Teaching Guide					
Identifying Data					2020/21
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	García Romero, Marcos Daniel		E-mail	marcos.garcia1@udc.es	
Lecturers	García Romero, Marcos Daniel		E-mail	marcos.garcia1@udc.es	
Web	www.usc.es/gl/centros/quimica/curso/master.html				
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.				
Contingency plan	1. Modifications to the contents No changes will be made 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 Moodle and Teams virtual classroom. Mixed test: it will be done through the Moodle platform 3. Mechanisms for personalized attention to students Activities will be tracked through teams, moodle and email. *Evaluation observations: all those reflected on the guide. 5. Modifications to the bibliography or webgraphy: none.				

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		
Learning of the biogenetic rules and the function of biomolecules	AC2 AC3 AC4	BC5 BC10 BC11	
Acquisition of advanced knowledge in the chemistry of the most important biomolecules (proteins, nucleic acids and sugars).	AC1 AC9	BC1 BC2 BC4 BC7	CC4
Learning the more relevant aspects related to the isolation and characterization of biomolecules as well as their synthetic manipulation	AC2 AC4	BC2 BC5 BC7	CC1 CC3

Contents	
Topic	Sub-topic
UNIT 1. Introduction and historical aspects.	Different components of the cell. Organization. Structure and function of main biomolecules
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
Problem solving	B4 B7 B10 B11	3	17.5	20.5
Case study	A2 A4 C1	0	1	1
Oral presentation	B1 B4 B7 B10 B11 C1	4	0	4
Mixed objective/subjective test	A1 A4 A3 A9 B1 B2 B5	1.5	10	11.5
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	There will be 12 magisterial sessions in a group where the theoretical contents of the subject will be included, along with relevant illustrative examples. They will mainly consist of presentations in Power Point. Students will have a copy of all the files in Moodle, so that the students can prepare the classes in advance, as well as facilitate the follow-up of explanations. Interactive participation of students will be encouraged at all times.
Problem solving	It is proposed to carry out 7 sessions of problem seminars in small groups, where students will solve the problems proposed by the teacher. Students will have enough time in advance to solve the problems since those will be uploaded in Moodle before the start of these classes. During these classes any questions that may arise will also be solved. Participation in these classes is mandatory
Case study	In the seminar sessions, the case studies proposed by the teacher will also be solved. Students will have access to such cases enough time in advance through Moodle.
Oral presentation	The students will present works, reports, etc., orally, including discussions between the teacher and the students.
Mixed objective/subjective test	The final exam will cover all the contents of the course

Personalized attention	
Methodologies	**Description**
Problem solving	Tutorships are programmed by the teacher and coordinated by the Center. In general, each student will have two hours per semester. During these sessions control activities such as directed exercises, clarification of doubts about the theory or problems, exercises, readings or other proposed tasks, presentations, discussions or comments will be carried out. In many cases, the teacher may require that the students submit the exercises before the celebration of the classes. These submissions will be included in the calendar of activities to be developed by the students throughout the course in the teaching guide. Participation in these classes is mandatory.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Guest lecture / keynote speech	B2 B5 C3 C4	The student's participation in the expositive sessions will be assessed, through questions asked by the teacher or through the discussion with the classmates.	5
Mixed objective/subjective test	A1 A4 A3 A9 B1 B2 B5	The final exam (N2) will cover all subjects. It will weigh 55% of the final mark.	55
Case study	A2 A4 C1	Within the seminars, a series of evaluable activities will be carried out: Resolution of practical cases, written work and reports	5
Oral presentation	B1 B4 B7 B10 B11 C1	The student will present orally during the course one or more of the results obtained within the activities proposed in the seminars	5
Problem solving	B4 B7 B10 B11	It will consist of two parts: theoretical-practical classes (seminars) and interactive classes in very small groups (tutorships). Within the continuous assessment (N1) this part will weigh 30% in the course mark	30

Assessment comments

The qualification of this subject will be done through continuous assessment and the completion of a final exam. To access the exam is necessary the participation in the 100% of compulsory attendance teaching activities (classes, seminars and tutorships). Continuous assessment (N1) will weigh 45% in the grade of the subject and consist of two components: small interactive group classes (seminars) and interactive classes in very small groups (tutorships). Seminars and tutorships will include the resolution of problems and practical cases (40%) and oral questions and problems during the course (5%). The final exam (N2) will cover the entire contents 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 note = 0.45 x N1 + 0.55 x N2 N1 corresponds to the continuous evaluation (scale of 0-10) and N2 the final exam (scale of 0-10).

Sources of information	
Basic	- Blackburn, M.: Gait, M.J.; Loakes, D.; Williams, D.M. (2006). Nucleic Acids in Chemistry and Biology. Rayal Society of Chemistry - Vranken, D-V; Weiss, G.A. (2012). Introduction to Bioorganic Chemistry and Chemical Biology. Garland Science - Chris R. Calladine, Horace R. Drew, Ben F. Luisi and Andrew A. Travers (2004). Understanding DNA, The Molecule & how It Works. Elsevier - Alberts et all (2002). Molecular Biology of the Cell. Garland Science - Davies, B.G.; Fairbanks. A.J. (2004). Carbohydrate Chemistry. Oxford Science publications - Taylor, M.E.; Drickamer, K. (2011). Introduction to Glycobiology. Oxford University press - Brändén, C-I; Tooze, J. (1999). Introduction to Protein Structure. Garland Science - Peng G. Wang, C. R. Betozzi. Marcel Dekker (2001). Glycochemistry, Principles, Synthesis and Applications.. - Gutte, B. (1995). Peptides: Synthesis, Structures and Application. Academic Press - Dr. Norbert Sewald, Prof. em. Dr. Hans-Dieter Jakubke, (2009). Peptides: Chemistry and Biology. John-Wiley - Driguez, H; Thiem (1997). Glycoscience, Synthesis of Substrate Analogs and Mimetics.. J. Springer-Verlag - D. Serge (1997). The Molecular and Supramolecular Chemistry of Carbohydrates. A chemical introduction to glicoscience.. Oxford Science publications
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
The students should review the theoretical concepts introduced in each chapter using the reference manual and the material provided by the professor. Those students, which have significant difficulties when working the proposed activities, should contact with the professor during the tutorships, in order to analyze the problem and help solve these difficulties. It is very important when preparing the exam to solve some of the exercises from the list at the end of each chapter.