Universida_{de}Vigo

Subject Guide 2020 / 2021

DENTIFYING DATA Organic chemistry III Subject Organic chemistry III III Code Y116200V01704 Study Y16200V01704 Study Y16200V01704 Study Y16200V01704 Study Y16200V01704 Study Y16200V01704 Study Y16200V01704 Descriptor ECTS Creditis Descriptor ECTS Creditis Opartment Ecching Students And Rodifylez, Rosna Ecching Fail Diop, Yaganare Morifylez Mordiguez, Obardez, Emilia Ecching E-mail qolerageuylop.es Web Ecching Conce Ecching Assupportanon regio- and stereselectivityl.	<i>*</i>			Jub	
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record them in a consistent and reliable way			emical properties,	events or change	s, and document and
	record	them in a consistent and reliable way			

C28 Interpret data derived from laboratory observations and measurements in terms of their significance and relate them to the appropriate theory

D1	Communicate orally and in writing in at least one of the official languages of the University			
D3	Learn independently			
D4	Search and manage information from different sources			
D5	Use information and communication technologies and manage basic computer tools			
D7	Apply theoretical knowledge in practice			
D8	Teamwork			
D9	Work independently			
D13	Make decisions			
D14	Analyze and synthesize information and draw conclusions			
D15	Evaluate critically and constructively the environment and oneself			
D18	Generate new ideas and show initiative			
Lea	rning outcomes			
Expe	ected results from this subject	Tra	5	nd Learning sults
1 R	ecognise structural elements in organic molecules	Δ2	C2	1ם

1. Recognise structural elements in organic molecules.	A2	C2 C11 C12 C13 C23 C24	D1 D3 D7 D9 D13 D14 D18
2. Propose retrosynthetic sequences of target molecules.	A1 A2 A5	C2 C11 C12 C13 C24	D1 D3 D4 D5 D7 D9 D13 D18
3. Analyse alternative retrosynthetic proposals.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24	D1 D3 D4 D5 D7 D9 D13 D18
4. Design synthetic sequences to target molecules.	A1 A2 A5	C2 C10 C11 C12 C13 C20	D1 D3 D4 D5 D7 D9 D13 D18
5. Value the use of structure-simplifying reactions.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24	D1 D3 D4 D7 D9 D13 D14 D18
6. Recognise relationships between functional groups of target molecules.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24	D1 D3 D4 D7 D9 D13 D18

