



Teaching Guide				
Identifying Data			2021/22	
Subject (*)	Chemistry of Biomolecules	Code	610509115	
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2020)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Optional	3
Language	GalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Departamento profesorado másterQuímica			
Coordinador	Pazos Chantrero, Elena	E-mail	elena.pazos@udc.es	
Lecturers	Pazos Chantrero, Elena	E-mail	elena.pazos@udc.es	
Web	<a href="https://www.usc.gal/gl/estudios/masteres/ciencias/master-universitario-investigacion-quimica-quimica-industrial">https://www.usc.gal/gl/estudios/masteres/ciencias/master-universitario-investigacion-quimica-quimica-industrial</a>			
General description	<p>This subject is intended for students to acquire a thorough understanding of the structure, function and applications of the major biomolecules, mainly proteins, carbohydrates and nucleic acids. It starts from the idea that students have enough knowledge of chemistry to understand various aspects of the molecular behavior of different types of biomolecules. The course will not only deal with structural aspects and the different biological functions of biomolecules, but the study on the different synthetic strategies for their manipulation will also be addressed, as well as the techniques used to modulate and / or modify their biological activity in order to get new tools in biomedical research.</p>			
Contingency plan	<p>1. Modifications to the contents No changes will be made</p> <p>2. Methodologies *Teaching methodologies that are maintained *Teaching methodologies that are modified All methodologies are maintained and adapted to a non-face-to-face mode and are carried out in the Campus Virtual and Teams virtual classroom. Mixed test: it will be done through the Campus Virtual platform</p> <p>3. Mechanisms for personalized attention to students Activities will be tracked through teams, Campus Virtual and email.</p> <p>4. Modifications in the evaluation: no changes are made, the contributions to the final grade of all the evaluable methodologies are maintained as well as all the evaluation observations included in the teaching guide. The fraudulent performance of the evaluation tests or activities will directly imply the qualification of failure '0' in the subject in the corresponding call, thus invalidating any qualification obtained in all the evaluation activities for the extraordinary call.</p> <p>5. Modifications to the bibliography or webgraphy: none.</p>			

Study programme competences / results	
Code	Study programme competences / results
A1	Define concepts, principles, theories and specialized facts of different areas of chemistry.
A2	Suggest alternatives for solving complex chemical problems related to the different areas of chemistry.
A3	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
A4	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
A9	Promote innovation and entrepreneurship in the chemical industry and in research.
B1	Possess knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context
B2	Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B4	Students should be able to communicate their conclusions, and the knowledge and the reasons that support them to specialists and non-specialists in a clear and unambiguous manner
B5	Students must possess learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.

B7	Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.
C1	CT1 - Elaborar, escribir e defender publicamente informes de carácter científico e técnico
C3	CT3 - Traballar con autonomía e eficiencia na práctica diaria da investigación ou da actividade profesional.
C4	CT4 - Apreciar o valor da calidade e mellora continua, actuando con rigor, responsabilidade e ética profesional.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Knowing the fundamental role that primary metabolites (carbohydrates, proteins , peptides and nucleic acids ) play in living organisms .	AC2 AC3 AC4	BC5 BC10 BC11	
Gain knowledge of instrumental techniques for the isolation and structural determination of these natural substances.	AC1 AC9	BC1 BC2 BC4 BC7	CC4
Knowing the value of its synthesis in the development of biologically active compounds.	AC2 AC4	BC2 BC5 BC7	CC1 CC3

Contents	
Topic	Sub-topic
UNIT 1. Introduction and historical aspects	Introduction and historical aspects
UNIT 2. Peptides and proteins	Structural aspects. Synthesis and modification. Design of functional proteins. Metalloproteins: types, methods of study, examples and applications
UNIT 3. Nucleic acids	Structure, DNA synthesis. Sequencing, PCR, DNA Recognition. DNA beyond biology: processing and storage of information; nanomaterials.
UNIT 4. Carbohydrates	Structural aspects. Synthesis and modification. Glycoconjugates and its role in cellular communication. Glycocode. Glycotherapy

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	B2 B5 C3 C4	12	24	36
Seminar	A1 A2 A4 B1 B4 B7 B10 B11 C1	7	18	25
Mixed objective/subjective test	A1 A4 A3 A9 B1 B2 B5	2	10	12
Personalized attention		2	0	2

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

Methodologies	
Methodologies	Description



Guest lecture / keynote speech	It is proposed to carry out 12 sessions of master classes in a single group where the theoretical contents of the subject will be developed together with the corresponding illustrative examples. It will consist mainly of Power Point presentations. The students will have, with sufficient time in advance, copies of the corresponding presentations through the virtual classroom, so that the student can previously prepare the subject that is going to be taught in addition to facilitate the follow-up of the explanations. The interactive participation of the student will be encouraged at all times. Attendance to these classes is not compulsory, but it is highly recommended.
Seminar	Resolution of practical exercises (problems, multiple choice questions, interpretation and processing of information, evaluation of scientific publications, etc.). Oral presentation of papers, reports, etc., including discussions with teachers and students.
Mixed objective/subjective test	The final exam will cover all the contents of the course

