

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

Coordinating unit: 370 - FOOT - Terrassa School of Optics and Optometry  
Teaching unit: 731 - OO - Department of Optics and Optometry  
Academic year: 2019  
Degree: BACHELOR'S DEGREE IN OPTICS AND OPTOMETRY (Syllabus 2009). (Teaching unit Compulsory)  
ECTS credits: 6 Teaching languages: Catalan

### Teaching staff

Coordinator: Martínez Vargas, Jessica  
Others: Martínez Vargas, Jessica  
Gassiot Riu, Susanna  
Roldan Molina, Mònica

### Degree competences to which the subject contributes

#### Specific:

1. Anatomy, histology, physiology, biochemistry and neurophysiology of the visual system and the process of vision
2. Technical english applied to optics and optometry
3. Applying the protocols of public health in relation to visual health.
4. Apply the techniques of detection of ocular and systemic diseases with visual affectation, from the etiology, signs, symptoms and epidemiology.
5. Applying an specific anamnesis to extract relevant information.
6. Evaluate the status and evolution of postoperative ocular parameters of the patient.
7. Ability to write and interpret a report
8. Detecting the need to derive the patient with the corresponding report to the appropriate professional and be able to collaborate keeping the follow-up of the patient
9. Detecting adverse reactions caused by systemic and topical medication.
10. Determined by scanning objective procedures if eye conditions are appropriate or contraindicate the use of contact lenses of any material.
11. Design and fit contact lenses for treating specific conditions such as presbyopia, aphakia in pediatric patients, non-inflammatory corneal ectasia induced and natural, corneal degenerations, and therapeutic assistance for certain corneal diseases.
12. Designing protocols for prevention of visual health
13. Establish protocols, analyze results and elaborate the corresponding reports
14. Do properly binocular and accommodative tests.
15. Do properly refractive vision exams

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

16. Follow up of eye diseases with involvement. (Follow up of patients with diseases affecting visual)
17. Inform thoroughly the patient about the advantages and benefits that will have in using the recommended contact lenses, and the indications for the use of better maintenance and preservation of contact lenses.
18. Interpret refractive test results to determine the suitable optical prescription.
19. To interpret the results and determine if necessary a treatment.
20. Measure of ocular parameters presurgical of the patient
21. Perform the necessary tests to identify dysfunctions of binocular vision, both strabismus dysfunction as not strabismus dysfunction, could be enhanced by visual therapy.
22. Producing accurately diagnoses and remission reports.
23. Know interpret functional and health test results of the visual system.
24. Being able to take, treat, represent and interpret experimental data. "Use basic laboratory equipment and techniques"
25. Being able to perform literature searches.
26. Being able to relate the structure with the properties of inorganic and organic compounds and biomolecules
27. Use appropriate techniques to adapt to each case and establish guidelines for tracking users of contact lenses in order to preserve the integrity and optimal adaptation of the ocular structures.
28. Value the nervous control of the visual system.

### Generical:

29. Acquire communication techniques appropriate to ensure the success of teamwork
30. Apply the principles of emotional intelligence to develop a teamwork
31. Capacity to assume different roles within the team, leadership, coordination with other members
32. Define the general objectives and to carry out a specific group
33. Develop methods to encourage teamwork participation of its members, critical thinking, mutual respect, the ability to negotiate to achieve common goals
34. Judgments (ratings) reports and surveys
35. Display information orally and in writing of reasonably and coherent.
36. Extract the main points of a text or any source of information (oral or written)
37. Flexibility to integrate into dynamic environments, multidisciplinary and multicultural.
38. Encourage methodical work, rigorous, consistent and innovative
39. Reflect and be able to make a critic of the knowledge and developed skills and the level of achievement.
40. Synthesize and organize information to convey it effectively orally and / or written

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

41. Locate new information and the interpretation of it in its context.
42. Working with evidence, methodology and rigour.
43. Value the methods used to achieve the objectives.
44. Value and incorporate technological necessary improvements for the proper development of the profession
45. Assessing the acquisition of the course objectives.

