



IDENTIFYING DATA

Integrative cell biology and physiology: Implications for health

Subject	Integrative cell biology and physiology: Implications for health			
Code	V02G031V01407			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Blanco Imperiali, Ayelén Melisa Megías Pacheco, Manuel Míguez Miramontes, Jesús Manuel			
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General description	<p>English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.</p> <p>The objective of the course is to deepen in the cellular bases and physiological responses that allow the organism to maintain homeostasis in normal situations, as well as in the alterations that are triggered by changes in the environment and with certain pathologies. The course deals with the contents that complement the formation previously acquired on the cytological and physiological bases of living beings, as well as their integrative functioning.</p>			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C16	The ability to identify the genetic and molecular bases of disease, advise on genetic counselling and genomic studies. Understand the control of cellular activity and integrated physiological responses, analysing their repercussions on health.
C17	Understanding the social projection of biology applied to health at its different levels (analytical, pathological and public health) and its repercussions on professional practice.

D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To understand the importance of cellular compartments in the function of tissues and organs.	A2 A3	B2 B3	C3 C6 C16	D2
To understand the influence of the environment on the control of cellular activity.	A2 A3	B2	C3 C6 C16 C17	D1 D4
To know the cellular basis of major diseases.	A2	B3 B4	C3 C6 C16	D2 D4
To identify the mechanisms of integration of the different physiological systems.	A3	B3 B4	C3 C6 C10 C16	D1 D4
To understand the physiological basis of adaptive responses.	A3	B2	C3 C6 C16	D3
To know the physiological basis of cognitive functions and behaviour.	A2 A3	B2	C6 C17	D1 D2 D4

Contents

Topic	
THEORETICAL CONTENTS	Topic 1. Cellular stress. Causes of cellular stress and cell responses to maintain homeostasis. Apoptosis and autophagy.
SECTION 1. Cellular homeostasis. Alterations and consequences in health.	Topic 2. Aging. Cellular basis of aging. Topic 3. Cancer and microenvironment. Characteristics and behavior of tumor cells, and the influence of the environment. Topic 4. Cell differentiation and tissue engraftment. Sources of stem cells. Types of stem cells. Cell differentiation. Extracellular matrices, properties. Decellularization. Applications: advantages and disadvantages.
SECTION 2. Body homeostasis. Adaptive responses and functional alterations	Topic 5. Body homeostasis, health and disease. Homeostatic regulation. Disease: determining, conditioning and predisposing factors. Factors (physical, chemical, biological) causing disease. Adaptations to extreme conditions. Topic 6. General adaptation syndrome and specific organic responses. Physiology of stress. Inflammation. Fever. Pain. Topic 7. Energy homeostasis. Components of energy balance. Regulation of intake. Fasting and obesity. Topic 8. Functional alterations of special relevance. Diabetes, Atherosclerosis. Hypo- and hypertension, cardiopathies, etc.
SECTION 3. Behavior and higher functions.	Tema 9. Rhythmic physiology and chronobiology. Molecular and physiological bases of circadian rhythms. Topic 10. Nervous bases of behavior. Encephalic mechanisms: limbic system and hypothalamus. Reward systems. States of consciousness: sleep.
PRACTICAL CONTENTS	Some of the possible activities that would be developed in the practical sessions are the following:
Practical sessions that will be carried out in the laboratory and in which contents that reinforce and/or complement those provided in the other activities will be addressed.	<ul style="list-style-type: none"> - Alterations in cell lines. - Cytological and tissue characteristics of tumor tissue. Metastasis. - Blood cell count and leukocyte formula. Hematic parameters. - Blood pressure. Electrocardiogram. - Circadian rhythm monitoring.

SEMINARS

Classroom sessions in which the resolution of experimental problems and case studies will be approached through work in small groups.

