of fats and oils. Hydrogenation and Interesterification.
V: AMINOACIDS, PEPTIDES AND PROTEINS	Topic 10: Amino acids, peptides and proteins in food: general and structural aspects. Protein denaturation and effects on food systems. Topic 11: Chemical modifications of proteins in food processing. Topic 12: Functional properties of amino acids, peptides and proteins
VI: EMULSIONS AND FOAMS	Topic 13. Colloidal systems: stabilizers and thickeners, surfactants, emulsions and food foams
VI: ENZYMES	Topic 14: Main enzymes in food and their effects. Hydrolases, redox enzymes and isomerases. Procedures of control of the enzymatic activity in food. Topic 15: Enzymatic browning. Substrates. Enzymes. Mechanism of reaction. Favourable and adverse effects during food processing. Prevention.
VIII: VITAMINS AND PIGMENTS	Topic 16. Main vitamins: solubility and stability against technological treatments. Color in food: color and chemical structure, main food pigments, stability against technological treatments

IX: ADDITIVES	Topic 17. Additives. Introduction. Classification.
X: PRACTICAL COURSE (LABORATORY)	1: Water activity determination in different food systems 2: Carbohydrate reactivity: Maillard reaction and caramelization 3: Separation and gelification of food proteins 4: Enzymatic browning. Kinetics of polyphenoloxidases 5: Lipid oxidation in food systems

<b>Planning</b>			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	28	56
Laboratory practical	14	14	28
Seminars	14	6	20
Autonomous problem solving	0	30	30
Problem and/or exercise solving	0	16	16

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

<b>Methodologies</b>	
	Description
Lecturing	50-minute master classes using power point and blackboard. Attending these classes will help the students to understand the most difficult concepts of the subject. To reinforce this police, the student will have self-evaluation questionnaires with objective questions at the end of each section (water, lipids...)
Laboratory practical	The activities will be carried out following protocols and materials provided by the teachers and under their supervision. The practical classes are structured in five sessions (days) each lasting 4 hours on average. The student will learn to conduct laboratory experiments with little supervision and at the end should be able to analyze and interpret data and discuss results in the context of the past knowledge on the topic. At the end of the practical course, they will have to write a lab report and pass an specific exam. The attendance of practical course is compulsory.
Seminars	The teaching techniques used in these seminar sessions will be the analysis of texts, the correction and interpretation of problems previously solved by the students and the study of complex cases. For the follow-up of these activities, the student will have support material developed by the teachers. Main objectives of these activities are the development and evaluation of transversal competences such as the ability to analyze and synthesize, the search for scientific information, the resolution of problems, the writing of scientific texts and their oral presentation in public, the critical spirit, teamwork and the motivation for achieving the excellence. Attendance to seminar activities in the conventional classroom will be assessed. Depending on the activity, the students will work individually or in groups (2-4 people) with common goals, being evaluated in this case both as a whole, according to the productivity of the group, as well as individually
Autonomous problem solving	It consists on carrying out individually or in small groups of exercises and simple practical cases in order to consolidate the theoretical concepts of the subject and develop the ability to apply them to real cases.

<b>Personalized assistance</b>	
<b>Methodologies</b>	<b>Description</b>
Lecturing	- Attention programmed by the center. - Attention to the students or small groups in the seminars. - Personalized monitoring of the students / groups during the tutorials - Personalized monitoring of the students through the teledocence platform
Laboratory practical	- Attention programmed by the center. - Attention to the students or small groups in the seminars. - Personalized monitoring of the students / groups during the tutorials - Personalized monitoring of the students through the teledocence platform
Seminars	- Attention programmed by the center. - Attention to the students or small groups in the seminars. - Personalized monitoring of the students / groups during the tutorials - Personalized monitoring of the students through the teledocence platform
Autonomous problem solving	- Attention programmed by the center. - Attention to the students or small groups in the seminars. - Personalized monitoring of the students / groups during the tutorials - Personalized monitoring of the students through the teledocence platform

<b>Assessment</b>	<b>Description</b>	<b>Qualification</b>	<b>Training and Learning Results</b>