### Teaching methodology

The hours of learning are:

Lectures (medium group) in which the teacher performs the masterly exposition of a theme to introduce the learning objectives related to general concepts of matter. Introducing the same time questions about the concepts explained in order to try to motivate and engage students in a way that actively participate in their learning.

Theory classes (small group) in which the teacher a brief theoretical matter considering learning as a monograph seminar to introduce the learning objectives related to general concepts of matter, where the student has participate actively in their learning individually or in groups, working on communication skills and the analysis of knowledge.

Practical classes (small group) performed by pairs of students develop the basic skills of laboratory equipment type and application of scientific method.

In addition each student will follow and critical analysis of their aprenantatge by means of a portfolio that takes into account all the powers of the subject.

### Learning objectives of the subject

At the end of the course, students should be able to:

Understanding the biochemical and physiological processes of the human body as the basis for the prior understanding of the functioning of the different structures of the organ of vision and its annexes by knowing:

- The composition and structure of the molecules that make up living things.
- The molecular basis of storage and the expression of biological information.
- Transformations of some biomolecules in others.
- The function of the apparatus and systems of the human body.
- The properties and functions of different elements that compose the visual system.
- The principles and foundations of the biological processes involved in the normal visual system.
- The biochemical processes that occur in the eye and vision.
- The changes related to aging processes of perception.
- The materials and basic techniques of the laboratory.

### Study load

Total learning time: 144h	Hours large group:	0h	0.00%
	Hours medium group:	32h	22.22%
	Hours small group:	28h	19.44%
	Guided activities:	0h	0.00%
	Self study:	84h	58.33%

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Content

<p>1. GENERAL BIOCHEMISTRY</p>	<p>Learning time: 40h Laboratory classes: 18h Self study : 22h</p>
<p>Description: This content is worked: With functional and biochemical reactions in general. Structure and function of biomolecules. Energy metabolism and oxidative stress. Glucidic metabolism. Research techniques in biochemistry and molecular biology.</p> <p>Related activities: It carried out activities 1, 2 and 3 correspond to practical laboratory directed learning and continuous assessment tests in group and individual.</p>	
<p>2. GENERAL PHYSIOLOGY</p>	<p>Learning time: 40h Theory classes: 12h Laboratory classes: 6h Self study : 22h</p>
<p>Description: This content is worked: On the biochemical and physiological processes of the human body, digestion, circulation, respiration, and value systems of the body with the external environment (hormones and nervous system) as a base prior understanding of how the different structures of the body vision and its annexes.</p> <p>Related activities: It carried out activities 4, 5 and 6 that correspond to practical laboratory directed learning and continuous assessment tests in group and individual.</p>	
<p>3. OCULAR PHYSIOLOGY AND BIOCHEMISTRY</p>	<p>Learning time: 70h Theory classes: 24h Laboratory classes: 6h Self study : 40h</p>
<p>Description: This content is worked: Function, the normal physiological processes and biochemical structures of the organ of vision and its attachments, using general terminology and basic physiology of the eye as a basis for understanding the importance of these in practice of Optometry and Contactology and pathological processes of the eyeballs and its annexes.</p> <p>Related activities: It carried out activities 7, 8, 9 and 10 that correspond to practical laboratory directed learning and continuous assessment tests in group and individual.</p>	



