

Course guide

370002 - QUIMICA - Chemistry for Vision Sciences

Last modified: 19/03/2024

Unit in charge: Terrassa School of Optics and Optometry
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN OPTICS AND OPTOMETRY (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Joan Torrent Burgués (<http://futur.upc.edu/JuanTorrentBurgues>)

Others: Ramon Portés, Eva
Ivanova, Kristina Dimitrova
Pere Garriga Solé (<http://futur.upc.edu/PereGarrigaSole>)

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE05. (ENG) The ability to understand the structure of matter, the chemical processes of solutions and the structure, properties and reactivity of organic compounds. The ability to understand the composition and structure of the molecules that make up living beings. The ability to understand the transformation of certain biomolecules into others. The ability to study the molecular basis of the storage and expression of biological information. The ability to apply biochemical knowledge to the eye and the process of vision.

CE07. (ENG) The ability to understand and manage basic laboratory materials and techniques.

CE11. Describe the physical and chemical properties of the materials used in the field of optics and optometry.

Generical:

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CG16. Participate effectively in both single-discipline and multidisciplinary work groups on projects related to optometry.

Transversal:

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT3. Teamwork. To be able to work as a member of a multidisciplinary team, either as a base member or undertaking managerial decisions aiming at developing projects from a practical and responsible standpoint, adopting commitments given the available resources

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

11. Understanding the chemical processes in aqueous solution.
12. Being able to relate the structure with the properties of inorganic and organic compounds and biomolecules.
13. Being able to use basic laboratory equipment and techniques and to take, represent and interpret experimental data. rimentales.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Hours medium group	45,0	30.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. Presentation. Basic concepts. Stoichiometry. Solutions

Description:

Description:

First, a presentation of the subject in which he speaks to students of the course objectives, the program of the lectures, seminars and practical. Shows the system of assessment and communication as will teachers - students so that they get all the information on the subject.

This was tackled Theme 1:

- Structure of atoms. Atomic number and atomic mass.
- Isotopes. Natural atomic mass.
- Molecules. Molecular formula. Molecular mass. Formula weight.
- Mol. Avogadro's number.
- Ions. State or oxidation number.
- Chemical reactions: chemical equation. Matching chemical equations.
- Stoichiometric ratio and stoichiometric ratio. Stoichiometric calculations.
- Solutions as chemical reagents, concentration units. Preparation of solutions. Solubility. Neutralizations

Full-or-part-time: 22h

Practical classes: 3h

Laboratory classes: 5h

Self study : 14h



2. Ionic equilibria in aqueous solution

Description:

This content is working Theme 2:

- Acid-base equilibria. Acidity and basicity constants.
- PH buffer solutions. Predominant species in solution.
- Curves of acid-base titration.
- Redox processes. Galvanic cells.
- Potential for a battery.
- Electrode potential. Metal corrosion.
- Electrolysis.

Full-or-part-time: 26h

Practical classes: 7h

Laboratory classes: 3h

Self study : 16h

3. Atomic and molecular structure. Covalent bond

Description:

content english

Full-or-part-time: 23h

Practical classes: 9h

Laboratory classes: 2h

Self study : 12h

title english

Description:

Theme 5. Organic compounds. Organic formulation.

- Introduction to organic compounds. The carbon atom.
- Formulation and nomenclature of hydrocarbons.
- Formulation and nomenclature of compounds with functional groups.
- Polymers and Biopolymers.

Theme 6. Isomerism.

- Concept and type of isomerism.
- Structural isomerism: string, position, function.
- Stereoisomerism: geometric optics.
- Conformational analysis.

Full-or-part-time: 32h

Practical classes: 13h

Laboratory classes: 1h

Self study : 18h



5. INTERMOLECULAR FORCES. STATES OF MATTER. PHYSICAL PROPERTIES

Description:

Tema 7. Fuerzas intermoleculares. Estados de agregación de la materia. Propiedades físicas.

- Estados de agregación de la materia. Cambios de estado.
- Tipos de fuerzas intermoleculares.
- Tipo de sustancias según las fuerzas de interacción entre las partículas.
- Comparación de las propiedades físicas entre compuestos orgánicos.

Full-or-part-time: 16h

Practical classes: 5h

Laboratory classes: 1h

Self study : 10h

6. ORGANIC REACTIONS

Description:

Theme 8. Organic reactions.

- Acidity and basicity of organic compounds.
- Structure and Reactivity.
- Nature of organic reactions. Nucleophilic and electrophilic reagents.
- Classification of organic reactions.
- Substitution reactions.
- Addition reactions.
- Reactions of elimination.
- Condensation Reactions.
- Polymerization.
- Organic reactions of oxidation-reduction.