### Personalized attention

Methodologies	Description
Seminar Mixed objective/subjective test	Tutorials are scheduled by the professor and coordinated by the Center. In general, each student will have 2 hours per term and subject. Activities such as supervision of directed work, clarification of doubts about theory or practices, problems, exercises, readings or other proposed tasks are proposed; as well as the presentation, exposition, debate or commentary of individual work or work done in small groups. In many cases the professor will require the students to hand in exercises prior to the tutorial. These deliveries will be included in the calendar of activities to be carried out by the students throughout the course in the Teaching Guide of the corresponding subject. Attendance to these classes is compulsory.

### Assessment

Methodologies	Competencies / Results	Description	Qualification
Seminar	A1 A2 A4 B1 B4 B7 B10 B11 C1	Within the continuous evaluation (N1), a series of evaluable activities will be carried out in the seminars: resolution of practical cases, completion of assignments and written reports. Likewise, the student will present orally, throughout the course, one or more of the results obtained in the activities proposed in the seminars.	45
Mixed objective/subjective test	A1 A4 A3 A9 B1 B2 B5	The final exam (N2) will cover all subjects.	55

### Assessment comments

<p>The qualification of this subject will be done through continuous evaluation and the completion of a final exam. In order to access the exam it is necessary to participate in 100% of the teaching activities of compulsory attendance (classes, seminars and tutorials).</p> <p>Continuous assessment (N1) will weigh 45% of the course grade and consists of two components: interactive classes in small groups (seminars) and interactive classes in very small groups (tutorials). Seminars and tutorials will include problem solving and case studies (40%), oral questions and problems during the course (5%).</p> <p>The final exam (N2) will cover the totality of the content of the subject and will have a value of 55%.</p> <p>The student's score will be obtained as a result of the application of the following formula:</p> $\text{final grade} = 0.45 \times N1 + 0.55 \times N2$ <p>N1 corresponds to the continuous evaluation (scale of 0-10) and N2 to the final exam (scale of 0-10).</p> <p>A minimum grade of 4 in the final exam will be required to pass the course.</p>
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### Sources of information



<b>Basic</b>	<ul style="list-style-type: none"><li>- Alberts et al (2002). Molecular Biology of the Cell. Garland Science</li><li>- Vranken, D-V; Weiss, G.A. (2012). Introduction to Bioorganic Chemistry and Chemical Biology. Garland Science</li><li>- Blackburn, M.; Gait, M.J.; Loakes, D.; Williams, D.M. (2006). Nucleic Acids in Chemistry and Biology. Royal Society of Chemistry</li><li>- Gutte, B. (1995). Peptides: Synthesis, Structures and Application. Academic Press</li><li>- Brändén, C-I; Tooze, J. (1999). Introduction to Protein Structure. Garland Science</li><li>- Dr. Norbert Sewald, Prof. em. Dr. Hans-Dieter Jakubke, (2009). Peptides: Chemistry and Biology. John-Wiley</li><li>- Chris R. Calladine, Horace R. Drew, Ben F. Luisi and Andrew A. Travers (2004). Understanding DNA, The Molecule &amp; how It Works. Elsevier</li><li>- Peng G. Wang, C. R. Betozzi. Marcel Dekker (2001). Glycochemistry, Principles, Synthesis and Applications..</li><li>- D. Serge (1997). The Molecular and Supramolecular Chemistry of Carbohydrates. A chemical introduction to glicoscience.. Oxford Science publications</li><li>- Taylor, M.E.; Drickamer, K. (2011). Introduction to Glycobiology. Oxford University press</li><li>- Davies, B.G.; Fairbanks. A.J. (2004). Carbohydrate Chemistry. Oxford Science publications</li><li>- Driguez, H; Thiem (1997). Glycoscience, Synthesis of Substrate Analogs and Mimetics.. J. Springer-Verlag</li></ul>
<b>Complementary</b>	

## Recommendations

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

Advanced Structural Determination/610509103

Structure and Reactivity of Organic Compounds /610509114

### Subjects that are recommended to be taken simultaneously

Chemistry of Natural Products/610509118

Molecular Biology/610509117

Medicinal Chemistry/610509116

### Subjects that continue the syllabus

### Other comments

It is very important to attend the lectures.&nbsp;It is essential to carry out a continuous study of the subject.&nbsp;Once the class is over, it is useful to summarize the most important points.&nbsp;The resolution of exercises is key to the learning of this subject. It may be helpful to start with the problems solved in the support and reference manuals, to continue with the problems proposed at the end of each chapter.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.