## 370510 - FIBI - General and Ocular Physiology and Biochemistry

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Planning of activities

<p>1. LABORATORY PRACTICES (CONTENT 1).</p>	<p>Hours: 8h Laboratory classes: 4h Guided activities: 0h Self study: 4h</p>
<p><b>Description:</b> Practices that should be taken to the laboratory in pairs, with a duration of 4 hours total. The laboratory should carry out the experimental part. It is planned that students do after reading the script and answer the questionnaire to identify appropriate targets, from the standpoint of learning outcomes to be achieved after the experiment.</p> <p><b>Support materials:</b> All materials and reagents needed to perform the experimental part. Written by detailed questionnaire and the available experimental Atenea.</p> <p><b>Descriptions of the assignments due and their relation to the assessment:</b> Registration for the teacher to check the student's learning directed by questionnaires on development and the experimental results at the end of the session. Evaluated individually and establishing a feedback to the teacher's group general reflection on classroom and outstanding common errors and the associated learning objectives to be strengthened. It represents a fraction of the 20% corresponding to the evaluation of the practical lessons.</p> <p><b>Specific objectives:</b> On completion of the internship, students must be able to:</p> <ul style="list-style-type: none"> <li>- Determine qualitatively different groups of amino acids and proteins <math>\zeta</math></li> <li>- Determine glícids qualitatively different groups.</li> <li>- Determine the rate of acid lipid.</li> </ul>	
<p>2. CONTINUOUS ASSESSMENT TEST GROUP (CONTENT 1)</p>	<p>Hours: 8h Laboratory classes: 2h Self study: 6h</p>
<p><b>Description:</b> In groups of 3-4 students will develop the skills of independent learning groups, continuing to update knowledge and skills, teamwork and communication of knowledge about the contents of a topic of general biochemistry to meet specific objectives of the learning content. Correction by teachers.</p> <p><b>Support materials:</b> Guide theoretical notes available through the campus Atenea and recommended reading.</p> <p><b>Descriptions of the assignments due and their relation to the assessment:</b> Presentation of the exercise each group with the corresponding common assessment for each of the groups. With appropriate feedback from teachers and general classroom discussion about common errors and the associated learning objectives to be strengthened. It represents a fraction of the 20% corresponding to the evaluation of the seminars (S).</p> <p><b>Specific objectives:</b> At the end of the activity, students should be able to:</p> <ul style="list-style-type: none"> <li>- Communicate the information gained through the preparation of learning material.</li> <li>- Share information and discuss the knowledge acquired.</li> </ul>	

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

<p><b>3. INDIVIDUAL TESTS FOR CONTINUOUS ASSESSMENT (CONTENTS 1)</b></p>	<p>Hours: 14h Laboratory classes: 2h Guided activities: 0h Self study: 12h</p>
<p><b>Description:</b> Carrying out individual exercises to cover general chemistry content of the specific learning objectives of the content. Exercises questions short statement. Correction by teachers.</p> <p><b>Support materials:</b> Guide theoretical notes available through the campus Athena and recommended reading (not usable during the time of testing).</p> <p><b>Descriptions of the assignments due and their relation to the assessment:</b> Resolution of the exercises for the student, that the teacher will evaluate. It represents a fraction of the 30% corresponding to the evaluation of the first exam of the theoretical lessons (T1).</p> <p><b>Specific objectives:</b> At the end of the activity, students should be able to:</p> <ul style="list-style-type: none"> <li>- Define and explain the concept of glícid and its main biological functions.</li> <li>- Classify the different groups glícids.</li> <li>- Describe the structure and characteristics of major groups glícids and its derivatives.</li> <li>- Define the concept of amino acid.</li> <li>- Describe the structure and properties of different groups of amino acids.</li> <li>- Define and differentiate between the concept of peptide and protein.</li> <li>- Explain the principles of structural proteins and the factors that determine their three dimensional folding.</li> </ul> <p>Describe the main physicochemical properties of proteins and explain the concept of distortion.</p> <ul style="list-style-type: none"> <li>- List the main biological functions of proteins.</li> <li>- List the most common posttranslational modifications of proteins.</li> <li>- Describe the structure, types and functions of collagen.</li> <li>- Define the concept of enzyme protein.</li> <li>- Explain the functional characteristics of enzymes.</li> <li>- Classify the different types of enzymes.</li> <li>- Explain and differentiate between the concept of the coenzyme and cofactor</li> <li>- Describe the influence of the concentrations of the roofs, the product of the enzyme, along with temperature and pH on the speed of the enzymatic reactions.</li> <li>- Explain the main molecular mechanisms of enzyme inhibition.</li> <li>- Describe the concept and the structural characteristics of different groups of lipids.</li> <li>- Describe the importance of different biological groups of lipids and their derivatives.</li> <li>- Explain and outline the basic structure of Biomembranes.</li> <li>- Explain the basic principles of operation of oxidative metabolism.</li> <li>- Describe the biological significance of the cellular respiratory chain and the use of metabolic energy.</li> <li>- Describe the physiological significance of degradation of glucose via glycolysis and via the phosphate pentoses.</li> <li>- Describe the metabolic fate of pyruvate and its physiological significance.</li> <li>- Calculate the energy balance of the total or partial degradation of a glucose molecule.</li> <li>- Describe the physiological significance of the sorbitol pathway.</li> <li>- Describe the significance of the physiological cycle of fatty tricarboxílics.</li> </ul>	
<p><b>4. LABORATORY PRACTICES (CONTENT 2).</b></p>	<p>Hours: 8h Laboratory classes: 4h Self study: 4h</p>

