



(*)Facultade de Bioloxía

Presentación

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Grado en Biología

Subjects

Year 2nd

Code	Name	Quadmester	Total Cr.
V02G031V01201	Biochemistry I	1st	6
V02G031V01202	Botany I: Algae and fungi	1st	6
V02G031V01203	Animal and plant histology and cytology I	1st	6
V02G031V01204	Microbiology I	1st	6
V02G031V01205	Zoology 1: Non-arthropod invertebrates	1st	6
V02G031V01206	Biochemistry II	2nd	6
V02G031V01207	Botany II: Archegonia	2nd	6
V02G031V01208	Animal and plant histology and cytology II	2nd	6
V02G031V01209	Genetics I	2nd	6
V02G031V01210	Zoology 2: Arthropod invertebrates and chordates	2nd	6

IDENTIFYING DATA				
Biochemistry I				
Subject	Biochemistry I			
Code	V02G031V01201			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Suárez Alonso, María del Pilar			
Lecturers	San Juan Serrano, María Fuencisla Suárez Alonso, María del Pilar			
E-mail	psuarez@uvigo.es			
Web	http://fatic.uvigo.es			
General description	The subject Biochemistry aims to provide students with basic knowledge about the structure and function of biomolecules, as well as their corresponding routes of biosynthesis and degradation. It also enables them to analyze and identify biomolecules.			

Training and Learning Results	
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.
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.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
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
Recognize the structure, properties and function of biomolecules.	A1 B2 C3 D1 B3 D2 B6
Understand and know the fundamentals of bioenergetics.	A1 B2 C3 D1 A2 B3 C6 D2 A3 B6
Identify the mechanisms of action and regulation of enzymes.	A1 B2 C3 D1 A2 B3 C4 D2 A3 B6 C6
Know the general organization of metabolism.	A1 B2 C3 D1 A2 B3 C4 D2 A3 B6 C6

Apply biochemical knowledge to isolate, identify, handle, and analyze specimens and samples of biological origin, including viruses, as well as to characterize their cellular and molecular constituents.	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2
Apply knowledge and technology related to biochemistry in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2 D3
Contrast information, develop experiments and interpret results.	A1 A2 A3	B2 B3 B6	C3 C6	D1 D2
Understand the social projection of biochemistry and its repercussions on professional practice, as well as know how to use its contents for teaching and dissemination.	A1 A2 A3	B2 B3 B6	C6	D2 D4
Handle the concepts, terminology and scientific-technical instrumentation related to biochemistry.	A1 A2 A3	B2 B3 B6	C3 C4 C6	

