



IDENTIFYING DATA

Advanced techniques in biology

Subject	Advanced techniques in biology			
Code	V02G030V01504			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department	Functional Biology and Health Sciences Biochemistry, Genetics and Immunology			
Coordinator	Faro Rivas, Jose Manuel			
Lecturers	Álvarez Otero, Rosa María Canchaya Sanchez, Carlos Alberto de Carlos Villamarín, Alejandro Leonides Faro Rivas, Jose Manuel Gallardo Gómez, María Miguel Villegas, Encarnación de Pérez Diz, Ángel Eduardo Vicens Sánchez, Alberto			
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General description	<p>Subject essentially practical whose mission is the acquisition of experience in the employment of advanced molecular, cellular and histological techniques. It intends to show the possibilities of such techniques, and it completes and extends the knowledge gained by the student in the subject "basic techniques of laboratory" of the first year of the degree and in the laboratory sessions of the subjects of the second year of the degree. For that different experimental protocols will be performed in the laboratory that are considered advanced at both technical and conceptual levels. The different techniques will be grouped in modules according to their relation to distinct areas of the Biology. The teaching method is mainly based in the work of laboratory, but also incorporates complementary readings and tools in order to achieve an integration of the knowledge from diverse fields so that it can be applied to an experimental problem from different technical approaches. The working material will be mostly in castilian, but some will be in English.</p> <p>The schedules of the subject can be consulted link us: http://bioloxia.uvigo.es/gl/docencia/degree-in-bioloxia/time or http://bioloxia.uvigo.es/es/docencia/degree-in-biologia/time</p>			

Competencies

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
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.
A4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Ability of reading and analyzing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the corresponding conclusions.
B3	Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area.

- B4 Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context.
- B5 Understanding of the levels of organization of living beings from a structural (molecular, cellular and organic) and functional point of view by observing their relations with the environment and other organisms, as well as their appearances in situations of environmental alteration.
- B7 Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue.
- B10 Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.
- B11 Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).
- B12 Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context.
- C2 Recognizing different levels of Living systems organization. Performing phylogenetic analysis and identifying evidence of evolution.
- C3 Identifying, analysing and characterizing biological samples, including those of human origin, and possible anomalies.
- C4 Isolating, analysing and identifying biomolecules, viruses, cells, tissues and organs.
- C5 Growing microorganisms, cells, tissues and organs.
- C6 Assessing and interpreting metabolic activities.
- C7 Manipulating and analysing genetic data and carrying out genetic counseling
- C31 Knowing and handling technical and scientific apparatus.
- C32 Knowing and handling basic or specific key concepts and terminology
- C33 Understanding the social projection of Biology.
- D1 Development of capacity of analysis and synthesis
- D2 Acquisition of the organization and planning capacity for tasks and time
- D3 Development of oral and writing communication abilities
- D4 Acquisition of foreign language knowledge related to the study field
- D5 Use of computer resources related to the study field
- D6 Research and interpreting of information from different sources
- D7 Resolution of issues and decision making in an effective way
- D8 Development of the ability of independent learning
- D9 Ability to work in collaboration or creating groups with an interdisciplinary character
- D10 Development of the critical thinking
- D11 Adquisition of an ethical agreement with the society and the profession
- D12 Respectful behaviour to diversity and multiculturalism
- D13 Sensitivity for environmental issues
- D14 Adquisition of abilities in the interpersonal relationships
- D15 Development of creativity, initiative and entrepreneurial spirit
- D16 Acceptance of a quality commitment
- D17 Development of the self-criticism ability
- D18 Development of negotiating power

Learning outcomes

Expected results from this subject	Training and Learning Results			
New	A1	B2 B3	C4 C5 C6 C7 C31	D2 D4 D6 D7 D10 D15
New	A3	B3 B4	C3 C31	D6 D7 D17
New	A1	B2 B3 B5	C2	D1 D10
New	A1 A2	B4 B7 B10	C4 C5 C6 C7	D5 D8 D9
New	A1 A2	B4 B7 B10	C7	D5 D8 D9

