

Biological Organic Chemistry

4th Degree

Optative

Credits: 6 (3 Theory, 3 Practice)

Teachers:

**Ángela Sastre Santos, Catedrática de Química Orgánica
(Responsible of the Course). asastre@umh.es**

Luis Martín Gomis, Profesor Titular de Química Orgánica

Jorge Follana. Ayudante



MODULUS I ORGANIC CHEMISTRY OF BIOLOGICAL STRUCTURES

- *ADVANCED structural study of the functional groups and molecular building blocks of the main biological structures*
- *Understanding the basic molecular components and functional groups of major biological structures and their reactivity.*

MODULUS II. CHEMISTRY OF NATURAL PRODUCTS

- *Know the main metabolic pathways and chemical properties of the final obtained compounds.*

MODULUS III. BIOORGANIC CHEMISTRY

- *Understanding the mechanisms of action at the molecular level of the enzymes and receptors and increase their knowledge of supramolecular chemistry*

MODULUS IV. SEMINARS

$^1\text{H-NMR}$, $^{13}\text{C-NMR}$, MS, IR

Report of a scientific publication and its oral presentation

MODULUS I ORGANIC CHEMISTRY OF BIOLOGICAL STRUCTURES

- *ADVANCED structural study of the functional groups and molecular building blocks of the main biological structures*
- *Understanding the basic molecular components and functional groups of major biological structures and their reactivity.*

1. Asymmetry of biological structures. Preferences of Nature.
2. Carbohydrates and polysaccharides. Structure (conformational study glycosidic bond). Properties. Chemical reactivity. Synthesis of sugars. Structural determination. cyclodextrins
3. Lípids. Acoblament molecular de molècules anfifílicas. Micel·les, membranes i vesícules.
4. Amino acids. Natural amino acids. Acidity and basicity. Proteinogenic amino acids and unnatural. α - and β -amino acids. Polihidroxiaminoácidos. Amino acids α , β -disubstituted.
5. Peptides and Proteins. Peptide bond. Hydrogen bonds. Conformational study of peptides. Primary structure of the quaternary structure. Protein sequencing. Protecting groups. Structural determination. Protein biosynthesis. Particular study of some proteins. Hemoglobin. HIV-protease.
6. Nucleosides and nucleotides. Purines and pyrimidines. Phosphates: hydrolysis mechanisms. Ribonuclease.
7. Nucleic Acids DNA, RNA. Structural aspects. Sequencing. Nucleic acid biosynthesis.

MODULUS II. CHEMISTRY OF NATURAL PRODUCTS

•*Know the main metabolic pathways and chemical properties of the final obtained compounds.*

8. Metabolites derived from acetate Fatty acids, prostaglandins, polyphenols, quinones.

9 Metabolites derived from mevalonate. Terpenes. Biogenesis.

10 Carotenoids. Vitamin A. Chemistry of vision.

11. Steroids Classification and nomenclature. Examples. Bile acids and steroid hormones.

12 Shikimate derived metabolites. Benzoic and cinnamic acids. Coumarins. Flavonoids.

13 Secondary metabolism of amino acids. Biogenesis of alkaloids. Classification and examples of alkaloids.

14 Alkaloids. Ephedrine, papaverine. Polycyclic systems. Morphine, berberine.

MODULUS III. BIOORGANIC CHEMISTRY

•Understanding the mechanisms of action at the molecular level of the enzymes and receptors and increase their knowledge of supramolecular chemistry.

15 Enzymatic catalysis. Enzymatic action (selectivity). Mechanisms of action

16 Abiotic Receptors. Podands, coronands and cryptands. Synthetic Methods. More complex systems.

17 Molecular Recognition. Complementarity receptor pre-organization. Circular and spherical Recognition: complexation of cations.

18 Complexation recognition chiral anion. Macrocyclic polyamides. Cascade effect.

19 Enzymatic Models. General principles for design. Multiple recognition. Regulation and allostery. Micelles: stereochemical reconomiento. Polymers.

