

**COURSE DATA****Data Subject**

<b>Code</b>	33063
<b>Name</b>	Clinical biochemistry
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	5.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1100 - Degree in Biology	Faculty of Biological Sciences	4	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1100 - Degree in Biology	16 - Fundamentals of health biology	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
MURGUI FAUBEL, MARIA AMELIA	30 - Biochemistry and Molecular Biology

**SUMMARY**

Introduction to Clinical Biochemistry is, together with “ Diseases and Pathogens”, Endocrinology”, “Human Genetics”, Immunology “ and “Neurobiology” each of which having 5 ECTS credits, included on the fourth course of the Biology degree of de Universitat de Valencia.

Clinical Biochemistry is an applied science that investigates biochemical alterations produced by illnesses in homeostatic maintenance. It uses laboratory analysis, whose objective is to know how organs and systems work, under normal and pathological conditions, therefore, it can help diagnostics, prognostics, evolution control, treatments, medicines monitorization and illness’ prevention.

This subject allows the student to know analysis methods for health evaluation and, as a result, understand its applications and its limits.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

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

### Other requirements

To take this course the student should have knowledge of: structure and function of biomolecules, regulation and integration of metabolism, Genetics and Molecular Biology, Animal Physiology, biochemical methodology, knowledge of English (translation).

## OUTCOMES

### 1100 - Degree in Biology

- Conocer y saber aplicar el método científico.
- Capacidad de organización, planificación y gestión de la información usando bases de datos bibliográficas adecuadas.
- Utilización del vocabulario específico de la Biología sanitaria.
- Capacidad de resolución de problemas y toma de decisiones.
- Capacidad de elaborar artículos, informes o proyectos y de exponerlos a diferentes auditorios.
- Capacidad de análisis crítico de textos científicos.
- Aprendizaje autónomo y adaptación a nuevas situaciones.
- Potenciar la creatividad, iniciativa y espíritu emprendedor.
- Apreciación del rigor, el trabajo metódico, y la solidez de los resultados.
- Capacidad de utilización de herramientas matemáticas y estadísticas.
- Reflexión ética sobre la actividad profesional.
- Conocer los principales métodos y técnicas experimentales aplicadas al estudio de las enfermedades humanas, su etiología y la efectividad de los tratamientos.
- Conocimiento de las enfermedades y disfunciones más frecuentes durante las distintas etapas de la vida.
- Conocer los organismos patógenos de humanos, las patologías que provocan y conocer los fundamentos de las principales estrategias terapéuticas.
- Conocer los mecanismos de interacción hospedador-patógeno para entender factores de virulencia en enfermedades infecciosas y parasitarias.
- Saber diseñar y preparar vacunas y saber realizar las vacunaciones.
- Entender la genómica de patógenos y sus implicaciones para el diseño de fármacos y vacunas.



## LEARNING OUTCOMES

The main objective of the course is that the student knows the biochemical alterations introduced by the disease in the body's homeostasis.

Objectives:

- Understanding the biochemical mechanism of the disease and its rational approach to diagnosis, prognosis, treatment and prevention.
- Understanding the main techniques and analytical methods used in the diagnosis and monitoring of certain diseases.
- Give the students a vision of clinical chemistry as a science of everyday, useful in both the laboratory and in medical practice.
- Integrating knowledge of basic science to clinical practice.
- Understanding that the maintenance of our internal homeostasis depends on the balance between our internal metabolism and our environment.

## DESCRIPTION OF CONTENTS

### 1. Clinical biochemistry

Concept. Specimens types. Collection and preparation of biological samples. Storage and conservation.

### 2. Interpretation of results

Analytical quality. Values of reference. Semiologic value of the biochemical determinations. Interferences

### 3. Analytical methods in the Clinical Biochemistry laboratory

Spectrophotometry. Chromatography, electrophoresis. Immunological techniques. Techniques of Molecular Biology.



#### **4. Plasma proteins. Proteins in urine.**

Study of plasma proteins. Biochemical functions and clinic interest. Proteinuria. Protein identification methods. Clinical applications

#### **5. Clinical enzymology**

Diagnostic value of plasma enzymes and isoenzymes

#### **6. Alterations of sugar metabolism.**

Metabolism of Galactose, Fructose, Lactose. Glycogenosis.

#### **7. Diabetes mellitus**

Differential study and complications. Study of hypoglycemia. Metabolic Syndrome

#### **8. Alterations and evaluation of plasma lipoproteins**

Biochemical diagnosis of lipoproteins disorders . Biochemical markers of the myocardial infarction.

#### **9. Alterations and evaluation of the nitrogen metabolism**

Clinical study of urea and creatinine. Study of the renal clearance.

#### **10. Disorders of the nitrogen metabolism: Purines.**

Clinical study and biochemical evaluation of hyperuricemia

#### **11. Heme metabolism**

Biochemical evaluation of the jaundices and of the porphyrias.

#### **12. Iron metabolism**

Biochemical evaluation of the anaemias and the hemochromatosis.

#### **13. Clinical Biochemistry of the bone**



Metabolism of the calcium, phosphorus and magnesium

#### 14. Clinical Biochemistry of the thyroid function

Analytical study of the Hypothyroidism and Hyperthyroidism

#### 15. Molecular Base of Celiac Disease.

Definition. Clinical manifestations. Etiopathogenesis.

