UAB
Universitat Autònoma de Barcelona

Animal Physiology: Systems

Code: 100806
ECTS Credits: 6

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Degree	Type	Year
2500004 Biology	OB	2

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

It is desirable that the student has acquired basic knowledge and competences on the structure and organization of animal organisms and their cellular systems.

It is important that the student has acquired the basic knowledge and skills of the Histology and the Biochemistry course

In order to be able to attend the sessions of laboratory practices, the student must justify having passed the biosafety and security tests that he will find in the Virtual Campus and be knowledgeable and accept the rules of operation of the laboratories of the Faculty of Biosciences.

Objectives and Contextualisation

The subject *Physiology Animal I: Systems* is programmed during the second course of the Degree of Biology and develops the knowledge of the normal function of the following systems of the animal organism: blood and hematopoietic organs, cardiovascular system, respiratory system, digestive system, metabolism and Regulation of body temperature systems and excretory system and body fluids regulation.

The acquisition of the basic competences of the subject will allow the student to confront with a sufficient base the study of Animal Physiology II: neurophysiology and endocrinology as well as the understanding of the mechanisms that have been chosen evolutionarily in the different animal groups for Its effectiveness.

The general training objectives of the subject are:

Learn the basics of Physiology of thedifferent functional systems of the animal organism.
Acquire a complete and integrated vision of the interrelations of the different systems in the organism.
To integrate the knowledge of Physiology with those acquired in other basic subjects, which deal with the structure and the cellular and molecular aspects of the organism, in order to achieve a global vision of the functioning of the animal body.
To train the student to apply the physiological knowledge in the deduction of the consequences of the pathological alterations of the organism.

Acquire the practical skills needed to carry out functional study techniques

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Carry out functional tests and determine, assess and interpret vital parameters.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand and interpret the physicochemical bases of the basic processes of living beings
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
3. Apply statistical and computer resources to the interpretation of data.
4. Be able to analyse and synthesise.
5. Be able to organise and plan.
6. Carry out functional tests and determine, assess and interpret vital parameters in animals.
7. Critically analyse the principles, values and procedures that govern the exercise of the profession.
8. Gain further understanding of electric phenomena and of signal transmission to excitable cells.
9. Gain further understanding of the functional mechanisms of hydrosaline and acid-base balance in the animal organism.
10. Identify, enumerate, describe, interpret, explain and summarise the different levels of organisation of animals.

11. Identify, enumerate, describe, interpret, explain and summarise the function and regulatory mechanisms of the cardiovascular system.
12. Identify, enumerate, describe, interpret, explain and summarise the function and regulatory mechanisms of the digestive system.
13. Identify, enumerate, describe, interpret, explain and summarise the function and regulatory mechanisms of the excretory system.
14. Identify, enumerate, describe, interpret, explain and summarise the function and regulatory mechanisms of the respiratory system.
15. Identify, enumerate, describe, interpret, explain and summarise the functional organisation of animal organs and systems.
16. Identify, enumerate, describe, interpret, explain and summarise the functional mechanisms of animal nutrition and metabolism.
17. Identify, enumerate, describe, interpret, explain and summarise the fundamental principles of the concept of homeostasis.
18. Identify, enumerate, describe, interpret, explain and summarise the physiological bases of adaptation to the environment.
19. Identify, enumerate, describe, interpret, explain and summarise the physiological bases of pathological processes.
20. Identify, enumerate, select, describe, interpret, explain and summarise the practical skills needed to apply the most common functional study techniques.
21. Propose new methods or well-founded alternative solutions.
22. Propose projects and actions that incorporate the gender perspective.
23. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
24. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
25. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
26. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
27. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
28. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
29. Work in teams.

Content

PROGRAM

INTRODUCTION.

1.- Animal Physiology. Concept Internal madia and Homeostasis

EXCITABILITY AND EXCITABLE CELLS

1.-Intercellular communication mechanisms

2.- Excitable cells. Excitability concept

3.- Ionic channels. Ionic bases of resting membrane potential and action potential

MUSCULAR PHYSIOLOGY

1.- Muscular tissues: anatomical and functional characteristics

2.- Skeletal musculature. Motor unit, muscle tone, isotonic and isometric contraction

3.- Smooth musculature and heart musculature

AUTONOMIC NERVOUS SYSTEM

1.- General characteristics of the autonomic nervous system, comparing to the central nervous system

2.- SNA sympathetic and parasympathetic

LIQUID COMPARTMENTS, BLOOD AND HEMATOPOIESIS

1.- General functions and physicochemical characteristics of the blood

2.- Functional constituents: Physicochemical characteristics of plasma. Plasma proteins

3- Characteristics and functions of erythrocytes. Erythropoiesis. Hemoglobin

4.- Concentration and proportion of leukocytes. Leucocyte formula. Formation and functional characteristics of leukocytes. Inflammation

5.- Haemostasis: phases and elements

CIRCULATORY SYSTEM

1.- Organizational schemes of the circulatory systems. Concepts of hemodynamics. Evolution of the circulatory system.