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Description:

Practice should be done in the laboratory, in pairs, with a duration of 2 hours. The laboratory should carry out the experimental part. It is planned that students do after reading the script and answer the questionnaire to identify appropriate targets, from the standpoint of learning outcomes to be achieved after the experiment.

### Support materials:

All materials necessary for carrying out the experimental part is in the laboratory.

Written by detailed questionnaire and the pilot available on the intranet Atenea.

### Descriptions of the assignments due and their relation to the assessment:

Registration for the teacher to check the student's learning directed by questionnaires on development and the experimental results at the end of the session. Evaluated individually and establishing a feedback to the teacher's group general reflection on classroom and outstanding common errors and the associated learning objectives to be strengthened. It represents a fraction of the 20% corresponding to the evaluation of the practical lessons.

### Specific objectives:

On completion of the internship, students must be able to:

- Determine the values  $\Delta P$  of human blood pressure and recognize the values  $\Delta P$  of maximum pressure and minimum systolic or diastolic or by sphygmomanometer and stethoscope
- Understand and evaluate the volumetric parameters of the human respiratory mechanics using a spirometry

### 5. CONTINUOUS ASSESSMENT TEST GROUP (CONTENT 2)

Hours: 8h

Laboratory classes: 2h

Self study: 6h

### Description:

In groups of 2-4 students will develop the skills of independent learning groups, continuing to update knowledge and skills, teamwork and communication of knowledge about the contents of an issue of basic neurobiology to meet specific objectives of the learning content. Correction by teachers.

### Support materials:

Recommended bibliography.

### Descriptions of the assignments due and their relation to the assessment:

Presentation of the exercise each group with the corresponding common assessment for each of the groups. With appropriate feedback from teachers and general classroom discussion about common errors and the associated learning objectives to be strengthened. It represents a fraction of the 20% corresponding to the evaluation of the seminars (S).

### Specific objectives:

At the end of the activity, students should be able to:

- Describe the composition and enumerate the functions of cell membranes
- Describe the different types of transport across cell membranes

### 6. INDIVIDUAL TESTS FOR CONTINUOUS ASSESSMENT (CONTENT 2)

Hours: 14h

Theory classes: 2h

Guided activities: 0h

Self study: 12h

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Description:

Carrying out individual exercises to cover general content of physiology of the specific learning objectives of the content. Exercises to test questions and short statement. Correction by teachers.

### Support materials:

Guide theoretical notes on paper, theoretical materials available through the campus Atenea and recommended reading.

### Descriptions of the assignments due and their relation to the assessment:

Resolution of questions and exercises for the student, the teacher will evaluate. It represents a fraction of the 30% corresponding to the evaluation of the first exam of the theoretical lessons (T1).

