



1. General information

Course: ORGANIC CHEMISTRY II

Type: CORE COURSE

Degree: 376 - UNDERGRADUATE DEGREE PROGRAMME IN PHARMACY

Center: 14 - FACULTY OF PHARMACY

Year: 2

Main language: Spanish

Use of additional
languages:

Web site:

Code: 14318

ECTS credits: 6

Academic year: 2022-23

Group(s): 10

Duration: First semester

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: JOAQUIN CALIXTO GARCIA MARTINEZ - Group(s): 10				
Building/Office	Department	Phone number	Email	Office hours
Facultad de Farmacia	QUÍMICA INORG., ORG., Y BIOQ.	+34926053224	joaquin.garcia@uclm.es	
Lecturer: ANTONIO MANUEL RODRÍGUEZ GARCÍA - Group(s): 10				
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Facultad de Farmacia	QUÍMICA INORG., ORG., Y BIOQ.		AntonioM.Rodriguez@uclm.es	

2. Pre-Requisites

No prerequisites are established for this subject although it is recommended that the student has previously passed Organic Chemistry I.

3. Justification in the curriculum, relation to other subjects and to the profession

As experts in medicines and their use for therapeutic purposes in humans, the future pharmacist has to know the structure and chemical properties of the main groups of natural and heterocyclic products, since many drugs biomimic the structure and functions of many of them. This subject together with Organic Chemistry I forms the basis for Pharmaceutical Chemistry I and Pharmaceutical Chemistry II. In addition, the concepts of characterization and structural determination using spectroscopic techniques, mainly nuclear magnetic resonance (NMR) and infrared spectroscopy (IR), are introduced.

4. Degree competences achieved in this course

Course competences

Code	Description
B01	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages.
B02	Knowledge of Information and Communication Technologies (ICT).
B03	A correct oral and written communication
B04	Ethical commitment and professional deontology.
B05	Ability to develop those learning skills necessary to undertake further studies.
EQ01	Identify, design, prepare, analyse and produce active principles, drugs and other materials and products of sanitary interest.
EQ02	Adequately choose the techniques and methodologies for the evaluation, design and application of chemical reagents, laboratory methodologies and analytical techniques.
EQ03	Complete standard laboratory processes including the employment of scientific equipment related to synthesis and analysis.
EQ04	Evaluate risks/hazards associated to the use of chemical substances and lab processes.
EQ08	Know and understand the chemical nature and behavior of functional groups in organic molecules.
EQ11	Know and apply the main structural determination techniques, including spectroscopy.
G01	Identify, design, obtain, analyze, control and produce drugs and medicines, as well as other products and raw materials of sanitary interest for human or veterinary use.
G02	Evaluate the therapeutic and toxic effects of substances with pharmacological activity.
G03	Know how to apply the scientific method and acquire skills in the handling of legislation, sources of information, bibliography, elaboration of protocols and other aspects considered necessary for the design and critical evaluation of preclinical and clinical trials.
G04	Design, prepare, supply and dispense medicines and other products of health interest.
G05	Provide therapeutic advice in pharmacotherapy and dietotherapy, as well as in the nutritional and food field in the establishments where they provide services.
G06	Promote the rational use of medicines and medical devices, as well as to acquire basic knowledge in clinical management, health economics and the efficient use of health resources.
G07	Identify, evaluate and assess problems related to drugs and medicines, as well as participate in pharmacovigilance activities.
G08	Conducting clinical and social pharmacy activities, following the pharmaceutical care cycle.
G09	Intervene in health promotion and disease prevention activities at the individual, family and community levels, with an integral and multi-professional vision of the health-disease process.
G10	Design, apply and evaluate clinical reagents, methods and analytical techniques, knowing the basic principles of clinical analysis and the characteristics and contents of laboratory diagnostic reports.
G11	Evaluate the toxicological effects of substances and design and apply appropriate tests and trials.
G12	Develop hygienic-sanitary analyses, especially those related to food and environment.
	Develop communication and information skills, both oral and written, to deal with patients and users of the centre where they carry out

