VNIVERSITAT DE VALÈNCIA

Course Guide
34290 Optical materials

COURSE DATA

Data Subject	
Code	34290
Name	Optical materials
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1207 - Degree in Optics and Optometry	Faculty of Physics	1	Second term

Subject-matter

Degree	Subject-matter	Character
1207 - Degree in Optics and Optometry	6 - Chemistry	Basic Training

Coordination

Name	Department
MELLO CENTONZE, ROSSELLA CECILIA	325 - Organic Chemistry

SUMMARY

Optical Materials The course is a basic training course mandatory quarterly taught in the first degree course in Optometry. The curriculum consists of a total of 6 ECTS. This course is intended for students to delve into those skills acquired in Chemistry Baccalaureate courses and, in some respects, to complete. Such knowledge and skills essential to lay the foundation for the student to subsequently address the study of the various branches of the field of materials and especially the organic optical materials that are based on polymeric materials. Being integrated in the course of Optometry degree approach to study chemical concepts, should be geared specifically toward organic optical materials. The course has a theoretical character. The basic lines contained in the program of the course is organized around the fundamental concepts in organic chemistry. In particular it is intended that the student is familiar with the concepts of structure, bond, nomenclature and isomerism and intermolecular forces. Who knows the principles governing the kinetic and thermodynamic aspects of chemical transformation, to understand the effects that influence the stability of organic reactional intermediate draw energy profiles of these reactions, delving into those involved in polymerization processes. You know those aspects of the structure, link, basic properties and reactivity of organic molecules of particular relevance to the manufacture of organic optical materials with polymeric structures and their use as ophthalmic materials.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is assumed that students know and use, basic but clear manner, the concepts taught in the final year of high school chemistry, especially:
Chemical Nomenclature and Formulation of organic compounds.
Adjustment of chemical reactions.
Identification of acid-base character of organic compounds.
However, teaching materials will be provided to cover those deficiencies are detected.

OUTCOMES

1207 - Degree in Optics and Optometry

- Knowing how to apply the knowledge acquired to professional activity, knowing how to solve problems and develop and defend arguments.
- Being able to transmit information, ideas, problems and solutions to both a specialized and non-specialized audience.
- Development of learning skills necessary to undertake further studies with a high degree of autonomy.
- To know the structure of matter, the chemical processes of dissolution and the structure, properties and reactivity of organic compounds.
- To know the physical and chemical properties of the materials used in optics and optometry.

LEARNING OUTCOMES

Describe basic aspects associated with the formation of covalent (single or multiple) in molecular organic.
Draw Lewis structures of neutral and charged organic species, asking whether or not satisfy the octet rule, identifying possible structures resonance forms and saying, if there are several possible structures, which is the most stable through the application of the rules of prioritizing nonequivalent resonant structures.
Predict the molecular geometry.
Describe the basic elements of the model of localized covalent bond and the concept of hybrid orbital.
Identify the type of hybridization in organic molecules and the type of bond they have.
Justify and predict the polarity and the dipole moment of diatomic and polyatomic organic molecules.
Obtain basic stereochemistry and distinguish between constitutional and configurational isomers (geometric and optical isomerism)
Identify the different functional groups in organic molecules.
Derive some properties of organic molecules based on the structure of the functional group containing

structure within the relationship ----- properties.
Identify various existing intermolecular forces (Van der Waals forces and hydrogen bonding)
Explain, from them, properties or phenomena of interest (states of aggregation, melting and boiling points, solubilities, etc. ...
Saber Name and formulate organic compounds: hydrocarbons (alkanes, alkenes, alkynes and aromatic), halogenated, oxygenates (alcohols, ethers, aldehydes, ketones, acids and esters) nitrogen (amines, amides and nitriles)
Appoint polyfunctional organic molecules.
Distinguishing between types of organic reactions from the mechanistic standpoint.
Addition reactions distinguish substitution, deletion and rearrangement.
Predict an oxidation-reduction (redox)
Acquire basic knowledge of thermodynamics and kinetics of organic reactions, and the representation of the energy profile of an organic process of one step or two steps.
Knowing the stability of the reaction intermediates (carbocations, carbanions and free radicals) and the effects that influence its stability.
Predicting the acid-base behavior of the organic molecules.
Understanding the concepts nucleophile-electrophile and its application to the reactivity in organic chemistry.
Enter the basic concepts and classification of polymers and their properties.
Distinguishing polymer structures and the relationship between structure and properties of the polymers.
Define the crystallinity of the polymers. Differentiate between the melting point (Tm) and glass transition phenomenon (Tg).

