Teaching Guide				
Identifying Data				2022/23
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	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Departamento profesorado másterQuímica			
Coordinador	Pazos Chantrero, Elena	E-mail	elena.pazos@udc.es	
Lecturers	Estévez Cabanas , Juan Carlos Pazos Chantrero, Elena Vázquez Sentis, Marco Eugenio	E-mail	elena.pazos@udc.es	
Web	www.usc.gal/gl/estudos/masteres/ciencias/master-universitario-investigacion-quimica-quimica-industrial			
General description	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.			

Study programme competences	
Code	Study programme competences
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

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**	**Ordinary class hours**	**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. Students with part-time dedication or specific learning modalities or support for diversity, personalized attention will be provided within the flexibility allowed by the coordination schedules and the material and human resources.

Assessment			
Methodologies	Competencies	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
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). 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%). The final exam (N2) will cover the totality of the content of the subject and will have a value of 55%. The student's score will be obtained as a result of the application of the following formula: final grade = 0.45 x N1 + 0.55 x N2 N1 corresponds to the continuous evaluation (scale of 0-10) and N2 to the final exam (scale of 0-10). A minimum grade of 4 in the final exam will be required to pass the course. Students with recognition of part-time dedication will be evaluated with the criteria set out above. Students with academic dispensation are exempt from attending seminars and tutorials (45% of the overall qualification) and will be evaluated only by the final test, both in the first and in the second opportunity, which will account for 100% of the overall qualification. The fraudulent performance of the tests or evaluation activities will be penalized taking into account the established in the regulations.

Sources of information

Basic	- Alberts et all (2002). Molecular Biology of the Cell. Garland Science - Vranken, D-V; Weiss, G.A. (2012). Introduction to Bioorganic Chemistry and Chemical Biology. Garland Science - Blackburn, M.: Gait, M.J.; Loakes, D.; Williams, D.M. (2006). Nucleic Acids in Chemistry and Biology. Rayal Society of Chemistry - Gutte, B. (1995). Peptides: Synthesis, Structures and Application. Academic Press - Brändén, C-I; Tooze, J. (1999). Introduction to Protein Structure. Garland Science - Dr. Norbert Sewald, Prof. em. Dr. Hans-Dieter Jakubke, (2009). Peptides: Chemistry and Biology. John-Wiley - Chris R. Calladine, Horace R. Drew, Ben F. Luisi and Andrew A. Travers (2004). Understanding DNA, The Molecule & how It Works. Elsevier - Peng G. Wang, C. R. Betozzi. Marcel Dekker (2001). Glycochemistry, Principles, Synthesis and Applications.. - D. Serge (1997). The Molecular and Supramolecular Chemistry of Carbohydrates. A chemical introduction to glicoscience.. Oxford Science publications - Taylor, M.E.; Drickamer, K. (2011). Introduction to Glycobiology. Oxford University press - Davies, B.G.; Fairbanks. A.J. (2004). Carbohydrate Chemistry. Oxford Science publications - Driguez, H; Thiem (1997). Glycoscience, Synthesis of Substrate Analogs and Mimetics.. J. Springer-Verlag
Complementary	

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. It is essential to carry out a continuous study of the subject. Once the class is over, it is useful to summarize the most important points. 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.