A list of topics and/or case studies will be provided for the students of each group to choose one and proceed to its development in the seminar sessions. Students will develop the skills of searching and categorizing information, as well presentation, defense and debate.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	36	60
Seminars	12	48	60
Laboratory practical	12	12	24
Objective questions exam	1	0	1
Essay questions exam	2	0	2
Essay	1	1	2
Objective questions exam	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	The main concepts related to the contents will be presented, supported with images and videos. Participation will be encouraged and the topics and concepts covered will be discussed in class, as far as possible. Class attendance is mandatory.
Seminars	Students will be divided into groups and these in turn will be divided into pairs of groups. Each pair will be assigned an experimental problem that they will have to solve independently throughout the course. There will be periodic meetings that will coincide with the dates of the seminars in the calendar to check the progress of each group. At the end of the course each pair will present and defend their proposal, which will then be discussed to look for weaknesses and strengths. Attendance to the seminars is compulsory.
Laboratory practical	In laboratory sessions, samples will be analyzed and experiments related to cellular and systemic homeostasis will be carried out, as well as the monitoring of parameters indicative of functional status. Attendance to the practicals is mandatory.

Personalized assistance

Methodologies	Description
Lecturing	Classes will be interactive and will allow establishing personalized reinforcement actions. Students will be able to request individualized tutorials for the resolution of doubts and problems related to the theoretical contents of the subject.
Seminars	The sessions will be interactive and will allow to establish follow-up and reinforcement actions. Students may request individualized tutorials for the resolution of doubts and problems related to the seminar sessions.
Laboratory practical	During the realization of the practices the teachers will give individualized attention to each student for the correct understanding of the experimental objectives and the methodologies or techniques used.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	There will be 4 short tests (10 minutes) throughout the term, which will be given during class time. These tests are aimed at evaluating theoretical knowledge taught in class sessions.	10	A2	B4	C6 C10 C16	D1
Essay questions exam	It will take place in the final test. It will allow evaluating theoretical and general knowledge of the subject. It will include short development questions and practical cases.	40	A2	B3	C6 C16	D2

Essay	Aimed at evaluating knowledge related to the seminar sessions. They are works done in groups (2-3 students) and in pairs of groups. They will involve the development of a short report, an exposition and a defense of the work in front of the class.	30	A2 A3	B2 B4	C6 C10 C16 C17	D1 D2 D3 D4
Three aspects will be taken into account in the evaluation: <ol style="list-style-type: none"> 1. Performance during the realization of the work (20%). 2. Presentation and defense of the final proposal (5%). 3. Ability to argue the strong points of one's own project and the weak points of the opponent (5%). 						
Objective questions exam	It is aimed at the evaluation of the practical contents. It will be carried out in the last practical session of Cell Biology (first part of the test, 7%) and Physiology (second part of the test, 13%).	20	A3	B3 B4	C3 C6 C10 C16	D3 D4

Other comments on the Evaluation

Minimum grades and second chance evaluation

In order to pass the course, students must complete all the proposed activities and achieve a minimum grade of 5 points out of 10 (5/10) in each evaluable activity (theoretical contents, seminars, laboratory practices). However, it will be possible to compensate the different activities if a minimum grade of 4/10 points is reached in each of them. In case of not reaching the minimum grade in the section of theoretical contents (4/10), that will be the grade that will appear in the final qualification of the subject (the grades of practices and seminars will not be taken into account).

The justification of non-attendance to the practical sessions and seminars does not exempt the student from taking them in another group, as long as the calendar allows it.

Second opportunity and next course

The activities passed in the first opportunity of the course will be retained for the second opportunity. In the case of practices and seminars, their recovery in the second opportunity will entail the realization of an alternative evaluation test.

Students who repeat the subject in the following course will keep the grades obtained in the activities passed in the previous course, having to repeat those not passed. Optionally they can repeat those activities even if they pass them, in this case participating in a new evaluation process.