7. Use properly the functional groups interconversions.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24	D1 D3 D4 D5 D7 D9 D13 D14 D18
8. Propose synthesis of carbocyclic and heterocyclic compounds.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24 C25 C26 C27 C28	D1 D3 D4 D7 D9 D13 D14 D18
9. Know the reactivity of heterocyclic compounds.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24 C26 C27 C28	D1 D3 D4 D7 D9 D13 D14 D18
10. Know the reactions that can provide selectivity (chemo-, regio- and stereoselectivity) in chemical transformations.	A1 A2 A5	C2 C10 C11 C12 C13 C19 C20 C24	D1 D3 D4 D5 D7 D8 D9 D13 D14 D18
11. Handle appropriately the disconnections between unsaturated fragments.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24	D1 D3 D4 D5 D7 D9 D13 D14 D18
12. Evaluate and propose the use of protective groups in organic synthesis.	A1 A2 A5	C2 C10 C11 C12 C13 C20 C24	D1 D3 D4 D7 D9 D13 D14 D18
13. Recognise and value the importance of organic synthesis in the advancement of society.	A2 A4 A5	C23	D15
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COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . i. Carbanions stabilised by phosphorous: Wittig and HWE reactions. ii. Carbanions stabilised by silicon: Peterson reaction. iii. Carbanions stabilised by sulphur: Julia reaction. iv. Claisen rearrangement. v. Olefin metathesis. 6.2. Palladium-catalyzed reactions. i. Heck reaction. ii. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. i. Cyclization reactions. The Thorpe-Ingold effect. ii. Baldwin Rules. iii. Formation of carbocyclic compounds. 7.2. Formation of heterocyclic compounds. i. (3+2) Cycloadditions. ii. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds. 7.4. Topological strategies in Retrosynthetic Analysis.
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D-	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . Carbanions stabilised by phosphorous: Wittig and HWE reactions. Carbanions stabilised by sulphor: Peterson reaction. Carbanions stabilised by sulphur: Julia reaction. Carbanions stabilised by sulphur: Julia reaction. Claisen rearrangement. Olefin metathesis. Palladium-catalyzed reactions. Heck reaction. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. Cyclization reactions. The Thorpe-Ingold effect. Baldwin Rules. Formation of carbocyclic compounds. (3+2) Cycloadditions. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds.
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D- glucopyranoside pentaacetate	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . i. Carbanions stabilised by phosphorous: Wittig and HWE reactions. ii. Carbanions stabilised by silicon: Peterson reaction. iii. Carbanions stabilised by sulphur: Julia reaction. iv. Claisen rearrangement. v. Olefin metathesis. 6.2. Palladium-catalyzed reactions. i. Heck reaction. ii. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. i. Cyclization reactions. The Thorpe-Ingold effect. ii. Baldwin Rules. iii. Formation of carbocyclic compounds. 7.2. Formation of heterocyclic compounds. i. (3+2) Cycloadditions. ii. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds. 7.4. Topological strategies in Retrosynthetic Analysis.
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D-	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . Carbanions stabilised by phosphorous: Wittig and HWE reactions. Carbanions stabilised by silicon: Peterson reaction. Carbanions stabilised by sulphur: Julia reaction. Carbanions stabilised by sulphur: Julia reaction. Claisen rearrangement. Claisen rearrangement. Olefin metathesis. Palladium-catalyzed reactions. Heck reaction. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. Cyclization reactions. The Thorpe-Ingold effect. Baldwin Rules. Formation of carbocyclic compounds. (3+2) Cycloadditions. Condensation of dicarbonyl compounds. T.3. Properties and reactivity of aromatic heterocyclic compounds. A. Topological strategies in Retrosynthetic Analysis.
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D-glucopyranoside pentaacetate LAB EXPERIMENT 2. Preparation of b-D-	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . Carbanions stabilised by phosphorous: Wittig and HWE reactions. Carbanions stabilised by silicon: Peterson reaction. Carbanions stabilised by sulphur: Julia reaction. Carbanions stabilised by sulphur: Julia reaction. Claisen rearrangement. Claisen rearrangement. Olefin metathesis. Palladium-catalyzed reactions. Heck reaction. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. Cyclization reactions. The Thorpe-Ingold effect. Baldwin Rules. Formation of carbocyclic compounds. (3+2) Cycloadditions. Condensation of dicarbonyl compounds. T.3. Properties and reactivity of aromatic heterocyclic compounds. A. Topological strategies in Retrosynthetic Analysis.
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D-glucopyranoside pentaacetate LAB EXPERIMENT 2. Preparation of b-D-glucopyranoside pentaacetate LAB EXPERIMENT 3. Reactivity of dimethylsulfoxonium methylide with conjugated	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . Carbanions stabilised by phosphorous: Wittig and HWE reactions. Carbanions stabilised by silicon: Peterson reaction. Carbanions stabilised by sulphur: Julia reaction. Carbanions stabilised by sulphur: Julia reaction. Claisen rearrangement. Olefin metathesis. Palladium-catalyzed reactions. Heck reaction. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. Cyclization reactions. The Thorpe-Ingold effect. Baldwin Rules. Formation of carbocyclic compounds. (3+2) Cycloadditions. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds. T.4. Topological strategies in Retrosynthetic Analysis. One session
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D-glucopyranoside pentaacetate LAB EXPERIMENT 2. Preparation of b-D-glucopyranoside pentaacetate LAB EXPERIMENT 3. Reactivity of dimethylsulfoxonium methylide with conjugated and nonconjugated carbonyl compounds:	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . Carbanions stabilised by phosphorous: Wittig and HWE reactions. Carbanions stabilised by silicon: Peterson reaction. Carbanions stabilised by sulphur: Julia reaction. Carbanions stabilised by sulphur: Julia reaction. Claisen rearrangement. Olefin metathesis. Palladium-catalyzed reactions. Heck reaction. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. Cyclization reactions. The Thorpe-Ingold effect. Baldwin Rules. Formation of carbocyclic compounds. (3+2) Cycloadditions. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds. T.4. Topological strategies in Retrosynthetic Analysis. One session
COMPOUNDS 7. FORMATION AND REACTIVITY OF CYCLIC COMPOUNDS. TOPOLOGICAL STRATEGIES LAB EXPERIMENT 1. Preparation of a-D-glucopyranoside pentaacetate LAB EXPERIMENT 2. Preparation of b-D-glucopyranoside pentaacetate LAB EXPERIMENT 3. Reactivity of dimethylsulfoxonium methylide with conjugated	 5.3. Disconnections based in chiral fragments. 6.1. Stereoselective olefin synthesis . Carbanions stabilised by phosphorous: Wittig and HWE reactions. Carbanions stabilised by silicon: Peterson reaction. Carbanions stabilised by sulphur: Julia reaction. Carbanions stabilised by sulphur: Julia reaction. Claisen rearrangement. Olefin metathesis. Palladium-catalyzed reactions. Heck reaction. Stille, Negishi and Suzuki cross-coupling. 7.1. Formation of saturated carbocyclic and heterocyclic compounds. Cyclization reactions. The Thorpe-Ingold effect. Baldwin Rules. Formation of carbocyclic compounds. (3+2) Cycloadditions. Condensation of dicarbonyl compounds. 7.3. Properties and reactivity of aromatic heterocyclic compounds. T.4. Topological strategies in Retrosynthetic Analysis. One session