2.- Characteristics of myocardial fiber. Electromechanical coupling. Calcium paper. Electrical events during the heart cycle. Rest and action potential. Excitability, conductivity and regulation of myocardial automatism. Record of the electrical activity of the heart. ECG

3.- Electrical and mechanical events during the heart cycle. Auricles and ventricles, auriculoventricular and semilunars valves. Systole and diastole. Normal limits of the auricular, ventricular and arterial pressures in pulmonary and systemic circulations

4.-Mechanisms of regulation of the cardiac function: Intrínsecs: homologous and heterometric self-regulation. Extrinsic: autonomic nervous system. Coronary circulation

5.- Arterial and venous system: differences between the arterial and venous system: pressure and resistance.

6.- Capillary exchange and lymphatic system. Hemodynamic functions of the lymphatic system.

7.- Blood pressure. Distribution of the relation pressure / resistance. Blood pressure curve. Measurement of blood pressure. Arterial elasticity curve. Variation with age. Determinant parameters of blood pressure. Rhythmic fluctuations in blood pressure.

8.- Control of the cardiovascular system. General classification of control mechanisms. Local control mechanisms. Endocrine control mechanisms. Nervous control mechanisms

9.- Relationship between blood pressure and local flow control. Global control of blood pressure. Functional differences between short and long term control. Classification of regulatory mechanisms.

RESPIRATORY SYSTEM

1.- Concept of breathing. Respiratory pigments. Comparative aspects of breathing. Aerial and aquatic breathing

2.- Functional organization of the respiratory system. Respiratory and non-respiratory functions

3.- The mammalian lungs. Definition of ventilation mechanics. Variations of pressure and volume in the ventilation. Respiratory work Volumes and lung capabilities. Alveolar ventilation and respiratory areas.

4.- Regulation of pulmonary blood flow. Relation ventilation-perfusion. The respiratory membrane. Exchanging gas to alveoli and tissues.

5.- Regulation of respiration in mammals. The respiratory centers. Respiratory rhythm

DIGESTIVE SYSTEM

1.- General functions of the digestive system. Evolution of the digestive system. Components and functions of the digestive system. Smooth gastrointestinal muscle, characteristics and particularities. Electric base rhythm and action potential. Peristaltism

Enteric nervous system. Gastrointestinal extrinsic innervation. Gastrointestinal reflexes. Hormones and gastrointestinal peptides

2.- Mastication and swallowing. Salivary secretion

3.- Functional structure of the stomach. Gastric motility. Control of the emptying of the gastric content for gastric and duodenal signals. Gastric secretions Acid secretion: Composition and regulation of acid secretion. Other gastric secretions: digestive enzymes, mucus and intrinsic factor. The gastric mucosa barrier

4.- Functional structure of the small intestine. Secretions in the small intestine, pancreatic secretion and biliary secretion, regulation of secretions. Digestion and absorption of nutrients. The ilio-cecal valve.

5.- Heavy intestine, functional structure. Movements in the large intestine. Secretions and control of secretions. Secretion and intestinal absorption of water and electrolytes. Defecation

6.- Introduction to the regulation of short and long term intake

METABOLISM AND BODY TEMPERATURE REGULATION

1.- Characteristics of energy systems: Energy balance. Metabolic rate: Basal metabolic rate. Factors that regulate the metabolic rate.

2.- Integration of the metabolic functions of the organism. Liver as a metabolic organ in the cycles of intake / stomach.

3.- Body temperature and thermal balance. Pioquilothermia and homeothermia. Mechanisms of regulation of body temperature. Adaptations of animals to extreme temperatures. Hyperthermia and fever. Hypothermia and freezing

EXCRETOR SYSTEM

1.- Volume and composition of body fluids. Body water Water balance

2.- Excretory organs. Excretion of nitrogenous products. Basic functions of the kidney in vertebrates. Functional structure of the kidney. Nephron as a functional unit.

3.- Processes that intervene in the formation of urine. Glomerular filtration, secretion and tubular reabsorption.

4.- Glomerular haemodynamics. Concept and calculation of plasma purification. Determination of the glomerular filtration rate. Determination of renal plasmatic flow

5.- Tubular reabsorption and secretion. Regulation of tubular reabsorption

6.- Mechanisms of concentration of the urine. The proximal tubule and the Henle Nansa. Function of the distal tubule and tubule collectors. Contracorrent deconcentration mechanism. Changes in volume and osmolarity of the tubular fluid throughout the nephron. Micción

7.- Regulation of the volume and osmolality of body fluids. Animal adaptations to situations of water stress

8.- Regulation of the acid-base balance. Concentration of hydrogenation in body fluids. The shock absorber systems. Renal regulation of the hydrogen concentration. Physiological compensation of acidic-basic alterations.