20 Transport processes. Ion transport. Ionophores and channels. Membrane models. Transport mechanisms. Stereoselective transport. Isomerizable photo-receptors.

MODULUS IV SEMINARS

Structural analysis of organic compounds. $^1\text{H-NMR}$, $^{13}\text{C-NMR}$, MS and IR

It will be developed in them by students with a supervised work based on literature searches on topics of interest within the area of bioorganic as indicated below. Such work must be exposed after completion of oral form to the rest of the class.

The first seminar will be devoted by the teacher training in literature search.

A list of publications will be provided to the student to present their seminars.

Issues (for example): Heteroaromatic metabolites. Porphyrin biosynthesis. Porphyrins of biological interest. Catalytic antibodies. Artificial Enzymes. Artificial Receptors. Molecular hosts. Polyvalent Interactions. Crown-ethers as enzyme models. Metalloproteins as enzyme models. System coenzymes NAD (P) + / NAD (P) H. Pyridoxal phosphate system. Cyclodextrins as enzyme models. Dendrimers as enzyme models. Calixarenes as enzyme models. Helicates bio-organometallic chemistry: Cobalt and Vitamin B12. Phthalocyanines of biological interest. Perylenediimides of biological interest. BODYPYs of biological interest.

Any issue of interest proposed by the students.