Defining the thermoplastic and thermoset polymers.
Enter different polymerization processes and mechanisms. (Addition cationic, anionic, free radical, condensation etc. ....
Knowing the materials of spectacle lenses and contact lenses: made of inorganic glass and organic materials
Acquire knowledge about the lens manufacturing process in series and organic materials for rigid contact lenses, and soft silicone.
Acquire knowledge about the properties and characteristics of the polymeric materials used for the manufacture of plastic frames.
Identify the metal frames and surface treatments.
In short: To acquire basic knowledge about the nature of organic and polymeric materials with special focus on materials with optical properties that manage and use the student in his professional life, as well as familiarize with the main methods of fabrication and characterization of these materials .

DESCRIPTION OF CONTENTS

1. STRUCTURE AND BONDS IN ORGANIC MOLECULES

Introduction. Functional groups: Classification of organic compounds. Representative of organic compounds. The structure of atoms: atomic orbitals.
The chemical bonding: ionic and covalent bonding. Lewis structures. Orbital hybridization. Links polarized. Intermolecular forces.

2. HYDRACARBONS

Alkanes. Structural isomerism and stereoisomerism. Alkenes. Alkynes. aromatic hydrocarbons

3. Oxygen-containing functional groups AND SULFUR.

Alcohols, Phenols, Ethers. Aldehydes and ketones. Carboxylic acids and derivatives.

4. Nitrogen-containing functional groups

Amines and nitriles.

5. INTRODUCTION TO organic reactions

Classification of organic reactions. Reaction mechanisms. Thermodynamics and kinetics of reactions. Reaction intermediates: carbocations, free radicals and carbanions. Nucleophilic and electrophilic reagents

6. STRUCTURE AND PROPERTIES OF ORGANIC POLYMERS

Introduction to polymer chemistry: Basics. Classification and properties of polymers. Polymeric structure. Relation between structure and properties of the polymers. Crystallinity of the polymers. Melting and glass transition phenomenon. Thermoplastic and thermoset polymers.

7. POLYMERIZATION REACTIONS. Polymer applications

Types polymerization reactions. Mechanisms of polymerization chain growth: radical reactions, anionic and cationic. Polymerization reactions with controlled stereochemistry. Stepwise growth polymerization of polyamides and polyesters, polyurethanes, polymers produced by condensation of formaldehyde, epoxy resins. Additives polymers.

8. OPTIC MATERIALS

Materials for spectacle lenses and contact lenses: inorganic glass. Organic materials: Types and properties of organic materials. Manufacturing process of organic lenses in series. Material for hard contact lenses, and soft silicone.
Materials mounts. Plastic Frames: Properties. Polymers for frames and features.
Metal frames: raw materials, metals and alloys. Surface treatments.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	50,00	100
Tutorials	10,00	100
Development of group work	10,00	0
Study and independent work	20,00	0
Readings supplementary material	10,00	0
Preparing lectures	30,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Clasroom activities
Theoretical and practical classes: classes modality (can be blended or modalities also include non-contact) which impart the theoretical content of the material. It will reinforce the use of audiovisual methodology, which more clearly exemplify the theoretical and examples to develop. Exercises will develop practical application of theoretical content.

Small Group Theory sessions: sessions are devoted to student group work, with suggested exercises to be analyzed and studied by the group. Interactivity will be sought through group presentations and classroom examples and accounted for continuous assessment.