### Specific objectives:

At the end of the activity, students should be able to:

- Define the concepts of external environment, internal environment and understand the systems involved in maintaining the constancy of internal environment.
- Define the concept of homeostasis and ultimate goal of understanding how to balance and regulate body systems.
- Distinguish the concepts of intra and extracellular fluid
- To analyze the biochemistry of blood and blood clotting
- Distinguish the constitution and physiology of the different blood components: red blood cells, white blood cells and platelets
- Enunciate and distinguish the major blood groups: ABO system, Rh system
- Analyze the functioning of the heart pump
- Identify the major systemic circulation and reduced lung
- Define the concept of cardiac output
- Analysis of respiratory mechanics
- To analyze the transport and gas exchange in lungs and blood
- Describe the mechanism of neural control of breathing
- List the main elements of human nutrition
- Define and analyze the function of mastication and salivation
- Define and analyze the gastric and intestinal digestion and the intestinal absorption
- Define the concepts of acidemia and alcalèmia
- Describe the composition and volume of urine
- Describe and analyze the function of the nephron and the glomerular filtration
- To analyze the biochemical basis of hormonal action
- Define and analyze the nature and classification of hormones
- Describe the main physiological functions of hormones
- Describe and analyze the composition and functions of cell membranes
- To analyze the transport through cell membranes and its variants

### 7. LABORATORY PRACTICES (CONTENT 3).

Hours: 8h

Laboratory classes: 4h

Guided activities: 0h

Self study: 4h

### Description:

Practices that should be taken to the laboratory in pairs, with a duration of 4 hours. The laboratory should carry out the experimental part. It is planned that students do after reading the script and answer the questionnaire to identify appropriate targets, from the standpoint of learning outcomes to be achieved after the experiment.

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Support materials:

All materials necessary for carrying out the experimental part is in the laboratory.

Written by detailed questionnaire and the pilot available on the intranet Atenea.

### Descriptions of the assignments due and their relation to the assessment:

Registration for the teacher to check the student's learning directed by questionnaires on development and the experimental results at the end of the session. Evaluated individually and establishing a feedback to the teacher's group general reflection on classroom and outstanding common errors and the associated learning objectives to be strengthened. It represents a fraction of the 20% corresponding to the evaluation of the practical lessons.

### Specific objectives:

On completion of the internship, students must be able to:

- ¿Describe the difference between environmental variation and adequate stimulus for sensory receptors.
- Describe the relationship between the threshold intensity of a sensory receptor and the perception of the stimulus.
- Describe each of the elements that form a reflex arc.
- Understand the relationship between the ocular structures that act as sensory receptors and effectors located on the eyeball and its appendices.
- Describe different eye reflexes and pupil simple clusters.
- Explain the meaning of different physiological reflexes and eye pupil simple clusters. ¿
- Represent and interpret graphs of experimental results obtained.
- Formulate reasonable hypotheses about the observed phenomena.

### . CONTINUOUS ASSESSMENT TEST GROUP (CONTENT 3)

Hours: 8h

Laboratory classes: 2h

Guided activities: 0h

Self study: 6h

### Description:

n groups of 3-4 students will develop the skills of independent learning groups, continuing to update knowledge and skills, teamwork and communication of knowledge about the contents of a topic of ocular physiology to meet specific objectives of the learning content. Correction by teachers.

### Support materials:

Recommended reading ATENEA placed on the intranet.

### Descriptions of the assignments due and their relation to the assessment:

Presentation of the exercise each group with the corresponding common assessment for each of the groups. With appropriate feedback from teachers and general classroom discussion about common errors and the associated learning objectives to be strengthened. It represents a fraction of the 20% corresponding to the evaluation of the seminars (S).

### Specific objectives:

At the end of the activity, students should be able to:

- Communicate the information gained through the preparation of learning material.
- Share information and discuss the knowledge acquired.

### 9. INDIVIDUAL TESTS FOR CONTINUOUS ASSESSMENT (CONTENT 3)

Hours: 22h

Theory classes: 2h

Guided activities: 0h

Self study: 20h



## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Description:

Production testing of the content of individual physiology and biochemistry of the eye to meet specific learning objectives of the content. Exercises questions short statement. Correction by teachers.

### Support materials:

Guide theoretical notes available through the campus Athena and recommended reading (not usable for the assessment tests).

### Descriptions of the assignments due and their relation to the assessment:

Resolution tests for the student, the teacher will evaluate. It will be evaluated in the first and second exams of the theoretical lessons (T1 and T2).