LAB EXPERIMENT 4. Microwave-assisted Diels-	One session		
Alder reaction			
LAB EXPERIMENT 5. Preparation of an Ionic	Two sessions		
Liquid. Application in the synthesis of coumarines			
LAB EXPERIMENT 6. Suzuki reaction in water	One session		
LAB EXPERIMENT 8. Total synthesis of a natural	Four sessions		
product: caffeic acid phenethyl ester (CAPE)			

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	26	49	75
Laboratory practical	45.5	32.5	78
Lecturing	13	17	30
Problem and/or exercise solving	3	27	30
Essay questions exam	2	10	12
*The information in the planning table is fo	r guidance only and does no	t take into account the het	erogeneity of the students.

Methodologies	
	Description
Seminars	In this activity, which is scheduled to take place twice a week, the most complex topics of the subject will be discussed, and the exercises and problems previously proposed by the teaching staff will be solved.
	These seminars will be teached taking into consideration the health and distance recommendation provided by the National Institute of Health (INS). When the capacity of the classrooms do not allow the students to be present, they will be teached on line using the teaching resources available in FAITIC and also the virtual offices.
Laboratory practical	Each student will plan and execute the corresponding lab experiments in sessions lasting 3.5 hours. The students will be provided with the explanation of the lab session by the teaching staff. All the observations, calculations and notes for every experiment will be collected in a lab notebook, which will also include the discussion of the questions posed in the experiment description as well as the spectroscopic characterization of the synthesized compounds.
Lecturing	The teaching staff will explain the general contents of the course paying particular attention to those considered key topics and of the greater difficulty. In anticipation of each master session, all the handouts and presentations will be made available in the TEMA teaching platform for downloading by the students.

Personalized assistanc	e
Methodologies	Description
Lecturing	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the course syllabus, informing beforehand about his/her availability.
Seminars	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the course syllabus, informing beforehand about his/her availability.
Laboratory practical	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the laboratory practice, paticularly in the lab sessions and beforhand.
Tests	Description
Problem and/or exercise solving	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the short answer tests, informing beforehand about his/her availability. In addition, short answer test exams from previous years will be solved in seminars before the official tests take place.
Essay questions exam	The teaching staff will devote the necessary time to solve the requests and questions raised by the students related to the long answer tests, informing beforehand about his/her availability. In addition, long answer test exams from previous years will be solved in seminars before the official tests take place.

