Last update: 02-07-2019

230458 - QOB - Organic Chemistry and Biochemistry

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: MONTSERRAT GARCIA ALVAREZ

Others: JOSÉ IGNACIO IRIBARREN LACO

Degree competences to which the subject contributes

Specific:

1. Knowledge of the chemistry laws. Knowledge of the main chemical methods of producing materials and nanomaterials. Ability to conduct and analyze basic chemical reactions.
2. Knowledge of the organic chemistry basis and their use in the production of complex materials and biological systems. Ability to develop the activity in a chemistry lab and produce compounds and/or materials.

Generical:

3. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.

Transversal:

2. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
1. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
4. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

Teaching methodology

Inside class: 2,6 ECTS. Seminal classes (theory + seminars) with the participation of the student. Homework (individual and/or team). Tutorial.
Outside class: 3,4 ECTS. Exercises and projects (theory or seminars).

Learning objectives of the subject

- Justify the reactivity of the main organic functional groups.
- Define and explain the diferent basic biochemical functions that allows life to exist.
- Characterize chemical compounds with the most common structural identification techniques.

Last update: 02-07-2019

230458 - QOB - Organic Chemistry and Biochemistry

Study load

Total learning time: 150h	Hours large group:	65h	43.33%
	Self study:	85h	56.67%

Last update: 02-07-2019

230458 - QOB - Organic Chemistry and Biochemistry

Content

1. INTRODUCTION TO ORGANIC COMPOUNDS

Learning time: 20h

Theory classes: 8h
Guided activities: 4h
Self study : 8h

Description:
Bonds in organic compounds. Lewis theory. Resonant structures. Formal charges. intermolecular forces in organic compounds. Functional groups. Reaction intermediates. electronic effects. Classification of organic reactions.

2. ISOMERISM AND STEREOISOMERISM

Learning time: 16h

Theory classes: 6h
Guided activities: 4h
Self study : 6h

Description:
Type of isomers. Structural isomers. Stereoisomers. Enantiomers. Racemic mixtures. Optical activity. Configuration of chiral centers. Absolute and relative configurations. Diastereoisomers. Carbohydrates: The glyceraldehyde. Monosaccharides, disaccharides and polysaccharides.

3. ALKANES AND CYCLOALKANES

Learning time: 10h

Theory classes: 4h
Guided activities: 2h
Self study : 4h

Description:
Characteristics and structure of alkanes. Conformational analysis. Newman projections. Chemical properties. Halogenation of alkanes. Combustion processes.

4. ALKENES AND ALKYNES

Learning time: 8h

Theory classes: 4h
Self study : 4h

Description:
Nomenclature, structure and physical properties. Obtaining alkenes and alkynes. Addition reactions to double and triple bond. Hydrogenation. Dienes. Oxidation and combustion. metal salts of alkynes. Ethylene and acetylene.

230458 - QOB - Organic Chemistry and Biochemistry

5. AROMATIC HYDROCARBONS	Learning time: 6h Theory classes: 3h Self study : 3h

Description:
Nomenclature, structure and physical properties. Procurement processes. Aromatic substitution reactions. Effect of substituents. Oxidation and combustion. Arens.

6. HALOGENATED	Learning time: 8h Theory classes: 4h Self study : 4h

Description:
Features and halogenated structure. alkyl halides. Physical and chemical properties. Nucleophilic substitution reactions. Elimination reactions. Organo-metallic compounds.

7. ALCOHOLS, PHENOLS AND ETHERS	Learning time: 10h Theory classes: 4h Guided activities: 2h Self study : 4h

Description:
Nomenclature, structure and physical properties. natural products and procurement processes. chemical reactions of hydroxylated compounds. Dehydration of Alcohols. Acid-base characteristics. Ethers. Ethanol and phenol.

8. COMPOUNDS CARBONYL. ALDEHYDES AND KETONES	Learning time: 10h Theory classes: 4h Guided activities: 2h Self study : 4h

Description:
Structural characteristics of carbonyl compounds. Physical properties. Formation of acetals and hemiacetals. Keto-enol tautomerism. Aldol condensation. Redox reactions.

230458 - QOB - Organic Chemistry and Biochemistry

9. CARBOXYLIC ACIDS AND DERIVATIVES	Learning time: 10h Theory classes: 4h Guided activities: 2h Self study : 4h

Description:
Acidity. Physical properties. Carboxylic acid chlorides, acid anhydrides, esters, amides. Reactivity of esters. Saponification and hydrolysis reactions. Reactivity of amides. Reduction, formation of nitriles. Lipids: fatty acids. Amino acids and proteins.

10. AMINES AND RELATED NITROGEN COMPOUNDS	Learning time: 10h Theory classes: 4h Guided activities: 2h Self study : 4h

Description:
Features and structure. Physical properties. Acid-base, redox, peroxide formation. Type amines. Features and structure. Physical properties. Acid-base characteristics.
Nucleic acids: nitrogenous bases.

11. SPECTROSCOPY AND STRUCTURAL DETERMINATION	Learning time: 22h Theory classes: 12h Guided activities: 2h Self study : 8h

Description:
Structural determination by spectroscopic techniques. Fundamentals of spectroscopy: Electromagnetic spectrum. Infrared spectroscopy. Nuclear magnetic resonance spectroscopy.

Qualification system

Qualification will include a final exam (EF) and continuous evaluation including a mid-semester exam (EP) and the participation of the student in seminar classes (P). The final qualification will be calculated as follows: max{EF, 0.65*EF + 0.30*EP + 0.05*P}

Last update: 02-07-2019

230458 - QOB - Organic Chemistry and Biochemistry

Bibliography

Basic:

Vollhardt, K.P.C. Química orgánica. 5a ed. Barcelona: Omega, 2008. ISBN 9788428214315.

Solomons, T.W.G. Fundamentos de química orgánica. 2a ed. México: Limusa, 1995. ISBN 9789681850074.

Nelson, D.L. Lehninger principios de bioquímica. 6a ed. Barcelona: Omega, 2015. ISBN 9788428216036.