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Specific objectives:

At the end of the activity, students should be able to:

- Differentiate between the concepts of opening, closing and blinking.
- List the muscles that allow movements of opening and closing of the eyelids.
- Explain the mechanism of action of blinking and the muscles involved in it.
- List the different types of blinking.
- Describe the different palpebral reflexes.
- Explain the functional characteristics of the tear and the tear film.
- List the chemical components of the tear film describing its concentration, its origin, its function and variation of the same age.
- Assess the importance of pH and osmotic pressure of tears.
- Differentiate between the concepts of reflex tear secretion and basic secretion.
- Differentiate between the concepts of basic tear and tear reflex.
- Describe the parasympathetic and sympathetic innervation of the main lacrimal gland and differentiate their functional characteristics.
- Differentiate based on their origin, the different sensory pathways of reflex tearing.
- Describe the factors anatomical, biochemical and metabolic determining and maintaining corneal transparency.
- List the main components of the cornea and biochemical functions of these in the maintenance of corneal transparency.
- Assess the importance of glucidic metabolism, and their interrelationships with the maintenance of the degree of hydration and corneal transparency.
- Relate the concept of corneal sensitivity to the degree and distribution of the innervation of the same.
- Assess the importance of development and regeneration of corneal nerves.
- Relate the possible neurological and biochemical changes of the cornea using contact lenses.
- Explain the functional characteristics of the lens.
- List the main biochemical components of the lens and capsule.
- Assess the importance of different types of peptides and proteins of the lens in maintaining its transparency.
- Understand the importance of glucidic metabolism in maintaining the transparency of the lens.
- Describe the concept of accommodation and its physiological function.
- List the anatomical structural elements involved in the accommodation and describe its mechanism of action.
- Describe the concept of the triad approach and other phenomena associated with the accommodation and its relationship to physiological.
- Differentiate between physical accommodation and physiological adaptation.
- Describe the physiological concept of presbyopia.
- Explain the different theories about the origin and development of presbyopia.
- Match the geometric variations of the crystalline lens with age and development of presbyopia.
- Relate the motor innervation of the muscles of the iris with the change in pupil diameter.
- List the different types of pupil reflexes clusters.
- Distinguish between the concept of miosis and mydriasis pupil and the stimulus that produces it.
- Describe the functional characteristics of aqueous humor.
- List the chemical components of the aqueous humor concentration and describing its operation.
- List the anatomical structural elements involved in the formation of aqueous humor.
- Describe the process and stages of formation of aqueous humor.
- Describe how to maintain the value of the physiological IOP.
- Describe the functional characteristics of the vitreous humor.
- List the chemical components of the vitreous humor describing the concentration and function.
- Describe the structure of the vitreous humor and its variation with age.

## 370510 - FIBI - General and Ocular Physiology and Biochemistry

### Qualification system

Final qualification is the sum of the following partial qualifications:

Evaluation of the content from theoretical lessons: T1 (30%) i T2 (30%)

Evaluation of the laboratory practical lessons: L (20%)

Evaluation of the seminars: S (20%)

Final qualification=  $0.3 \cdot T1 + 0.3 \cdot T2 + 0.2 \cdot L + 0.2 \cdot S$

### Regulations for carrying out activities

- It is mandatory to carry out laboratory activities and continuous assessment.
- If not done any of the laboratory activities and continuous assessment will be considered as non-rated.
- Under no circumstances can have any notes or bibliography on individually assessment tests.

### Bibliography

Basic:

Nelson, David L. Lehninger principios de bioquímica. 5a ed. Barcelona: Omega, 2009. ISBN 9788428214865.

Forrester, J. V. [et al.]. The eye: basic sciences in practice. 3a ed. London: Saunders Elsevier, 2008. ISBN 9780702028410.

Thibodeau, Gary A. Estructura y función del cuerpo humano. 13a ed. Barcelona: Elsevier, 2008. ISBN 9788480863551.

Pocock, Gillian. Fisiología humana: la base de la medicina. Barcelona: Masson, 2002. ISBN 8445810987.

Kaufman, P.L.; Alm A. Adler fisiología del ojo: aplicación clínica. 10ª ed. Madrid: Elsevier, 2004. ISBN 848174705X.