#### 16. PRACTICAL SESSIONS

1.- Types of Specimens, sampling, containers, conservation, interferences, etc.

2.- Determination of metabolites and ions.

Glucose. Urea. Uric acid. Total hemoglobin. Iron. Iron binding capacity (TIBC). Creatinine: Creatinine clearance. Cholesterol, HDL-Cholesterol: Assessment of atherogenic risk. Triglycerides. Study of plasma proteins..

3.- Determinations of enzymes and isoenzymes of clinical interest.

Glutamate-Oxaloacetate Transaminase (ASAT). Glutamate-Pyruvate Transaminase (ALAT). Gamma glutamyl transpeptidase (GGT). Serum phosphatases Alkaline. Lactate dehydrogenase total (LDH) and heat resistant. Amylase.

4.-Discussion and interpretation of results. Simulation of clinical cases and reporting.

#### WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	33,00	100
Laboratory practices	15,00	100
Tutorials	2,00	100
Development of group work	10,00	0
Development of individual work	5,00	0
Preparation of evaluation activities	43,50	0
Preparing lectures	9,50	0
Preparation of practical classes and problem	2,00	0
Resolution of case studies	5,00	0
<b>TOTAL</b>	<b>125,00</b>	





## TEACHING METHODOLOGY

The course will be based on the following teaching methods:

- 1.- Theoretical classes: sessions of 1 hour using the methodology of the lecture as , well as the use of spoken presentations for on-line classes or the use of videoconference-
- 2.- Practical classes: based on practical activities both in the laboratory and in simulation of clinical cases and reporting. The practical classes will be face-to-face.
- 3.- Tutorials and Seminars: It will review issues of interest to the student's formation in the field of clinical biochemistry, such as single topics, case reports, etc. The realization of the tutorials and seminars will be carried out on-line

## EVALUATION

- 1.- Evaluation of the theoretical content:

Theory exam: 65% of the student's final qualification (65 points)

An evaluation of the concepts worked on the theory sessions consisting of multiple choice questions and short and developmental issues.

2. – Evaluation of practices: 20% of the final grade (20 points)

Practices exam: theoretical questions about basics of techniques and clinical usefulness of determinations and calculation problems of some biochemical parameters and interpretation of results. (15 points)

5 points of the practical note will be obtained from exercises and evaluable tasks of the same.

- 3: - Continuous assessment tasks: 15% of the final grade (15 points)

During the semester, various tasks were carried out on aspects of the temary, topics of current interest in clinical biochemistry, etc.

- 4.- To pass the course it will be necessary to pass each of the sections separately

A student who does not pass the subject in the first call you can save for the second call that part that has passed.

## REFERENCES



### Basic

- BALCELLS, A. La Clínica y el Laboratorio. 22ª ed. Editorial Masson. (2015).
- BAYNES, J W Y DOMINICZAK, H. Bioquímica medica. 5ª ed. Elsevier-Mosby. (2019).
- BURTIS,C.A. & ASHWOOD,E.R. (Eds.) "TIEZ textbook of Clinical Chemistry" 4ª ed. Elsevier-Saunders Company (2006).
- GAW, A. et al. Bioquímica Clínica 5 ed. (2014).
- GONZALEZ HERNANDEZ, ALVARO. Principios de Bioquímica Clínica y Patología Molecular. 2 Ed Editorial Elsevier. (2016).
- HENRY, J.B. Clinical diagnosis and management by laboratory methods 3ª ed Saunders Co. (2005).
- KASPER, D.L. et al. Harrison: Principios de Medicina Interna. McGraw-Interamericana 16ª Ed. (2006).
- MARSHALL, W.J. & BANGERT, S.K. Clinical Chemistry. Metabolic and clinical aspects. Curchill Livingstone. (2008).

### ADDENDUM COVID-19

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

#### Workload and teaching planning

**THEORY:** In classes where attendance were not possible, they would be carried out on-line, either with Power broadcast or by Videoconference.

The insurance program and its workload in hours would be maintained.

**PRACTICAL SESSIONS:** If the attendance hours had to be reduced, a selection of practices would be made to carry out in the laboratory and the rest would be on line (power presentations, videoconference, tasks, etc.). If they could not be attended in any case, they would be carried out on-line with the digital platforms available

**GROUP TUTORIALS:** They would be carried out by Videoconference at the scheduled times.

#### Methodology

The materials provided in the original guide for face-to-face teaching would be adapted incorporating explanatory annotations and locutions so the student can access them at any time. BBC videoconferences to explain concepts that need clarification.

The tasks would be delivered through the option "task or questionnaire" of the virtual classroom.



Combination of BBC videoconferences, viewing of didactic videos and exercises proposed using the "Task" option in the virtual classroom for practical sessions at the established time.

Tutorial system. The virtual tutorial program is maintained

### **Evaluation**

Maintenance of the weight of each of the sections of the teaching guide.

The exams would be carried out in this case online, maintaining the characteristics indicated in the teaching guide, through questionnaires or tasks. If any student presents insurmountable connection problems during the exam, the exam will be held orally by videoconference.