Laboratory Practices

April 8-12; 16:00-19:30 h

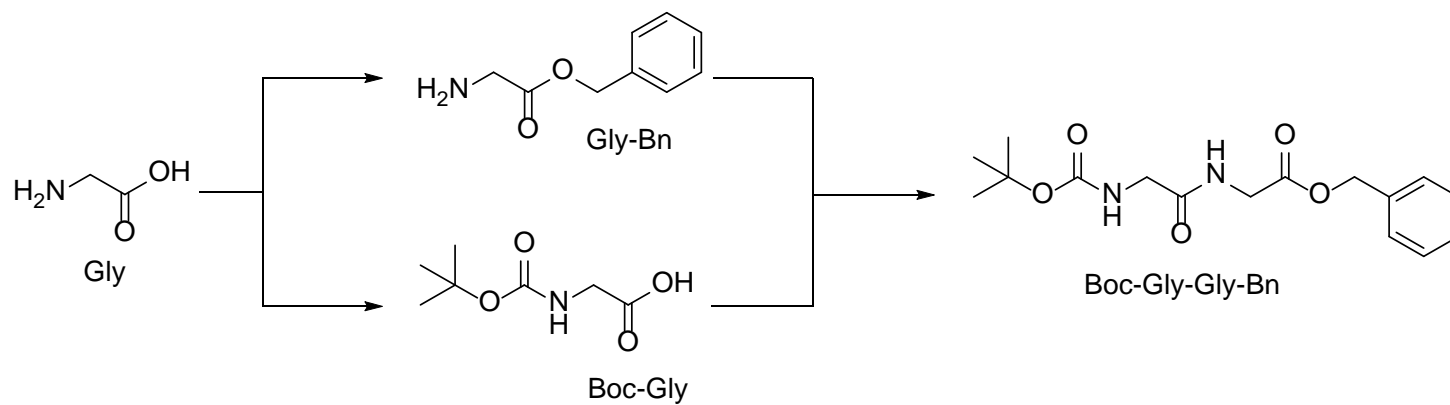
ARENALES BUILDING

QUIMICA ORGANICA LABORATORY

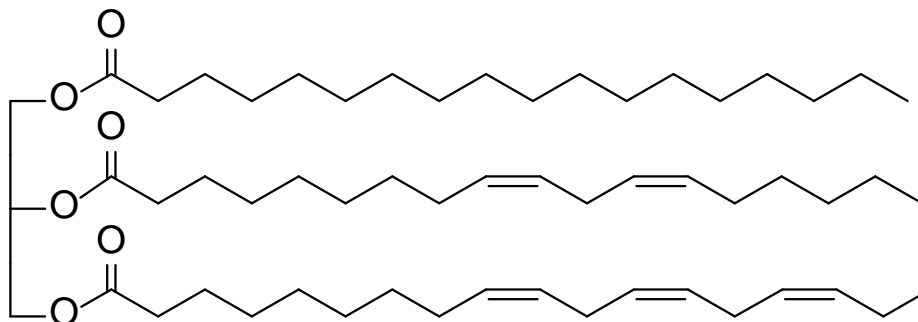


Luis Martín Gomis, Associated Professor

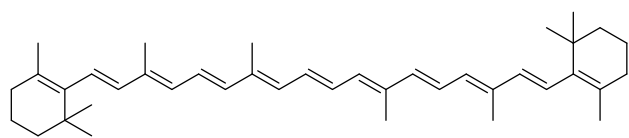
PRACTICAL SECTION 1. Total Synthesis of a Glycine Dipeptide



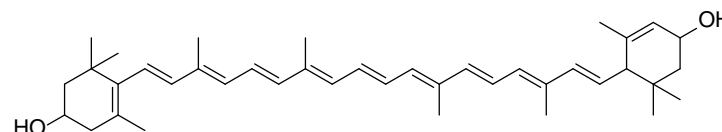
PRACTICAL SECTION 2. Extraction and ^1H NMR Analysis of Fats from Convenience Foods



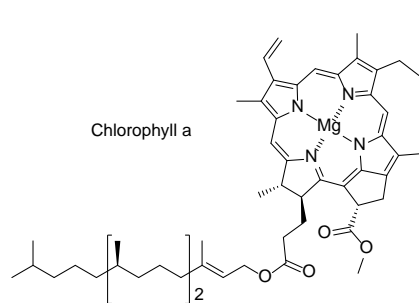
PRACTICAL SECTION 3. Column Chromatography of Leaf Pigments:



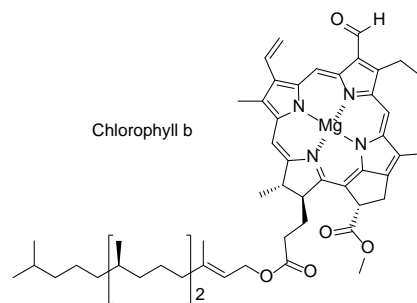
β -Carothene



Lutein (xanthophyll)

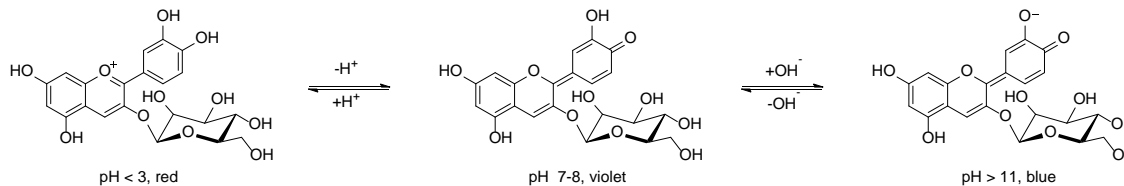


Chlorophyll a



Chlorophyll b

Cyanidin-3 glucoside



EVALUATION SYSTEM

The evaluation of the course will consist of 3 sections added 10 points: theory, laboratory and production and exhibition of work. The course can be overcome reaching 5 points.

Evaluation of the theory. Test that will be graded from 0 to 5 points will be made. 2.5 points must be obtained in this section to pass the course.

