



IDENTIFYING DATA

Chemistry applied to the marine environment I

Subject	Chemistry applied to the marine environment I			
Code	V10G060V01505			
Study programme	(*)Grao en Ciencias do Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Besada Pereira, Pedro			
Lecturers	Besada Pereira, Pedro Castro Fojo, Jesús Antonio Couce Fortúnez, María Delfina			
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Web				
General description	This subject includes the study of elements, inorganic substances and organic substances that can reach and alter the marine environment, acting as pollutants. Behaviour, influence and prevention of the effects produced by these elements, inorganic substances and organic substances in the environment will be studied. Moreover, the study of marine natural products (classification, function, pharmacological interest) will be addressed.			

Competencies

Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
C1	To know the vocabulary, codes and concepts inherent to the oceanographic scientific field
C2	To know and understand the essential facts, concepts, principles and theories related to oceanography
C5	Basic knowledge of research methodology in oceanography
C6	Ability to identify and understand the problems in the field of oceanography
C12	To be able to operate the instrumental techniques applied to sea
C15	To recognize and implement good scientific practice in measurement and experimentation, both in the field and in the laboratory
C17	Ability to survey in the field and to work in the laboratory responsibly and safely, encouraging team work
C18	To transmit writing, verbal and graphical information for audiences of various types
C28	To teach marine science at different levels
C30	Identify and assess environmental impacts in the marine environment
D1	Analysis and synthesis ability
D3	Written and oral communication in the official languages of the University
D6	Problem management and solving skills
D15	Ability to apply knowledge in practice
D17	Sensitivity towards environmental issues

Learning outcomes

Expected results from this subject	Training and Learning Results		
To describe global cycles of the elements, including the input and output processes.	A1	C1	D1
	A2	C2	D3
	A3	C6	D6
	A4	C18	
	A5	C28	
To define and to explain concepts, principles and sources related to chemical pollution.	A1	C1	D1
	A2	C2	D3
	A3	C6	D6
	A4	C18	D17
	A5	C28	
		C30	
To describe the chemical composition and speciation in seawater and to determine the mechanisms and factors that regulate it.	A1	C1	D1
	A2	C2	D3
	A3	C6	D6
	A4	C18	
	A5	C28	
To determine the processes that regulate chemical species complexation.	A1	C1	D1
	A2	C2	D3
	A3	C6	D6
	A4	C18	
	A5	C28	
To identify the toxicity mechanisms of metal ions, as well as the factors that determine and control the biomethylation processes.	A1	C1	D1
	A2	C2	D3
	A3	C6	D6
	A4	C18	D17
	A5	C28	
		C30	
To identify the toxicity mechanisms of the major organic pollutants.	A1	C1	D1
	A2	C2	D6
	A3	C6	D17
	A4	C18	
	A5	C28	
		C30	
To identify the most important natural products in the marine environment.	A1	C1	D1
	A2	C2	D6
	A3	C6	
	A4	C18	
	A5	C28	
To identify the main interactions between marine organisms.	A1	C1	D1
	A2	C2	D6
	A3	C6	
	A4	C18	
	A5	C28	
To describe the main applications of marine natural products.	A1	C1	D1
	A2	C2	D3
	A3	C6	
	A4	C18	
	A5	C28	
To analyze the results obtained in the laboratory using the theoretical concepts.	A1	C1	D15
	A2	C2	
	A3	C5	
	A4	C6	
	A5	C12	
		C15	
		C17	
		C18	
		C28	
		C30	

To develop the necessary skills for the resolution of the applications related with the subject.

A1	C1	D6
A2	C2	D15
A3	C5	D17
A4	C6	
A5	C12	
	C15	
	C17	
	C18	
	C28	
	C30	

Contents

Topic	
1. Introduction to environment	Cycles of the elements in the environment
2. Pollution of marine environment	Generalities. Major sources of pollution
3. Metal speciation	Aerobic and anaerobic environments. Pourbaix diagrams
4. Metals and metallic species	General characteristics. Effects of metal complexation with natural ligands
5. Pollution by heavy metals	Biogeochemical cycles. Methylation processes
6. Reactivity of pollutants non-metallic chemical species	Introduction: carbonates, nitrates, phosphates...
7. Radioactive pollution in marine environment	Study, behavior and control of radioactive pollutants
8. Organic pollutants in the marine water	Classification. Functional and structural description. Origin of marine pollution
9. Chemical transformations of organic compounds	Solubility of organic compounds. Reactions of organic pollutants with nucleophilic species. Redox processes. Photochemical and biological transformations
10. Types of natural products	Terpenes, steroids and carotenoids. Oxygen compounds: Phenols, lignans, coumarins, macrolides and polyethers. Nitrogenous compounds: alkaloids, peptides
11. Marine natural products and their biologic function	Metabolite transfer in marine ecosystems. Biogenesis. Incorporation of halogens: Haloperoxidases
12. Marine ecology	Chemical interactions between organisms
13. Marine natural products in drug discovery	Organic compounds of marine origin: isolation, characterization and biological activity

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	16	24	40
Laboratory practises	12	2	14
Tutored works	0	17	17
Master Session	24	48	72
Short answer tests	3	0	3
Reports / memories of practice	0	4	4

