

# Teaching guide

## IDENTIFICATION DETAILS

Degree:	Pharmacy		
Scope	Pharmacy		
Faculty/School:	Experimental Sciences		
Course:	CLINICAL BIOCHEMISTRY		
Type:	Compulsory	ECTS credits:	6
Year:	3	Code:	2541
Teaching period:	Fifth semester		
Subject:	Pharmacology		
Module:	Medicine and Pharmacology		
Teaching type:	Classroom-based		
Language:	Spanish		
Total number of student study hours:	150		

## SUBJECT DESCRIPTION

The subject of Clinical Biochemistry, taught in the fifth semester of the Degree in Pharmacy on a compulsory basis, is framed within the Medicine and Pharmacology block and seeks to provide the future pharmacist with the necessary knowledge about the main diseases caused by metabolic disorders based on an etiological and biochemical basis.

Within the Health Sciences, Biochemistry, and particularly Clinical Biochemistry, represents a key element for:

- 1- Understand and interpret at the molecular level the etiology of different human pathologies.
- 2- The correct interpretation of the different laboratory tests.

The course is divided into three main blocks. A first introductory block, followed by two blocks where the biochemistry and metabolism of the main pathologies at the organ and tissue level will be studied, together with

their main laboratory tests.

## GOAL

Provide an overview of the molecular basis, methodology and interpretation of the most common laboratory diagnostic tests in clinical biochemistry.

Understand and relate the main metabolic disorders capable of triggering diseases, as well as their associated symptomatology with primary biochemical causes, in order to be able to act in the prevention, diagnosis, prognosis and treatment of this type of pathological process in an integrated way with and for other healthcare professionals.

The specific aims of the subject are:

Acquire knowledge about the possible alterations in the metabolic pathways that cause pathology in the human being.

Recognize the symptomatology associated with the most important metabolic defects.

Know and assess the main biomarkers associated with different pathologies.

Know, understand and apply analytical techniques related to laboratory diagnosis.

Evaluate and interpret the results of a laboratory report with different biochemical markers.

## PRIOR KNOWLEDGE

The study of the subject of Clinical Biochemistry requires knowledge about General Biology, Biochemistry and General Chemistry.

It is recommended to have completed and approved the subjects of Biochemistry and Physiology.

## COURSE SYLLABUS

### THEORETICAL CLASS PROGRAM

#### BLOCK 1: INTRODUCTION

- 1- Introduction to clinical biochemistry and phases of the analytical process. Pre-analytical, analytical and post-analytical phases.
- 2- Interpretation of results. Pre-analytical, analytical and biological variability. Reference intervals and discriminating capacity. Reference value of the exchange rate. Critical values.
- 3- Quality control. Evaluation of the quality of the results. Interpretation of internal and external control.

#### BLOCK 2: BIOCHEMICAL STUDY OF ORGANS AND TISSUES

- 1- Biochemical study of water and electrolyte homeostasis: Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>. Osmolarity and Osmolality.
- 2- Biochemical study of acid-base balance and respiratory function through blood gases.
- 3- Biochemical study of renal function: renal function tests. Study of glomerular and tubular function. Proteinuria and microalbuminuria. Study of the examination of the urinary strip and sediment.
- 4- Biochemical study of gastrointestinal and pancreatic function. Gastrointestinal and pancreatic pathology; markers for its screening, diagnosis and follow-up.
- 5- Biochemical study of liver function: Clinical manifestations of hepatocellular damage. Biomarkers for the study of liver disease. Metabolism and bilirubin determination.
- 6- Biochemical study of cardiac function: classic markers and new biomarkers in the study of cardiac function. Ischemic heart disease and heart failure.
- 7- Biochemical study of plasma proteins. Classification of plasma proteins. Identification, detection and quantification methods. Proteinogram and identification of electrophoretic profiles. Immunoglobulins: Clinical significance of polyclonal and monoclonal components and analytical methods for their study. Acute phase reactants. Enzymes.
- 8- Biochemical study of lipids: plasma lipoproteins. Changes in lipid metabolism. Study of lipid alterations in the clinical laboratory. Atherosclerosis, hyperlipidemia and cardiovascular disease.
- 9- Study of biological fluids. Serous fluids and cerebrospinal fluid.
- 10- Biochemical study of cancer patients: Pathways of tumorigenesis. Definition of tumor marker. Classification of tumor markers. Utility such as screening, diagnosis, prognosis and follow-up.
- 11- Biochemical study of sepsis.
- 12- Biochemical study of pregnancy: Biochemical changes in pregnancy. Antenatal screening.