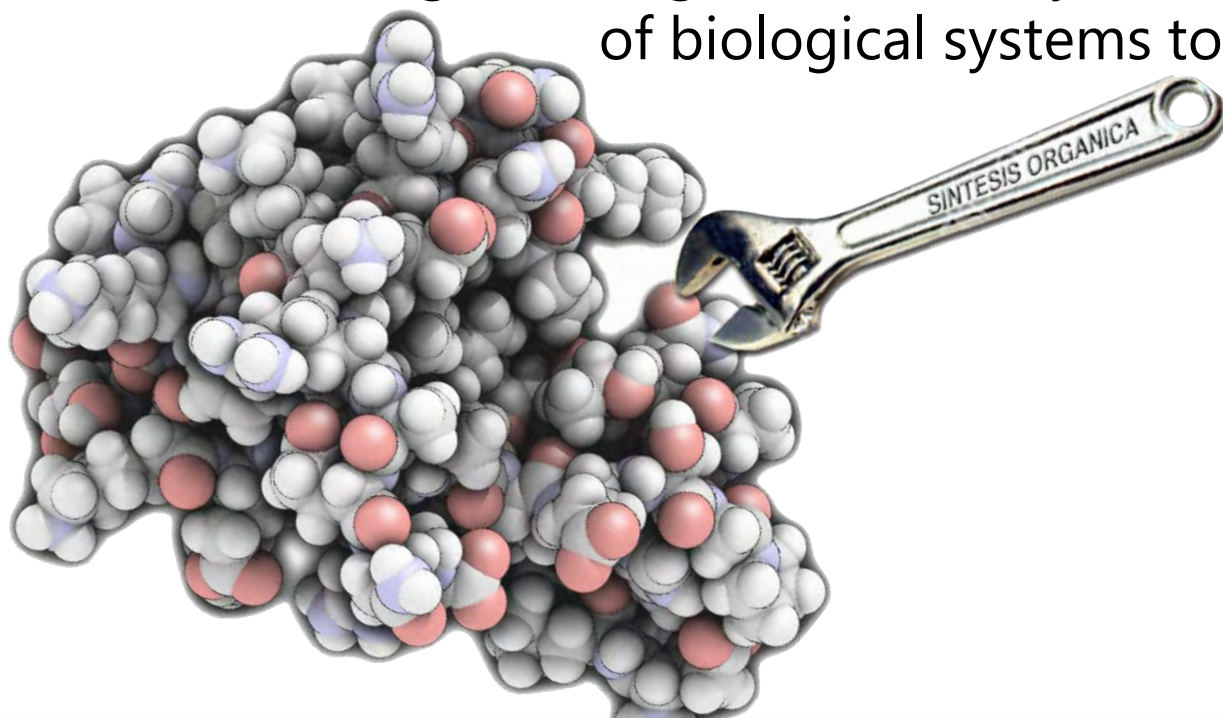
Evaluation of laboratory practices. Practices are compulsory. The evaluation of each of the five practices is 2.5 grade points for the course and in which assessed: (1) timeliness and follow basic safety rules in the laboratory and (2) Delivery of a report results / conclusions. Students suspended or not retained for subsequent calls presented the cumulative score in the labs except wishing voluntarily give it up.

Evaluation of the report of a scientific publication and its oral presentation. This section will be valued at 2.5 points. Job performance will score up to 1 point and 1.5 points the oral presentation. Students suspended or not retained for subsequent calls presented the cumulative score in this paragraph except wishing to voluntarily give it up.

Biological Organic Chemistry (BOC)

What is BOC?

The BOC is the study of biology with the tools and methodologies of organic chemistry, and the use of knowledge of biological systems to advance in chemistry