Global assessment

Students may request a global assessment, which will entail the waiver of continuous assessment. The global evaluation will allow obtaining 100% of the score of the subject by means of a test on the official date set for the final exam of the subject, both in the first opportunity and in the second one.

The exam may include: - Objective development questions; - Development questions; - Practical cases, etc.

The global evaluation does not exempt from the realization of practices and seminars of the subject. In the case of not realization of these activities, the final grade in the subject will be of 0 points.

Academic and examination schedules

The academic calendar can be consulted at: <http://bioloxia.uvigo.es/es/docencia/horarios>

The exams calendar can be consulted at: <http://bioloxia.uvigo.es/es/docencia/examenes>

Ethical aspects.

Plagiarism will be prosecuted in the work, as well as copying from other students during the evaluation tests, which may be grounds for a reduction of the grade and even a failure in the subject.

Sources of information

Basic Bibliography

Alberts, B., **Molecular Biology of the Cell**, 6, Garland Science, Taylor and Francis group, 2015

Fulda S., Gorman A.M., Samali A., **Cellular stress responses: cell survival and cell death**, Article ID 214074, 23 pages, Int. J. Cell Biol., 2010

Harding, J., Lodolce, J.P., **Becker's world of the cell**, Hoboken: Pearson, 2021

López-Otin C., Kroemer G., **Hallmarks of health**, 7;184(1): 33-63, Cell, 2021

López-Otín C, Blasco MA, Partridge L, Serrano M, Kroemer G., **The hallmarks of aging**, 153(6):1194-217, Cell, 2013

Guyton A.C., Hall J.E., **Tratado de Fisiología médica**, 14, McGraw-Hill Interamericana., 2021

Hall J.C., Hall M.E., **Guyton and Hall, Textbook of medical physiology**, 14, Elsevier, 2021

Norris T.M., **PORTH Fundamentos de fisiopatología**, 5, Wolter-Kluver, 2020

Tresguerres J.A.F. et al., **Fisiología humana**, McGraw-Hill Interamericana, 2010

Rhoades R.A., Bell D.R., **Fisiología médica**, Wolter-Kluver, 2018

Silverthorn, **Fisiología humana. Un enfoque integrado**, Ed. Médica Panamericana, 2021

Complementary Bibliography

Kandel E.R., Schwartz J.H., Jessell T.M., Siegelbaum S.A., Hudspeth A.J., **Principles of neural science**, McGraw-Hill, 2013

Haines D.E., **Principios de neurociencia. Aplicaciones básicas y clínicas**, Elsevier, 2014

Redolar, **Fisiología de la conducta**, Ed. Médica Panamericana, 2015

Madrid J.A., Rol de Lama A., **Cronobiología Básica y clínica**, Editecred, 2006

Caciopo J.T., Tassinari L.G., Berntson G.G., **Handbook of psychophysiology**, Cambridge Univ. Press, 2007

Koukkari W.L., Sothorn R.B., **Introducing Biological Rhythms.**, Springer, 2006

Gluck M.A., Mercado E., Myers C.E., **Learning and memory. From brain to behavior**, McMillan Higher Education, 2014

Hof P.R., Mobbs C.V., **Functional neurobiology of aging**, Ed. Academic Press, 2001

Yudofsky S.C., Hales R.E., **Essentials of neuropsychiatry and behavioral neurosciences**, Americans Psychiatry Publishing, 2010

Recommendations

Subjects that are recommended to be taken simultaneously

Clinical biochemistry and immunology/V02G031V01405
Human genetics and molecular pathology/V02G031V01408

Subjects that it is recommended to have taken before

Biochemistry I/V02G031V01201
Biochemistry II/V02G031V01206
Animal and plant histology and cytology I/V02G031V01203
Animal and plant histology and cytology II/V02G031V01208
Genetics I/V02G031V01209
Animal physiology I/V02G031V01302
Animal physiology II/V02G031V01307
Genetics II/V02G031V01304