Student Work
- Study of theoretical
- Development of work and issues raised in class
- Individual tutorials

EVALUATION

English version is not available

REFERENCES

Basic

- Principios de Química, P. ATKINS; L. JONES, PANAMERICANA, 2012

- Química General, R. H. PETRUCCI , PEARSON, 2013.
- Química Orgánica Básica y Aplicada (Tomos 1 y 2). Eduardo Primo Yúfera, REVERTÉ, 1994-5
- Química Orgánica, F.A. CAREY, MCGRAW HILL, 2006
- Química Orgánica, J. MCMURRY, CENGAGE LEARNING, 2008.
- Polímeros, J. AREIZAGA, SINTESIS, 2002.
- Introducción a la Química de los Polímeros, R.B. SEYMOUR, C.E. CARRAHER, JR. , REVERTÉ, 1995.

Additional

- Materiales Ópticos Orgánicos. Monturas y Lentes, A. NAVARRO SENTANYES, BARCELONA, 2007.
- Materiales Ópticos Inorgánicos. Propiedades de vidrios y metales para óptica, A. NAVARRO SENTANYES, TERRASSA, 2006.
- Lentes de contacto y su mantenimiento, A. NAVARRO SENTANYES, BARCELONA, 1999.
- Fundamentos de la Ciencia e Ingeniería de los Materiales. W. F.SMITH, J. HASHEMI, MCGRAW HILL, 2006.
- Superficie ocular y Biomateriales: Lentes de Contacto, A. LÓPEZ ALEMANY, ULLEYE, XÁTIVA, 2010.
- Tecnología Óptica, J. S. ARQUÉS, M. FRANSOY BEL, EDICIONS UPC, 2001.
- ChemBioOffice Ultra, PerkinElmer (CambridgeSoft). Amplia selección de aplicaciones y funcionalidades que permite estudiar, dibujar, formular, modelar y editar estructuras moleculares químicas y biológicas.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

1. Contenidos

Se reducen los contenidos evaluables del temario que quedaba por impartir en el momento de de inicio de la docencia no presencial, en un 45%.

No serán evaluables:

- El Tema *Reacciones de polimerización* en su totalidad.
- El apartado correspondiente a los *materiales para monturas* del *Tema Materiales para óptica oftálmica*

2. Volumen de trabajo y Planificación temporal de la docencia

Volumen de trabajo:

Traslado de las 10 horas dedicadas a la *Elaboración de trabajos en grupo* previstas en la guía docente original, por el *Estudio y trabajo autónomo del estudiante* con los materiales subidos en el aula virtual (5 horas) y *Lectura de material complementario* (5 horas).

Traslado de 25 horas de clases presenciales de *Teoría y Tutorías*, que en total sumaban 60 h en la guía original, al apartado *Preparación de clases de teoría* (15 h) *y de clases prácticas y de problem*as (10h)

Planificación temporal de la docencia:

No se mantienen los horarios y se ha dado libertad a los estudiantes para realizar las actividades programadas de acuerdo con su propia programación.

3. Metodología docente

Subida de materiales docentes en Aula virtual previstos en la guía original para la docencia no presencial y apuntes complementarios.

Suministro de problemas y tests resueltos en Aula virtual.

Tutorías virtuales con resolución por correo electrónico de las dudas planteadas por los estudiantes en el aprendizaje

4. Evaluación

Se incrementa el peso de la evaluación continua que es del 20% en la guía docente original al 40%.

Se mantienen las actividades evaluables de manera continua de la guía docente original que consisten en los resultados de los controles de seguimiento.

Se reduce el peso del examen final del 80% previsto en la guía docente original al 60%.

Se reduce la nota mínima necesaria para sumar el porcentaje de la evaluación continua de 5/10 a 4/10.

La prueba de evaluación final no presencial consistirá en preguntas de tipo test y se realizará a través del Aula virtual, y se garantizará que los estudiantes matriculados en la asignatura dispongan del tiempo suficiente para descargar, realizar y entregar su evaluación.

Los estudiantes que no superen la calificación de 4/10 en el examen escrito de la 1ª convocatoria dispondrán de una 2ª convocatoria dentro del mismo curso académico en la que se mantendrá la nota obtenida en la evaluación continua

5. Bibliografía

Se mantiene la bibliografía recomendada ya que es accesible en línea