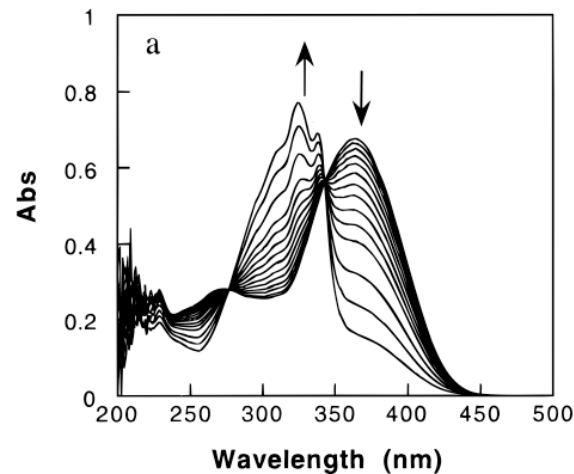
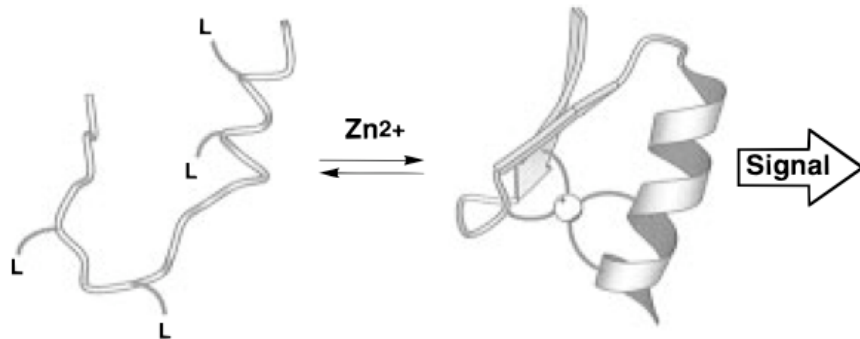
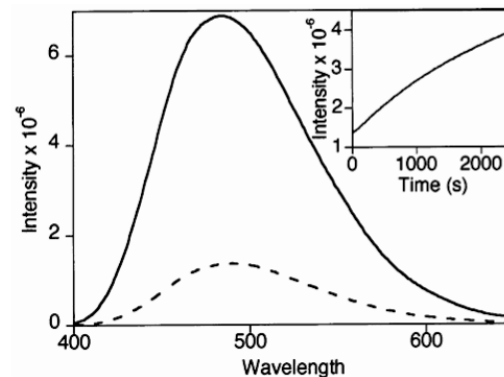
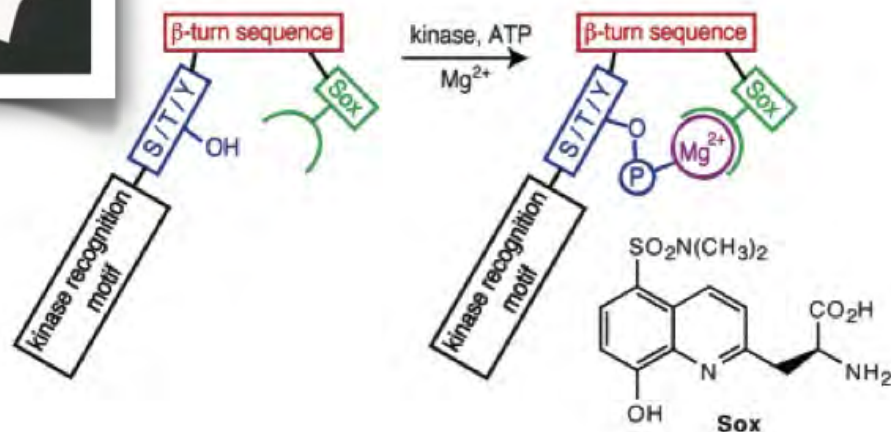
a) Karl-Heinz Altmann, et. al. The state of the art of Chemical Biology. *ChemBioChem* 2009, 10, 16; b) K.L. Morrison, G.A. Weiss. The Origins of Chemical Biology, *Nature Chem. Biol.* 2006, 2, 3

Biological Organic Chemistry (BOC)

Developing tools to understand processes

"All of biology is chemistry and all of these biological molecules are beautiful structures. Understanding their intricate working is our job for the next 100 years, and the more tools we have to do this with, the better"

Barbara Imperiali. Department of Biology and Department of Chemistry, Massachusetts Institute of Technology imper@mit.edu



Instituto de Bioingeniería

Universidad Miguel Hernández

NOTICIAS



NOVEDADES/EVENTOS

Conferencia «Genética forense:
CSI made in Spain»