Lecturing	Class attendance and active participation	5	C1 C4
	Learning outcomes RA1, RA2 y RA3		
Laboratory practical	Active participation, written summary of the practical classes and exam.	30	A2 B2 C1 C4 D1 D3 D4 D5 D8 D11
	Learning outcomes RA6, RA7 y RA8		
Seminars	Active participation in the activities of the seminars reflected through the oral presentation of cases, problem solving, participation in debates or delivery of reports of the activity carried out.	10	A2 B2 C1 C4 D1 D3 D4 D5 D8 D11
	Learning outcomes RA1, RA2, RA3, RA4 y RA5		
Autonomous problem solving	Evaluation of individual deliverables (exercise bulletins + readings)	15	C1 C4
	Learning outcome RA2, RA3, RA4 and RA5		
Problem and/or exercise solving	Exam of the subject contents	40	C1 C4
	Learning outcome RA1, RA2, RA3, RA4, RA5 and RA8		

#### Other comments on the Evaluation

##### CONTINUOUS EVALUATION

The continuous evaluation is based on the weighted evaluation, as indicated in the teaching guide, of all the activities proposed throughout the subject, including a final written exam.

It is compulsory to obtain a minimum grade (not weighted) of 5.0 in the written exam (*Problem solving and/or exercises*). If it wasn't the case, the global qualification and, therefore, the mark that will appear in the official grade of the subject, will be the mark achieved in the exam.

Except for the written exam, the qualifications obtained throughout the course will be maintained until the July call. The mark of the Lab practical course will be maintained for two consecutive academic years.

The students who repeat the course must carry out again the activities included in Problem solving activities.

##### GLOBAL EVALUATION

Students who select the global evaluation mode (a regular global exam that counts for 100% of the grade of the subject), will have a period of 30 calendar days to confirm the person responsible of the subject, by email or through the Moovi platform. Those who opt for the single evaluation, will have to go through an extensive examen (longer than for those who opt for a continuous evaluation), that will include theoretical questions and practical questions to solve problems and cases. The minimum score to pass the exam (and the subject) will be 5.0.

##### Dates of the exams:

- END OF STUDIES: September 22, 2023, 4:00 p.m.

Final exam: the student who chooses to be considered at the end of the course will be assessed only with the exam (which will be 100% of the final mark). In the case of attending the exam, the passing of the exam will be evaluated in the same way that the rest of the students "

- COMMON 1st EDITION: April 1, 2024, 4:00 p.m.

- COMMON 2nd EDITION: July 8, 2024, 4:00 p.m.

**In the event of an error in the transcript of the test dates, the valid ones will be those officially approved and published on the bulletin board and on the website of the Center**

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#### Sources of information

##### Basic Bibliography

##### Complementary Bibliography

BADUI, S., **Química de los Alimentos**, 4<sup>a</sup>, Pearson Educación, 2006

FENNEMA, O.R., **Química de los Alimentos**, 3<sup>a</sup>, Acribia, 2014

BELITZ, H.D.; W. GROSCH; P. SCHIEBENDE, **Química de los Alimentos**, 3<sup>a</sup>, Acribia, 2011

YUFERA, E.P., **Química de los Alimentos**, Síntesis, D.L., 1997

WONG, D.W.S., **Química de los Alimentos. Mecanismos y Teoría**, Acribia, 1995

CHEFTEL, J.C.; H. CHEFTEL, **Introducción a la bioquímica y tecnología de los alimentos Vol I y II**, Acribia, 1992

MILLER, D.D., **Food Chemistry: A Laboratory Manual**, John Wiley, 1998

J. Whitehurst and Maarten van Oort, **Enzymes in food technology**, 2<sup>a</sup>, Wolwy-Blackwell, 2010

Consejo europeo de Información sobre alimentación, <http://www.eufic.org/>,

Food Line Web, <http://services.leatherheadfood.com/foodline/index.aspx>,

Revista Consumer, <http://www.consumer.es/alimentacion>,

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**Recommendations**

**Subjects that continue the syllabus**

Advanced bromatology/O01G041V01601

Bromatology/O01G041V01501

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**Subjects that it is recommended to have taken before**

Biochemistry/O01G041V01302

Organic chemistry/O01G041V01304

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