Assessment			
Des	scription	Qualification	Training and
			Learning
			Results

Seminars	The resolution of problems and questions posed in the seminar classes, as well as the homework carried out by the students in those tasks of personal work entrusted by the teachers will be valued. Results of the learning: All the indicated, since the seminars will take place along the course.	20	A2 A4		D4 D5 D7 D8 D9 D13 D14 D15
Laboratory practical	 1 The work carried out in the laboratory: the assistance to each one of the sessions is compulsory. The attitude and skill of the student in the laboratory and the interpretation of the mechanisms and spectra will be valued. 2 The laboratory notebook. 3 Written exam: it will consist on theoretical and practical questions related to the lab experiments. It will take place in the official dates established by the Faculty. To pass the lab course it is mandatory to have passed each one of the three parts evaluated. Those students who passed the lab course in the academic year 2014-2015 are entitled to keep that grade in the present academic year. In the extraordinary exam the student will answer the written examination and will deliver a new laboratory notebook if required, keeping the qualifications obtained during the course in the others parts of the subject. Results of the learning: Recognise structural elements in the organic molecules. Design alternative synthetic sequences. Handle reactions of functional groups interconversions. Propose synthesis of carbo- and heterocyclic molecules. 	30	A2	C25 C26 C27 C28	D18
	 Recognise selective reactions. Recognise the importance of organic synthesis to the advancement of 				
	society.		—		
	A short answer exam will be carried out (10%).	10		C2	D1
exercise solving	9 Results of the learning: 1. Recognise structural elements of organic molecules.			C10 C11	
	2. Propose retrosynthetic sequences.		AJ	C12	
	3. Analyse alternative retrosynthetic proposals.			C12	
	4. Value the use of structurally-simplifying reactions.			C20	
	5. Recognise relationships between functional groups.				D13
	6. Use properly functional groups interconversion reactions.				D14
Essay questions exam	 A global proof for the evaluation of the competitions acquired in the subject. For passing the subject the students will have to obtain a minimum of 50% in the written proofs (short and long answer). Therefore, the qualification of the remaining parts will only be added when the grade obtained in overall written proofs is equal or higher than two and a half points. Results of the learning: Recognise structural elements of organic molecules. Propose retrosynthetic sequences. Analyse alternative retrosynthetic proposals. Value the use of structurally-simplifying reactions. Recognise relationships between functional groups. Use properly functional groups interconversion reactions. Propose synthesis of carbo- and heterocyclic molecules. Know the reactivity of heterocyclic compounds. Know selective reactions. Know the use of protective groups in organic synthesis. 	40	A4	C12 C13 C19 C20 C23 C24 C25	D18 D1 D3 D4 D5 D7

Other comments on the Evaluation

The participation of the students in any of the acts of evaluation of the subject will involve that they purchase the condition of "presented" and, therefore, they will have assigned a qualification. Acts of evaluation are considered the assistance to the classes of laboratory (three or but sessions), the realisation of the written exams and the handling of a minimum of 25% of the homework assigned by the teaching staff.

Evaluation of the July call:

>1) Grade obtained by the students during the course: maximum of 4 points, divided in the qualification obtained by the students along the course in the resolution of the problems, homework, etc (maximum of 1 point) and the realisation of the laboratory exams (maximum of 3 points).

2) Work carried out by the students: maximum of 1,5 points

for the resolution and handling of the exercises proposed by the teaching staff after the evaluation of January, that will be oriented to the acquisition of the necessary knowledge to pass the matter. This work will be handled in advance to the official date of the exam.

3) Written Tests: maximum of 4,5 points, which will evaluate the knowledge of the matter.

Sources of information	
Basic Bibliography	
Complementary Bibliography	
Warren, S.; Wyatt, P., Organic Synthesis: The Disconnection Approach, 2nd, Wiley, 2008	
Wyatt, P.; Warren, S., Organic Synthesis: Strategy and Control, 1st, Wiley, 2008	
Zweifel, G. S.; Nantz, M. H., Modern Organic Synthesis: An Introduction, 1st, W H Freeman, 2007	
Clayden, J.; Greeves, N.; Warren, S., Organic Chemistry, 2nd, Oxford University Press, 2012	
Starkey, L. S., Introduction to strategies for organic synthesis, 1st, Wiley, 2012	

Recommendations

Subjects that continue the syllabus Pharmaceutical chemistry/V11G200V01903

Subjects that it is recommended to have taken before

Structural Determination/V11G200V01501 Organic chemistry II/V11G200V01504

Contingency plan

Description

Adaptation of methodologies:

1) Teaching methodologies will be adapted according to the telematic resources available to teachers, in addition to the documents provided by FAITIC and other platforms, e-mail, etc. Personal interviews will take place upon request via the virtual office of professors or Campus Remoto.

2) Adaptation of evaluation:

The evaluation criteria will be maintained without changes, and the probes will be carried out using the available telematic resources.