New	A3 A4	B11 B12	C33	D3 D4 D11 D12 D13 D14 D15 D16 D18
New	A1 A4	B4 B7 B10	C32	D1 D4 D10

Contents

Topic	
Cellular and molecular analysis (Module I, 12 h)	Lymphoid organs Extraction of lymphoid cells and cell separation Cell counting and cell viability Crio-preservation of cells ELISA
Advanced microscopy techniques (Module II, 12 h)	Immunocytochemistry Fluorescence microscopy Electron microscopy
Advanced techniques of chromatography, electrophoresis and centrifugation (Module III, 20 h)	Espectrofluorimetry Centrifugation Chromatography Electrophoresis
Recombinant DNA and sequencing (Module IV, 20 *h)	Extraction of nucleic acids PCR and quantification Cloning and transformation Gene expression Sequencing and analysis

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Laboratory practices	64	0	64
Autonomous problem solving	0	29	29
Others	0	9	9
Practices report	0	9	9
Objective questions exam	1	18	19
Short answer tests	1	18	19

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

Methodologies

	Description
Introductory activities	It describes the method of work that will be followed
Laboratory practices	It presents to the student the experimental character of the Biology in its real form.
Autonomous problem solving	It can be proposed in any modules with material in English, Galician or Castilian. It will contribute to a better understanding of an experimental technique and a greater autonomy in its performance. In some modules it will be necessary to use computational tools or to perform mathematical and /or statistical calculations.
Others	Some modules can include readings of scientific works that use an experimental method of those worked in the subject. These readings can be in English, Galician or Castilian.

Personalized attention

Methodologies	Description
Laboratory practices	Personal following and help to solve any doubts arising during the lab class. Doubts can be also consulted in the weekly tutoring hours.
Autonomous problem solving	Personal following and help to solve any doubts arising during the non presential activities. Doubts can be also consulted in the weekly tutoring hours.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practices	The degree of interest and participation of the student is evaluated, as well as the punctuality and proper manners, in addition to the assimilation of the work developed during the lab hours.	ver "Otros comentarios" más abajo	A1	B2	C2	D1
			A2	B3	C3	D2
			A3	B4	C4	D3
			A4	B5	C5	D4
				B7	C6	D5
				B10	C7	D6
				B11	C31	D7
				B12	C32	D8
					C33	D9
						D10
						D11
						D12
						D13
						D14
						D15
						D16
						D17
						D18
Autonomous problem solving	The knowledge acquired in the practical sessions is evaluated, as well as the correct use of the language employed, English, Galician or Castilian (in particular, the gramatical construction, spelling and coherence of the text).	ver "Otros comentarios" más abajo	A1	B2	C2	D1
			A3	B3	C3	D3
				B4	C4	D4
					C5	D5
					C6	D7
					C7	D10
					C31	
Others	The understanding of the methodological part of a scientific text is evaluated, as well as the correct use of the language employed, English, Galician or Castilian.	ver "Otros comentarios" más abajo	A1	B3	C31	D1
			A2	B4	C32	D3
						D4
						D6
						D10
Practices report	The knowledge acquired in the practical sessions is evaluated, as well as the correct use of the language employed, English, Galician or Castilian (in particular, the gramatical construction, spelling and coherence of the text).	ver "Otros comentarios" más abajo	A1	B2	C2	D1
			A3	B3	C3	D3
				B4	C4	D5
					C5	D6
					C6	D8
					C7	D9
					C31	D10
					C32	D14
						D17
						D18
Objective questions exam	They evaluate the knowledge acquired in the practices and the complementary activities.	ver "Otros comentarios" más abajo	A1	B2	C2	D1
			A2	B3	C3	D2
			A3	B4	C4	D3
			A4	B5	C5	D10
				B10	C6	
				B11	C7	
					C31	
					C32	
Short answer tests	They evaluate the knowledge acquired in the practices and the complementary activities, as well as the correct use of the language employed, English, Galician or Castilian (in particular, the gramatical construction, spelling and coherence of the text).	ver "Otros comentarios" más abajo	A1	B2	C2	D1
			A2	B3	C3	D2
			A3	B4	C4	D3
			A4	B5	C5	D10
				B10	C6	
				B11	C7	
					C31	
					C32	

Other comments on the Evaluation

The evaluation system that arises in the course allows the student to choose one of the following two ways:

A: FINAL EXAM

For students who choose this option the exam test is 100% of the final grade. The test will consist of two parts:

Theoretical: examination (written or oral) with questions about the contents of the subject to be completed within a maximum of one hour. This part will constitute 50% of the note.