G13	their professional activity. Promote the capacity to work and collaborate with multidisciplinary teams and those related to other health professionals.
G14	Know the ethical and deontological principles according to the legislative, regulatory and administrative provisions governing professional practice, understanding the ethical implications of health in a changing social context.
G15	Recognise own limitations and the need to maintain and update professional competence, with particular emphasis on self-learning of new knowledge based on scientific evidence.
T01	Critical thinking skills based on the application of the scientific method
T02	Ability to manage quality scientific information, bibliography, specialized databases and resources accessible through the Internet.
T03	Handling of basic and specific software for the treatment of information and experimental results.
T04	Motivation for quality, safety at work and awareness of environmental issues, with knowledge of the internationally recognised systems for the correct management of these aspects.
T05	Organizational, planning and implementation skills.
T06	Ability to address human resources decision-making and management.
T07	Ability to work as a team and, where appropriate, exercise leadership functions, encouraging entrepreneurship.
T08	Develop interpersonal skills and the ability to function in an international and multicultural context.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Preparation of reports, summaries and presentations on bibliographic or experimental works, either individually or in teams, applying the capacity for criticism and self-criticism.

Ability to design simple organic compound synthesis from certain starting products and involving more than one reaction.

Characterization and identification of functional groups in organic compounds.

Ability to apply the knowledge acquired in laboratory practice and in solving problems and issues related to organic compounds.

Ability to name organic compounds according to IUPAC standards and represent their structure from the systematic name.

Correlate the structure of organic compounds with their physical properties, reactivity and stability.

To develop the necessary laboratory processes for the transformation, separation, isolation and purification of organic compounds, estimating the possible associated risks.

Structural determination of organic compounds from their chemical properties and chemical analysis data.

Recognize the three-dimensional structure of organic compounds and its implications.

6. Units / Contents

Unit 1: Aromatic Electrophilic Substitution (ArES)

Unit 1.1 Reaction ArES over benzene

Unit 1.2 Mechanism of ArSE

Unit 1.3 Influence of substituent in ArES

Unit 1.4 Synthesis of substituted benzenes

Unit 1.5 polyaromatic compounds

Unit 2: Structural determination of Organic Compounds

Unit 2.1 Infrared spectroscopy

Unit 2.2 Nuclear Magnetic Resonance Spectroscopy

Unit 3: Heterocyclic compounds

Unit 3.1 Aromaticity of heterocyclic compounds

Unit 3.2 6-members ring heterocycles

Unit 3.3 5-members ring heterocycles

Unit 3.4 synthesis of heterocycles

Unit 4: Aminoacid, peptides and proteins

Unit 4.1 Structure of aminoacid and peptides

Unit 4.2 acid and basic properties

Unit 4.3 synthesis of aminoacid

Unit 4.4 reactivity of aminoacid

Unit 4.5 peptides

Unit 4.6 synthesis of peptides

Unit 5: Carbohydrates and nucleic acids

Unit 5.1 Classification of carbohydrates

Unit 5.2 cyclic forms of carbohydrates

Unit 5.3 mutarotation

Unit 5.4 Mutarotation

Unit 5.5 Glycosides, disaccharides and polysaccharides

Unit 5.6 Reactivity of monosaccharides

Unit 5.7 Nucleic acid

Unit 6: Laboratory Practices

Unit 6.1 Synthesis con Cinnamic Acid. Use of Spectroscopic techniques

Unit 6.2 ArES. Synthesis of Martius Yellow

Unit 6.3 Synthesis of Knorr.