Síguenos en nuestras redes sociales

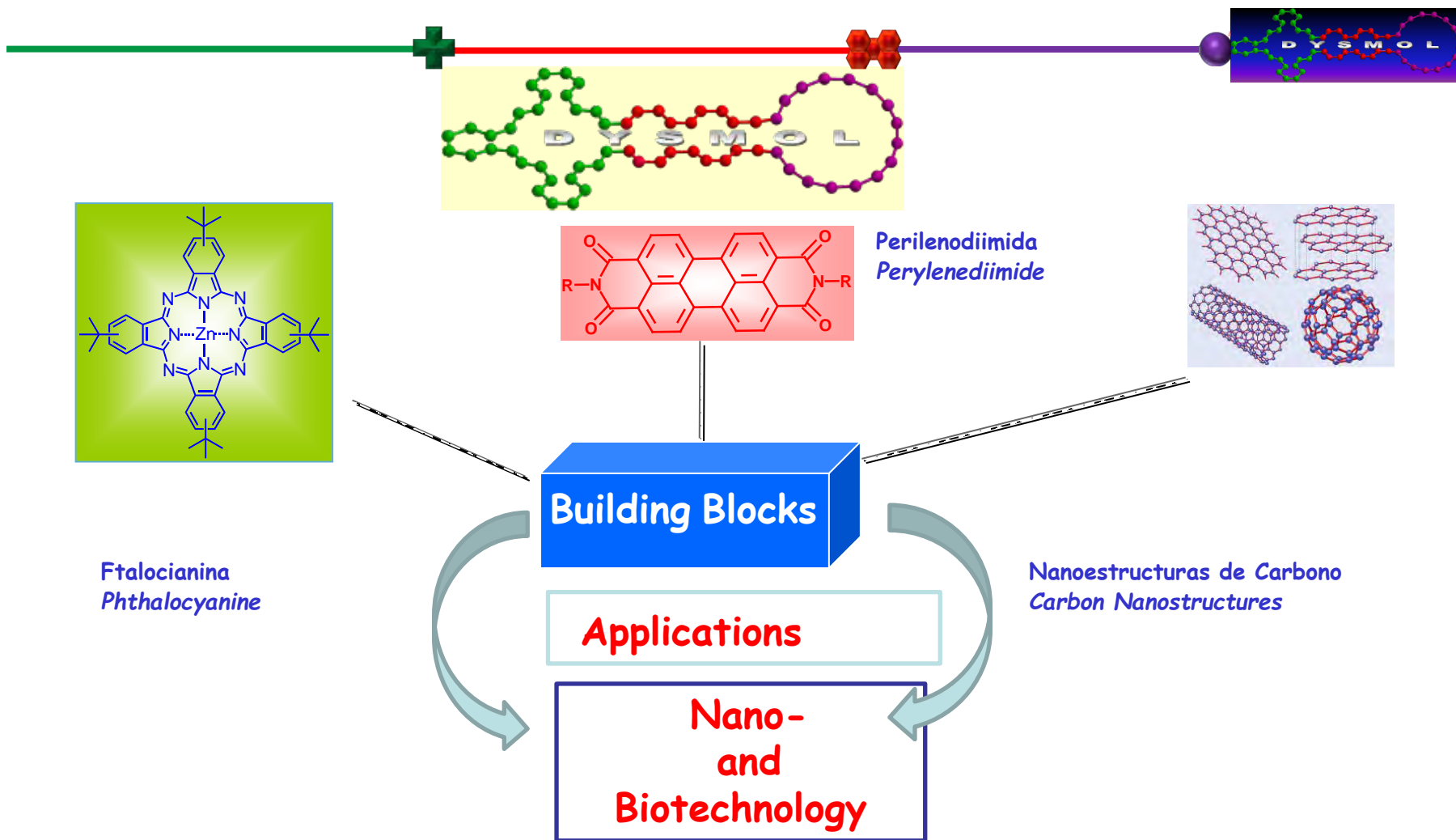


8 Unidades de Investigación y 20 Grupos de Investigación

- Biomateriales y Fotónica
- Genética
- Ingeniería Biomédica
- Ingeniería Celular y Zoología Aplicada
- **Farmacología**
- Nutrición y Bromatología
- Química Orgánica
- Toxicología