LABORATORY PRACTICAL CLASSES PROGRAM

ELECTROCARDIOGRAPHIC REGISTRY

1) Electrocardiogram

- Registration procedure. Placement of electrodes. Bipolar, monopolar and precordial derivations

- Evaluation of normal electrocardiogram register. Variations due to body position, local cold and apnea

CARDIORESPIRATORIES ADAPTATIONS TO THE EXERCISE

Heart rate and heart rhythm

- Measurement of the arterial pressure by the digital and analog method

- Effects of exercise, static and dynamic

- Evaluation of normal values and their physiological variations.

EXPERIMENTAL DESIGN IN PHYSIOLOGY

1) ANSWER TO HYDRIC DEPRIVATION IN THE RATOLI

- Physiological criteria to observe before designing an experiment with animals.

- Study of the possible response to water deprivation in mouse.

- Establishment of the hypotheses of the experimental methods to address it

- Discussion of the approaches and establishment of the experimental groups

2) DISCUSSION OF THE EXPERIMENTAL CONDITIONS

FUNCTIONAL ANATOMY OF THE RATE (NECROPSY)

1) IDENTIFICATION OF THE ORGANS AND SYSTEMS

- Disection and identification of organs

2) DETERMINATION OF THE ABSOLUTED AND RELATED ORGAN WEIGHT

- Identification of the main organs that are part of physiological systems

- Manipulation techniques used in studies with rodents

- Obtaining absolute and relative weight of the organs

PROGRAM OF SEMINARS

Problems and / or clinical cases related to the different subjects of the course will be solved, once the corresponding part is finished in the theoretical classes

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
laboratory practices	12	0.48	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 24
problem solving and clinical cases in class	6	0.24	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 26, 28, 29
theoretical expossitions	32	1.28	8, 9, 10, 11, 12, 13, 14, 15, 16, 17
Type: Supervised			
practice preparation	4	0.16	4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
problems resolution	12	0.48	4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
Type: Autonomous			
elaboration of works	4	0.16	3, 4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 27
questions resolution	8	0.32	1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 28, 29
study	60	2.4	3, 4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

Theoretical classes:

Systematized presentation of the subject's program, giving relevance to the most important concepts. The student acquires the basic scientific knowledge of the subject by attending theory classes that will be complemented with the personal study of the exposed topics.

Classroom practices:

Work on cases and/or problems relevant to learning the subject. The knowledge acquired in theory classes and personal study is applied to the resolution of practical cases that arise. Students work in groups.

Laboratory course:

Practice sessions for the observation and performance of procedures, practical learning of physiological techniques. Group work and active self-learning are promoted.

In order to attend the laboratory practice sessions, the student must prove that they have passed the biosafety and safety tests that they will find on the Virtual Campus and be familiar with and accept the operating standards of the laboratories of the Faculty of Biosciences.

Tutorials:

Individual sessions or in small groups to resolve doubts related to the subject. This type of activity will be carried out at the request of the students (individually or in groups) or will be proposed by the teacher on a voluntary basis. Therefore, it is an activity that will not be valued in the count of hours included in this teaching guide.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Examination of theoretical concepts	75%	8	0.32	4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
Practice questions resolution	10%	2	0.08	4, 5, 18, 19, 26, 27, 28
Problem solving and clinical cases in class	15%	2	0.08	1, 2, 3, 4, 5, 6, 7, 9, 11, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 29

Evaluation

- Evaluation of practical competences acquired through the resolution of problems and theoretical exam questions.

- Evaluation of theoretical competences by means of objective tests of multiple answer and in some aspects questions of development of the proposed objectives. It is indispensable to get a grade equal to or greater than 5 to consider the partial part of theoretical knowledge achieved.

- Evaluation of problems based on the results in the case of the problems and the capacity of synthesis and brief explanation in the resolution of questions posed.

- Possibility of recovering only those parts of the theoretical competences that were not obtained at the time.

- The modification of the overall grade of the subject can be done by means of the resolution of a synthesis examination (one question) of the entire subject, which implies the renunciation of the previous note

- Repeaters that do not carry out a continuous assessment, that is to say, do not face problems and / or practice sessions must notify the teaching staff at the beginning of the course, the others will have to do the continuous assessment just like the other classmates, they will have To carry out the practice exam and the mark of the subject will be calculated as 85% theoretical concepts and 15% practical.

To participate in the recovery, the students must have previously been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the "Non-Appraising" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade ".

Single assessment: The subject contemplates the single assessment. The practices are mandatory, they are 10% of the grade and will be evaluated through multiple choice questions on the same day as the theory exam. The theory represents 75% of the final mark and will be evaluated by means of a multiple-choice test (it is essential to get a mark equal to or higher than 5 to consider the partial part of theoretical knowledge achieved). The evaluation of practical problems in the classroom is 15% of the grade and will be evaluated through short questions on the same day of the theoretical and practical exam. The same recovery system as for the continuous evaluation will be applied. The revision of the final qualification follows the same procedure as for the continuous evaluation.

Bibliography

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Software

I don't use programari

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	121	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	122	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	121	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	122	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	123	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	124	Catalan	second semester	morning-mixed
(TE) Theory	12	Catalan	second semester	afternoon