Unit 6.4 Chemistry of Milk. Proteins and Carbohydrates

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description

Class Attendance (theory) [ON-SITE]	Combination of methods	B01 B02 B03 B04 B05 EQ01 EQ02 EQ08 EQ11 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.92	23	Y	N
Laboratory practice or sessions [ON-SITE]		B01 B02 B03 B04 B05 EQ02 EQ03 EQ04 EQ08 EQ11 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.8	20	Y	Y
Workshops or seminars [ON-SITE]	Combination of methods	B01 B02 B03 B04 B05 EQ01 EQ02 EQ08 EQ11 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.52	13	Y	N
Study and Exam Preparation [OFF-SITE]	Problem solving and exercises	B01 B02 B03 B04 B05 EQ01 EQ02 EQ03 EQ04 EQ08 EQ11 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	2.07	51.75	Y	N
Study and Exam Preparation [OFF-SITE]	Assessment tests	B01 B02 B03 B04 B05 EQ01 EQ02 EQ03 EQ04 EQ08 EQ11 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	1.53	38.25	Y	N
Mid-term test [ON-SITE]	Combination of methods	B01 B02 B03 B04 B05 EQ01 EQ02 EQ03 EQ04 EQ08 EQ11 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.16	4	Y	N
Total:			6	150		
Total credits of in-class work: 2.4			Total class time hours: 60			
Total credits of out of class work: 3.6			Total hours of out of class work: 90			

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Test	70.00%	70.00%	
Laboratory sessions	20.00%	20.00%	
Assessment of active participation	10.00%	10.00%	
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	23
Laboratory practice or sessions [PRESENCIAL][]	20
Workshops or seminars [PRESENCIAL][Combination of methods]	13
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	51.75
Study and Exam Preparation [AUTÓNOMA][Assessment tests]	38.25
Mid-term test [PRESENCIAL][Combination of methods]	4
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	23
Laboratory practice or sessions [PRESENCIAL][]	20
Workshops or seminars [PRESENCIAL][Combination of methods]	13

Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	51.75
Study and Exam Preparation [AUTÓNOMA][Assessment tests]	38.25
Mid-term test [PRESENCIAL][Combination of methods]	4
Total horas:	150

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Carey, Francis A.	Organic chemistry	McGraw-Hill		0-07-115148-6	2003	
Carey, Francis A.	Química orgánica	McGraw Hill		970-10-5610-8	2006	
Carey, Francis A.	Química orgánica	McGraw-Hill		84-481-2426-X	1999	
Hesse, M., Meier, H., Zeeh, B.	Métodos Espectroscópicos en Química Orgánica	Ed. Síntesis		9788477385226	2005	
VOLLHARDT, K. Peter C.	Organic Chemistry	W. H. Freeman and Company		0-7167-1786-7	1987	
Vollhardt, K. Peter C.	Química Orgánica	Omega		84-282-0882-4	1990	
Carey, Francis A.	Organic chemistry	McGraw-Hill		0-07-009831-X	1987	
Vollhardt, K. Peter C.	Química orgánica	Omega		84-282-0882-4	1994	
Vollhardt, K. Peter C.	Química orgánica	Omega		84-282-1006-3	1995	
Vollhardt, K. Peter C.	Química orgánica : estructura y función	Omega		84-282-1172-8	2000	
Vollhardt, K. Peter C.	Química orgánica : estructura y función	Omega		978-84-282-1431-5	2007	
Yurkanis, P.	Química Orgánica	Pearson		9789702607915	2007	Acceso on line libre para alumnos
	La editorial Digitalia tiene varios libros de Química Orgánica http://www.digitaliapublishing.com/					
VOLLHARDT, K. Peter C.	Química orgánica	Omega		84-282-1006-3	1995	
Vollhardt, K. Peter C.	Organic chemistry	W. H. Freeman and Company		0-7167-2010-8	1994	
Vollhardt, K. Peter C.	Organic chemistry : structure and function	W. H. Freeman and Company		0-7167-2721-8	1998	Acceso on line libre para alumnos
	La editorial Pearson tiene varios libros de Química Orgánica http://www.conten.es/ib/NPortada?CodPortada=1000188					