<http://bioingenieria.edu.umh.es>

Grupo de Investigación de Diseño y Síntesis Molecular

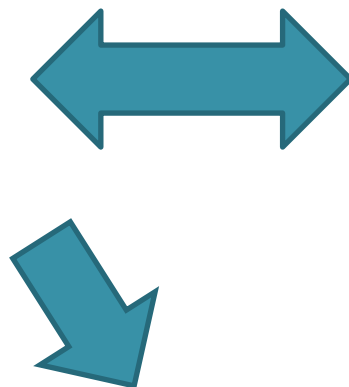
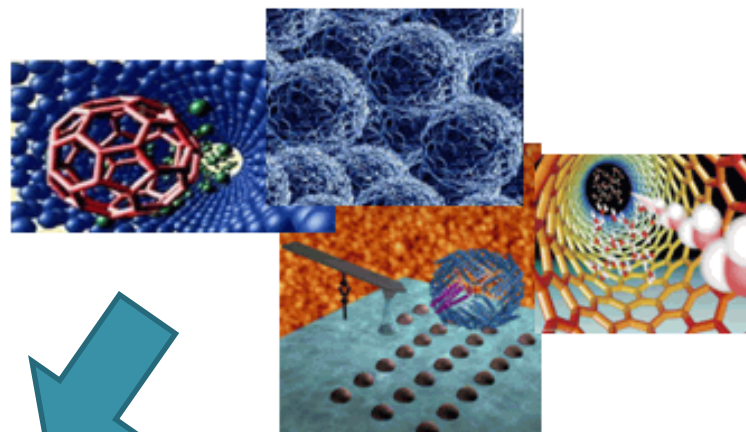


Future Efficient Materials

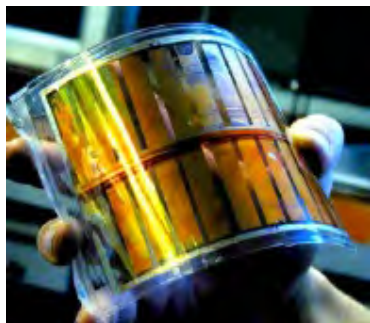
ORGANIC SYNTHESIS



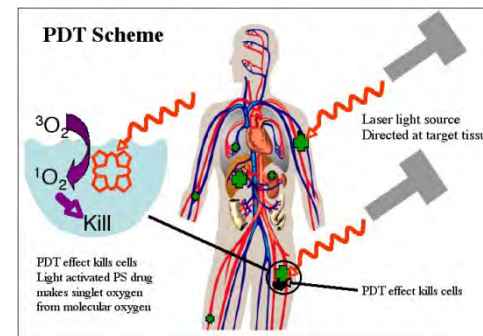
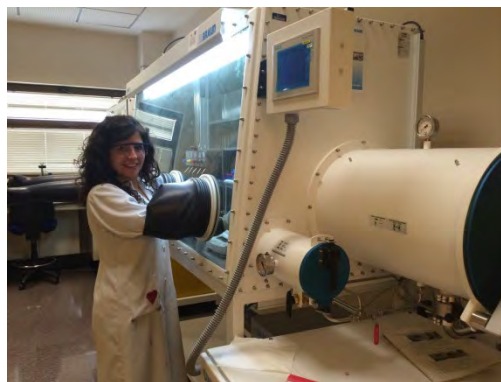
MOLECULAR MATERIALS



ORGANIC PHOTOVOLTAICS



PHOTODYNAMIC CANCER THERAPY



TÍTULO OFICIAL DE MÁSTER

Máster Universitario en Biotecnología y Bioingeniería

master-biotecnologia-bioingenieria.edu.umh.es

PERFIL DE INGRESO

¿Cuentas con una titulación universitaria en Biotecnología, Biología, Física, Química, Bioquímica, Veterinaria, Ciencia y Tecnología de los Alimentos, Farmacia, Medicina o Ciencias Ambientales? ¿Estudiaste Ingeniería Química, Materiales, Agrónoma, Informática o Industrial? ¿Quieres acceder a un programa de doctorado?