#### BLOCK 3: BIOCHEMICAL STUDY OF ENDOCRINE FUNCTION

- 1- Biochemical study of glucose homeostasis: Hormonal control of glucose homeostasis. Exploration of glucose metabolism. Diabetes mellitus. Protocols for diagnosis and monitoring by the laboratory. Functional tests. Glycosylated hemoglobin.
- 2- Biochemical study of thyroid function. Regulation. Hormones and thyroid pathology. Diagnostic methods.
- 3- Biochemical study of the adrenal glands. Adrenal function. Pathology of the mineralocorticoid axis. Pathology of the glucocorticoid axis. Adrenal insufficiency.
- 4- Biochemical study of the sexual glands. Ovarian function. Hormonal studies: prolactin, estradiol, progesterone, gonadotropins and androgens. Infertility evaluation. Testicular function. Alterations: hypogonadism, infertility, puberty disorders.

### PRACTICAL CLASS PROGRAM

- Biochemical and genetic determinations will be carried out routinely in a laboratory with the objective of solving a clinical case.
- Real clinical cases will be presented that the student will have to solve. This schedule is subject to whatever

modifications the teacher deems necessary.

## EDUCATION ACTIVITIES

AFP1. THEORY CLASSES The most important aspects of the syllabus will be addressed and their main purpose is the acquisition and practice of knowledge that facilitates the understanding of the content of the subject. In addition, students' participation in active learning will be facilitated through questions, discussions and applied activities that encourage the exploration, articulation and application of ideas.

AFP2. PRACTICAL CLASSES Laboratory work sessions in groups supervised by the teacher.

AFP3. EXERCISE CLASSES AND PROBLEMS Case study. As a complement to the theoretical classes, clinical cases and/or exercises will be analyzed with the objective of applying the knowledge acquired to real situations.

AFP4. SEMINARS AND/OR EXHIBITION OF WORKS Project learning. Students will prepare various projects/works individually and/or in groups under the supervision of the teacher.

AFP5. In-person tutoring or through email or video conferencing, for the resolution of doubts, questions, concerns, advice, etc. In short, they are intended to monitor the student more closely. The tutoring schedule will be informed by the teacher at the beginning of the course.

AFP6. CARRYING OUT EXAMS Evaluation of knowledge acquired and application of the same.

AFNP1. STUDY OF THEORY, EXERCISES AND PROBLEMS

AFNP2. PREPARATION AND STUDY OF PRACTICES

AFNP3. PREPARATION OF WORKS

AFNP4. TUTORING PREPARATION

## DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
60 Horas	90 Horas

## Cross Skills

To be able to apply the theoretical knowledge learnt in the of solving problems and practical cases linked to the various subjects.

## LEARNING RESULTS

Know the analytical techniques related to laboratory diagnostics, toxins, food and the environment.

Develop hygienic-sanitary analyses (biochemical, bromatological, microbiological, parasitological) related to health in general and to food and the environment in particular.