Related activities:

Practice 5. Acid -basic titration.

Practice 6. Physical properties and chemical reactions of organic compounds.

Final test.

Laboratory test.

Full-or-part-time: 19h

Practical classes: 4h

Laboratory classes: 3h

Self study : 12h

7. BIOMOLECULES

Description:

Theme 9. Biomolecules.

- Carbohydrates.
- Lipids.
- Amino acids, peptides and proteins.
- Nucleic acids.

Full-or-part-time: 12h

Practical classes: 4h

Self study : 8h



ACTIVITIES

name english

Related competencies :

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CE11. Describe the physical and chemical properties of the materials used in the field of optics and optometry.

CE07. (ENG) The ability to understand and manage basic laboratory materials and techniques.

CE05. (ENG) The ability to understand the structure of matter, the chemical processes of solutions and the structure, properties and reactivity of organic compounds. The ability to understand the composition and structure of the molecules that make up living beings. The ability to understand the transformation of certain biomolecules into others. The ability to study the molecular basis of the storage and expression of biological information. The ability to apply biochemical knowledge to the eye and the process of vision.

Full-or-part-time: 14h

Practical classes: 14h

name english

Related competencies :

CG16. Participate effectively in both single-discipline and multidisciplinary work groups on projects related to optometry.

CE07. (ENG) The ability to understand and manage basic laboratory materials and techniques.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT3. Teamwork. To be able to work as a member of a multidisciplinary team, either as a base member or undertaking managerial decisions aiming at developing projects from a practical and responsible standpoint, adopting commitments given the available resources

Full-or-part-time: 14h

Laboratory classes: 14h

name english

Full-or-part-time: 1h

Practical classes: 1h

name english

Full-or-part-time: 1h

Laboratory classes: 1h

name english

Full-or-part-time: 2h
Practical classes: 2h

name english

Full-or-part-time: 1h
Practical classes: 1h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

- Atkins, Peter William; Jones, Loretta. Principios de química: los caminos del descubrimiento. 5ª ed. Buenos Aires: Médica Panamericana, 2012. ISBN 9789500602822.
- Chang, Raymond. Principios esenciales de química general. 4ª ed. Madrid: McGraw-Hill, 2006. ISBN 8448146263.
- Blei, Ira; Odian, George. General, organic, and biochemistry : connecting chemistry to your life. 2nd ed. New York: W. H. Freeman, 2006. ISBN 0716743752.
- Torrent Burgués, Joan; Gaus Guerrero, Esther. Cuestiones de química. Barcelona: Edicions UPC, 1993. ISBN 8476533314.
- Sales i Cabré, Joaquim; Vilarrasa i Llorens, Jaume. Introducció a la nomenclatura química : inorgànica i orgànica [on line]. 5a ed. Barcelona [etc.]: Reverté, cop. 2003 [Consultation: 13/05/2022]. Available on: <https://web-s-ebshost-com.recursos.biblioteca.upc.edu/ehost/ebookviewer/ebook?sid=d84e14f8-67fa-41be-8279-eb8a5251067f%40redis&vid=0&format=EB>. ISBN 8429175512.
- Bell, Jerry [et al.]. Química : un proyecto de la American Chemical Society [on line]. Barcelona: Reverté, cop. 2005 [Consultation: 06/05/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8079. ISBN 8429170014.
- Peterson, W. R. Nomenclatura de las sustancias químicas [on line]. 4a. Barcelona: Reverté, 2016 [Consultation: 06/05/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5635463>. ISBN 9788429176087.
- Petrucci, Ralph H. Química general : principios y aplicaciones modernas [on line]. Undécima edición. Madrid: Pearson Prentice Hall, 2017 [Consultation: 06/05/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6751. ISBN 9788490355336.

RESOURCES

Other resources:

- Links to websites
- UPC Video Library of the Resource Group for the Teaching of Chemistry, teaching materials:
- Audiovisual materials showing basic procedures in the chemistry laboratory <http://upcommons.upc.edu/video/handle/2099.2/1241> />
- Audiovisual materials on safety in the chemistry laboratory: <http://upcommons.upc.edu/video/handle/2099.2/1240> />
- Website on laboratory equipment: <http://descartes.upc.es/adminmat/grediq/> />
- UPC Audiovisual Support Material, video organic reactions: <https://www.youtube.com/watch?v=JNmxX8IXo1Y> />
- MOOC ELI