PLAN DE ESTUDIOS

MATERIA	ECTS
Módulo Común	
Actividad Investigadora y su Financiación	7,5
Seminarios en Biotecnología y Bioingeniería	4,5
Módulo de Especialización (Escoger 6 asignaturas)	
Biotecnología en nutraceuticos	3
Desarrollo de Medicamentos para la Vía Oral: Optimización Biofarmacéutica y Farmacocinética	3
Materiales Biotecnológicos	3
Aspectos celulares y moleculares de la diabetes y la obesidad	3
Nanobiotecnología	3
Toxicología y Farmacología	3
Avances en Genética	3
Bases Moleculares de la Transducción de Señales y el Cáncer	3
Desarrollo Biotecnológico de Nuevos Agentes Activos	3
Ingeniería Biomédica	3
Reconocimiento Molecular y Diseño Racional	3
Síntesis Orgánica Avanzada	3
Transferencia e innovación en nutrición	3
Biofotónica	3
Tecnología aplicada a la salud	3
Trabajo Fin de Máster	30

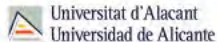
* ECTS: European Credit Transfer System



más **conocimiento**
competencias profesionales
MEJOR FUTURO

Enseñanza de calidad, Profesionales altamente cualificados, Modernas instalaciones, Prácticas en empresa

TÍTULO OFICIAL DE MÁSTER
Máster Universitario en
Nanociencia y Nanotecnología Molecular



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965 222 184



TÍTULO OFICIAL DE MÁSTER

Máster Universitario en
Nanociencia y
Nanotecnología Molecular

Conjunto UMH, UV, UA, UCLM, ULL, UAM, UVA

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60
CRÉDITOS
ECTS

1
CURSO
ACADÉMICO

SÍ
ACCESO
DOCTORADO

Modalidad de formación / Orientación del Máster

INVESTIGACIÓN

Forma de estudio

PRESENCIAL

Fecha de inicio

OCTUBRE



infomaster@umh.es

PERFIL DE INGRESO

El perfil de ingreso recomendado es aquel estudiante que haya cursado estudios previos de grado en titulaciones de enseñanzas técnicas o experimentales relacionadas con los objetivos del Máster; entre ellas: Química, Física, Bioquímica, Biotecnología, Farmacia, Medicina, Ingeniería Química, Ingeniería Electrónica, o titulaciones afines.

Se recomienda asimismo un nivel B1 de inglés que garantice que el estudiante puede seguir las clases teóricas, ya que éstas se imparten en inglés.

PLAN DE ESTUDIOS

El Máster se estructura en 4 módulos, todos ellos obligatorios. El módulo de introducción (módulo de nivelación) y el Trabajo Fin de Master se realizan en la UMH. El módulo básico y el módulo avanzado se imparten cada año en una de las 7 universidades que participan en el Máster.

MATERIA

ECTS

Módulo Introducción

Introducción al máster en nanociencia y nanotecnología molecular: conceptos básicos 6

Módulo Básico

Fundamentos de nanociencia 4,5

Técnicas físicas de caracterización 4,5

Técnicas físicas de nanofabricación 3

Conceptos básicos de química supramolecular 3

Nanomateriales moleculares: métodos de preparación, propiedades y aplicaciones 6

Módulo Avanzado

Uso de la química supramolecular para la preparación de nanoestructuras y nanomateriales 3

Electrónica molecular 4,5

Nanomagnetismo y espintrónica molecular 4,5

Temas actuales de nanociencia y nanotecnología molecular 6

Trabajo Fin de Máster

15

* ECTS: European Credit Transfer System

Química Orgánica Biológica

4º Curso

Optativa

Créditos: 6 (3 Teóricos, 3 Prácticos)

Profesora Responsable: Ángela Sastre Santos
Catedrática de Química Orgánica