Practice: Making a practical exercise in the laboratory or a case study for up to four hours. This part will constitute 50% of the note.

In any case, if a student gets less than 3 out of 10 in one of the 2 parts of the course he/she will not pass. In this case, if the sum of the 2 parts is less than 5 the overall mark will be that amount, otherwise the official note will be 4.9.

B: Continuous assessment

The continuous assessment system reflects the effort of the student throughout the course. Practices are divided into 16 sessions of 4 h each grouped into four modules. The note obtained by this evaluation system is divided into two main sections:

a) The sum of the assessments made in each module constitute 50% of the final grade. It is necessary to obtain a minimum of 3 out of 10 in each module in order to pass the subject. That note includes timeliness, poise and attitude, the degree of interest and participation of students in lab activities, and student participation in home work. Portfolios will be evaluated only when presented within the deadlines set by the teachers of each of the modules.

b) A final test that will assess the knowledge gained in each module and that constitute 50% of the final grade. It is necessary to obtain a minimum of 4 out of 10 in this exam to pass the subject.

If an student gets 4 or more points in the exam but less than 3 points in the evaluation of any of the modules, the second call exam will include only these modules with a test designed by those responsible for the modules. In case of failing the course, if the sum of the different parts is less than 5 the overall mark will be that sum, otherwise the official note will be 4.9. If the subject is suspended on second call, a student will have to fully repeat the subject in a later academic course. Students who have done laboratory work but did not perform the final exam will appear officially as "no presentado".

Attendance at practices is mandatory so that, in this connection, a student cannot opt for continuous assessment in the following cases: (1) unexcused absence to one or more sessions; and (2) excused absence to two or more sessions. In these circumstances the only option is the final exam with a corresponding practical test laboratory.

The written exam will be held on first call on October 21, 2016 and on second call on June 27, 2017 (dates approved by the Faculty Board).

Regardless of the system followed the student must obtain a minimum global score of 5 points to pass the subject.

Sources of information

Basic Bibliography

Faro, J (coordinador e editor), **Manual de técnicas experimentais en bioloxía molecular e celular**, Servizo de Publicacións da Universidade de Vigo, 2014

Lefkowitz, I, **Immunology methods manual: the comprehensive sourcebook of techniques**, 1997,

Green, RM, **Molecular Cloning: A Laboratory Manual, Fourth Edition**, 2012,

Nelson, DL y Cox, MM, **Lehninger: principios de bioquímica, 6a ed**, 2014,

Bozzola, JJ y Russell, LD, **Electron microscopy : principles and techniques for biologists**, 1999,

Hunter, E, **Practical electron microscopy: a beginner's illustrated guide**, 1993,

Hayat. MA, **Principles and techniques of electron microscopy: biological applications**, 2000,

Complementary Bibliography

Valverde, D, Megías, M y Morán, P,

https://www.youtube.com/channel/UCCK6B5Y_qUD8T2a5OB71c-g/videos?shelf_id=0&view=0&sort=dd,

Recommendations

Subjects that it is recommended to have taken before

Biology: Evolution/V02G030V01101

Biology: Basic laboratory techniques/V02G030V01203

Biochemistry I/V02G030V01301

Biochemistry II/V02G030V01401

Animal and plant histology and cytology I/V02G030V01303

Animal and plant histology and cytology II/V02G030V01403

Genetics I/V02G030V01404

Other comments

It is recommended to work in the subject continuously, refresh basic mathematics, including the resolution of equations of first degree, logarithms, exponentials, linear interpolation, and basic statistics, including linear regression by minimum