## **SPECIFIC LEARNING RESULTS**

It integrates the knowledge acquired in Physiology, Biochemistry and Pathophysiology and its expression in the form of laboratory data

It comprises the phases of the analytical process and the working methodology of clinical biochemistry laboratories

Understands the value of a diagnostic test

Demonstrates an overview of the molecular bases, methodology and interpretation of the most common laboratory tests

Demonstrates the ability to carry out an optimal selection of biochemical markers as well as the correct interpretation of RESULTS

Interpret and analyze different laboratory data for the diagnosis and monitoring of various pathologies

Associate the alteration of specific biomarkers with the corresponding pathology

## **LEARNING APPRAISAL SYSTEM**

### **REGULAR EVALUATION SYSTEM**

ISE1. Written or oral, developmental, short answer or test-type tests. (60% of the final grade)

- Theory test. A final written exam will be carried out with test-type questions, short questions and/or development questions to evaluate the learning and knowledge acquired and their analysis and application. To pass the course, it will be necessary to obtain a minimum grade of 5.00 out of 10.00.

- Clinical cases A continuous evaluation will be carried out of the practical application of the knowledge acquired through the resolution of clinical cases on an individual basis.

IF 2. Daily activities and exercises (5% of the final grade) The different activities and exercises proposed by the teacher will be evaluated.

IF 3. Individual and group work (15% of the final grade)

IF 4. Attendance and participation in face-to-face classroom activities (5% of the final grade) The activities carried out in the class and the degree of participation will be evaluated.

SE8. Attendance and participation in face-to-face activities in the laboratory. Laboratory internships (15% of the final grade). To pass the course, it is necessary to complete and approve the internships. At the end of the internships, they will be evaluated by the teacher responsible for them. Attendance at all practical sessions (regardless of where they take place: laboratory, computer rooms, simulation center, etc.) is mandatory. The unjustified absence of any of these sessions leads to the loss of the right to an internship evaluation in the ordinary call and a suspension of the course. Students in this situation should immediately contact the teacher.

**IMPORTANT:** In the extraordinary call, the same evaluation system is maintained, keeping the score for the theory or practice exam if they have been passed. The note of the clinical cases and of SE2, SE3 and SE4 will also be saved for the extraordinary call.

**ALTERNATIVE EVALUATION SYSTEM** Students in second or subsequent enrollment must contact the teacher to request to take advantage of this system.

**ISE1.** Written or oral, developmental, short answer or test-type tests. (65% of the final grade) A final written exam will be carried out with test-type questions, short questions and/or development questions to evaluate learning and knowledge acquired and their analysis and application. To pass the course, it will be necessary to obtain a minimum grade of 5.00 out of 10.00.

**IF 2.** Daily activities and exercises (5% of the final grade). A learning evaluation will be carried out through at least two tutorials

**IF 3.** Individual and group work (15% of the final grade).

**SE8.** Attendance and participation in face-to-face activities in the laboratory. Laboratory internships (15% of the final grade). To pass the course, it is necessary to complete and approve the internships. At the end of the internships, they will be evaluated by the teacher responsible for them. The internship note from the past year will be maintained as long as they are approved.

**IMPORTANT FOR BOTH EVALUATION SYSTEMS**

1- To pass the course, it will be essential to have completed all the internships, to have submitted the work corresponding to SE3, to obtain at least 50% of the maximum grade of the theory exam and the internship exam and to obtain an overall grade greater than or equal to 5.

2- Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations.

## **ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE**

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:

- a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
- b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
- c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website([https://www.ufv.es/gestion-de-la-informacion\\_biblioteca/](https://www.ufv.es/gestion-de-la-informacion_biblioteca/)).
- d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.

2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the [Guide for the Responsible Use of Artificial Intelligence in Studies at UFV](#). Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.

3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

## **BIBLIOGRAPHY AND OTHER RESOURCES**

### **Basic**

Gonzalez, Alvaro. Principles of Clinical Biochemistry and Molecular Pathology [Electronic Resource]/2nd ed. Madrid:Elsevier, 2014.

edition edited by X. Fuentes Arderiu, M. J. Castiñeiras Lacambra, J. M. Queraltó Compañó. Clinical Biochemistry and Molecular Pathology/2nd ed. Barcelona:Reverté, 1998.