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

Methodologies

	Description
Seminars	Seminars will be used for further working on some of the theoretical contents, and also for problems resolution as a complement of the masterclass. Students may prepare a topic of interest related with the subject.
Laboratory practises	Application of laboratory techniques in practical problems related to the subject
Tutored works	Preparation and presentation of a tutored work on a topic related to the contents
Master Session	Basic concepts of the subject will be introduced in the masterclass

Personalized attention

Methodologies	Description
Master Session	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor's office as well as through e-mail or the virtual campus. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h D. Couce: tuesday, wednesday and thursday from 12:00 to 14:00 h

Seminars	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor's office as well as through e-mail or the virtual campus. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h D. Couce: tuesday, wednesday and thursday from 12:00 to 14:00 h
Laboratory practises	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor's office as well as through e-mail or the virtual campus. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h J. Castro: tuesday and thursday from 10:00 to 13:00 h
Tutored works	Tutoring, support and motivation in the learning process, in the classroom, personally in the professor's office as well as through e-mail or the virtual campus. Tutorial hours: P. Besada: monday, wednesday and thursday from 11:00 to 13:00 h D. Couce: tuesday, wednesday and thursday from 12:00 to 14:00 h

Assessment

	Description	Qualification	Training and Learning Results		
Seminars	Participation, attitude and ability to relate and apply acquired concepts will be evaluated	5	A1 A2 A3 A4 A5	C1 C2 C6 C18 C28 C30	D6 D17
Tutored works	Student will developed a brief tutored work, and the report presented and its presentation will be assessed	20	A1 A2 A3 A4 A5	C1 C2 C6 C18 C28	D1 D3 D17
Short answer tests	In the final exam the theoretical contents that the students have learned in the master session will be assessed. The contents of this subject are divided in two blocks (Chapters 1-7 and 8-13) so the test will also be divided into two parts. To get promoted the student must obtain a minimum of a 3 out of 10 in each of the two parts in which the exam is divided.	65	A1 A2 A3 A4 A5	C1 C2 C6 C18 C30	D1
Reports / memories of practice	Students shall submit a report of the practice carried out in the laboratory. Attendance at the laboratory sessions as well as preparation of the report is compulsory to get promoted. The attitude in the lab sessions, the skills and the understanding of the experimental techniques used will be evaluated.	10	A1 A2 A3 A4 A5	C1 C2 C5 C6 C12 C15 C17 C18 C30	D15

Other comments on the Evaluation

The final qualification will be the sum of all paragraphs whenever the required minimum is reached. If the required minimum is not reached the final qualification will be the one of the final exam.

The participation of the student in the laboratory sessions, in the tutored work or in any exam will involve the condition of presented and the assignment of a score.

The percentages in each of the paragraphs will be maintained in the call of July.

It is require from the student who follows this subject a responsible and honest conduct.

It is consider inadmissible any kind of fraud (i.e. copy and / or plagiarism) aimed to falsify the level of knowledge or skill achieved by a student in any type of test, report or work designed for this purpose. This fraudulent conduct shall be punished with firmness and rigor that current regulations establish.

Sources of information

Basic:

- "Environmental Inorganic Chemistry" I. Bodek, W.J. Lyman, W.F. Reehl y D.H. Rosenblatt. Pergamon Press, 1988.

- "Environmental Organic Chemistry" R.P. Schwarzenbach, P.M. Gschwend, D.M. Imboden, John Wiley & Sons Inc 2nd Ed,

2003.

- *Química* R. Chang, Mc Graw Hill 11ª Ed, 2013.

- *"Química Orgánica"* P. Yurkanis Bruice, Prentice Hall México, 5ª Ed. 2007.

Supplementary:

- *"Contaminación Ambiental"* C. Orozco Barrenetxea, A. Pérez Serrano, M.N. González Delgado, F.J. Rodríguez Vidal, J.M. Alfayete Blanco. Thomson Ed, Madrid, 2002.

- *"Introducción a la Química Ambiental"* S. E. Manahan . Ed. Reverté, Barcelona, 2007.

- *"Handbook on Toxicity of Inorganic Compounds"* H. Seiler, H. Sigel, A. Sigel, Eds., Marcel Dekker, 1998.

- *"Inorganic Contaminants of Surface Water"* J.W. Moore. Springer-Verlag, 1991.

- *" Medicinal natural products: A biosynthetic approach "* Paul M. Dewick, John Wiley & Sons, 3rd Ed. 2009

- *"Principios de Bioquímica"* H.R. Horton y col., Pearson Educación, 2008.

- *"Técnicas experimentales en síntesis orgánica"* M.A. Martínez Grau, A.G. Csáky, Ed. Síntesis, 2001.

Revistas científicas: Fuente Biblioteca Universidad de Vigo

<http://atoz.ebsco.com/titles.asp?Id=4735&sid=203351298&TabID=2>

Marine Chemistry

Marine Pollution Bulletin

Science

Journal of Natural Products

Natural Product Reports

Chem13 News. <http://www.chem13news.uwaterloo.ca/>

Recommendations
