UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2016/17
Subject (*)	Química de Biomoléculas		Code	610509014
Study programme	Mestrado en Investigación Química e Química Industrial (plan 2016)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	Yearly	First	Optativa	3
Language	SpanishEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Fundamental			
Coordinador	Jimenez Gonzalez, Carlos	E-mail	carlos.jimenez@udc.es	
Lecturers	Jimenez Gonzalez, Carlos	E-mail	carlos.jimenez@udc.es	
Web				
General description	This material 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	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
A4	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
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

Learning outcomes			
Learning outcomes	Study programme competences		
? Acquisition of advanced knowledge in the chemistry of the most important biomolecules (proteins, nucleic acids and sugars).	AC1	BC1 BC4 BC10	
Learning of the biogenetic rules and the function of biomolecules	AC1	BC5	
Learning the more relevant aspects related to the isolation and characterization of biomolecules as well as their synthetic manipulation	AC2 AC4	BC2 BC10	
Learn the main applications, mainly as modulators of cellular activity and therefore as tools in biomedical research	AC3	BC2 BC7	

Contents	
Topic	Sub-topic
Chapter 1. Introduction and historical aspects. Basic structure and functions of cells. Most important biomolecules	Different components of the cell. Organization. Structure and function of main biomolecules
CHAPTER 2. Peptides and proteins. Structural aspects. Synthesis and modification. Design of functional proteins. Metalloproteins: types, methods of study, examples and applications	Amino acids and peptides. Proteins and functions. Primary, secondary, tertiary and quaternary structure. Biosynthesis. Chemical synthesis. Modification by chemical methods. Metalloproteins and synthetic models. Applications.
CHAPTER 3. Nucleic acids. Structural aspects. Synthesis and analysis techniques. Interactions with other nucleic acids. Interactions with small molecules. Interactions with metals. Interactions with proteins and peptides	Structure of nucleotides. Structure and function of the different nucleic acids. Supramolecular chemistry of nucleic acids. Biosynthesis. Synthesis and manipulation of nucleic acids by chemical methods. Interaction with small molecules, proteins and metal complexes
CHAPTER 4. Carbohydrates and their derivatives. Structural and synthesis. Glycoconjugates and its role in cellular communication. Glycocode. Glycotherapy	Monosaccharides, nomenclature, structure and chemistry. Oligosaccharides and polysaccharides, nomenclature, structure. Structural determination of oligo-and polysaccharides. Biosynthesis, chemical synthesis and biological synthesis of oligosaccharides. Glycosides and glycosidase inhibitors: types, incidence in nature, methods of synthesis and biological applications. Glycolipids. Types of structures. Natural incidence. Biosynthesis. Functions. Glycoproteins. Types of structures. Natural incidence. Biosynthesis. Functions. The glycocode concept. Future prospects and scope thereof. Glycotherapy and Glycoconjugates known functions.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 B1 B7 B10	12	24	36
Problem solving	A2 A3 A4 B5	7	17.5	24.5
Mixed objective/subjective test	A3 B2 B4	2.5	10	12.5
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	It will be held 12 sessions of lectures in one group where the theoretical contents of the course will be associated with illustrative examples. It will consist mainly in PowerPoint presentations. Copies of these presentations will be available for the students in advance via the virtual campus of the course. This will allow the students to study ahead the contents of the course and to facilitate the monitoring of explanations
Problem solving	7 sessions in small group seminars where students will present the work proposed by the professor followed by a discussion section. Students will have in advance the proposed exercises and papers via the virtual campus of the course. Attendance at these classes is mandatory
Mixed objective/subjective test	The final exam will cover all the contents of the course

Personalized attention	
Methodologies	Description
Problem solving	Tutoring scheduled by the professor and coordinated by the Centre. It will be 2 hours per student and will involve the supervision of proposed work, clarifying doubts, etc. Attendance at these classes is mandatory

Assessment			
Methodologies	Competencies	Description	Qualification
Problem solving	A2 A3 A4 B5	They will consist of two components: interactive class in problems solving clases (seminars) and interactive class in very small groups (tutorials). This part within the continuous assessment (N1) will be 40% of the qualification	40
Mixed objective/subjective test	A3 B2 B4	The final exam (N2) will cover all the contents of the course. This part will be 60% of the qualification.	60

Assessment comments
The evaluation of this course will be done by means of the continuous assessment and completion of a final exam. Access to the exam will be conditioned on the participation in at least 80% of the mandatory classroom teaching activities (seminars and tutorials). Continuous assessment (N1) will be 40% of the qualification and the final exam (N2) will cover all the contents of the course. The student's score will result of applying the following formula: Final score = 0.4 x N1 + 0.6 x N2 N1 and N2 are the marks corresponding to the continuous assessment (0-10 scale) and the final exam (0-10 scale), respectively The repeaters will have the same system of class attendance than those who study the course for first time

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 - Hadjiliadis, N.; Sletten, E. (2009). Metal Complex-DNA Interactions. Wiley - Taylor, M.E.; Drickamer, K. (2011). Introduction to Glycobiology. Oxford University press - Davies, B.G.; Fairbanks. A.J. (2004). Carbohydrate Chemistry. Oxford Science publications

Complementary	- Driguez, H; Thiem, J. (1997). Glycoscience, Synthesis of Substrate Analogs and Mimetics. Springer-Verlag, New York - Kaim, W. Schwederski, B.,Klein, A (2013). Bioinorganic chemistry, inorganic elements in the chemistry of life: an introduction and guide. John Wiley, Chichester

Recommendations
Subjects that it is recommended to have taken before
Profundización en Química Orgánica/610509004 Análise Estrutural Avanzado/610509005
Subjects that are recommended to be taken simultaneously
Síntese estereoselectiva/610509012 Química de Produtos Naturais/610509017
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 tutorials, in order to analyze the problem and to receive the necessary support. The professor will analyze with those students who do not successfully pass the evaluation, and so wish, their difficulties in learning the course content. Additional material (questions, exercises, tests, etc..) to strengthen the learning of the course might be also provided.