Contents

Topic	
(*) Topic 1. Introduction to Biochemistry	(*) Inorganic components of living organisms. Nature of molecular interactions. The role of water in biological processes: ionic product of water and the concept of pH. Ionic balance: Henderson-Hasselbalch equation, pKa concept and buffer solutions. Ionic strength concept.
(*) Topic 2: amino acids and peptides	(*) Amino acids : structure and classification. the peptide bond. Natural peptides of biological interest
(*) Topic 3: Proteins	(*) General concepts. Main functions of proteins. Levels of structural organization of proteins.
(*) Topic 4: Enzymes and enzymatic catalysis	(*) Enzymes: concept and chemical nature. Active center concept. Nomenclature and classification of enzymes. Enzymatic catalysis: concepts and mechanisms.
(*) Topic 5: Enzymatic catalysis	(*) Kinetics of enzymatic reactions. Kinetics of allosteric enzymes. Other mechanisms of modulation of enzymatic activity.
(*) Topic 6: Structure and properties of monosaccharides.	(*) Monosaccharides: aldoses and ketoses. linear structure. Cyclic structure and spatial conformations. Monosaccharides of biological interest.
(*) Topic 7: Oligosaccharides and polysaccharides	(*) General characteristics, properties and structure of the main oligosaccharides, polysaccharides and heterosides.
(*) Topic 8: Simple and complex lipids, and isoprenoids.	(*) General characteristics and biological importance of lipids. General ranking. Fatty acids and alcohols. simple lipids. complex lipids. Isoprenoid lipids.
(*) Topic 9: Nucleotides: structure and function	(*) Purine and pyrimidine bases. Structure and function of nucleosides and nucleotides.
(*) Topic 10. Introduction to metabolism	(*) Metabolism concept. General characteristics of metabolic pathways. Anabolic, catabolic and amphibolic pathways. General aspects of metabolic regulation.
(*) Topic 11. Carbohydrate Catabolism	(*) Glycolysis: description of enzymatic reactions. Incorporation of other monosaccharides to the glycolytic pathway. Pentose phosphate pathway: general concepts and biological significance.
(*) Topic 12. Metabolic fates of pyruvate	(*) Anaerobic destination: alcoholic and lactic fermentation. Aerobic fate: formation of acetyl-CoA by oxidative decarboxylation. Study of the pyruvate dehydrogenase enzyme complex.
(*) Topic 13.Cycle of tricarboxylic acids.	(*) Position of acetyl-CoA in intermediary metabolism. Overview of the cycle and sequence of reactions.
(*) Topic 14. Electronic transport chain and oxidative phosphorylation.	(*) Shuttle systems. Electronic transport chain: components, location and sequence of electronic transport. Oxidative phosphorylation and coupling to electron transport. ATP synthase enzyme complex.
(*) Topic 15. Gluconeogenesis.	(*) Gluconeogenesis: overview and main substrates. Description of the route. Specific reactions of gluconeogenesis.
(*) Topic 16. Glycogen metabolism	(*) Degradation of dietary glycogen. Lysosomal breakdown of glycogen. Glycogenolysis: enzymatic reactions. Glycogenogenesis: enzymatic reactions.
(*) Topic 17. Degradation of lipids and fatty acids.	(*) Digestion, absorption and transport of dietary lipids and endogenous lipids. Activation and intracellular transport of fatty acids. The beta-oxidation of saturated fatty acids with an even number of carbon atoms. Cetogenesis.
(*) Topic 18. Biosynthesis of fatty acids and lipids	(*) Biosynthesis of saturated fatty acids. Acetyl-CoA carboxylase reaction. Fatty acid synthase enzyme complex. Biosynthesis of the alcoholic components of lipids and triacylglycerols.

(*) Topic 19. Proteolysis, amino acid degradation and fate of the ammonium ion	(*) Digestion of dietary proteins. intracellular proteolysis. Overview of amino acid catabolism. Transamination and deamination. Decarboxylation reactions. Fate of the carbon skeleton of amino acids. Forms of ammonium nitrogen excretion. Urea cycle: enzymatic reactions.
(*) Topic 20. Biosynthesis of amino acids	(*) Nitrogen cycle in nature. Incorporation of the ammonium ion in amino acids: glutamate and glutamine pathways. Study of the different biosynthetic families.
(*) Topic 21. Nucleotide metabolism	(*) General aspects of the catabolism of nucleic acids and nucleotides. Degradation of purine and pyrimidine nucleotides. Biosynthesis of ribonucleotides and deoxynucleotides
PROGRAM OF PRACTICAL CLASSES	Elaboration of a serum albumin standard line by the Lowry method.
PRACTICE 1	
PRACTICE 2	Determination of protein concentration in rat liver supernatant.
PRACTICE 3	Preparation of a standard line of p-nitrophenol.
PRACTICE 4	Determination of beta-D-galactosidase activity in rat liver supernatant.
PRACTICE 5	Expression of beta-D-galactosidase activity in rat liver supernatant.
PRACTICE 6	Determination of the optimal pH of beta-D-galactosidase activity.
PRACTICE 7	Effect of substrate concentration on beta-D-galactosidase activity. Calculation of kinetic parameters.
PRACTICE 8	Effect of temperature on the stability of the enzyme beta-D-galactosidase.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	10	10	20
Lecturing	35	52.5	87.5
Seminars	3	4.5	7.5
Objective questions exam	1	14	15
Essay questions exam	2	18	20

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

Methodologies

	Description
Laboratory practical	They will take place in the Biochemistry teaching laboratory. Attendance to the practical classes is compulsory. During the practical sessions, students will follow a practical script prepared by the lecturer to develop the experimental protocols. During the course of the practicals, students must present the results obtained and answer a series of questions. At the end of the practicals, they must write a report on them
Lecturing	The lecturer will explain the contents of the subject in lectures, with slide projections. Students will be provided with supporting copies of figures, diagrams and tables. The classes will be developed interactively with the students. The Moovi platform will be used as a support tool.
Seminars	In the seminars, students will deal with topics under the supervision of the teacher and will solve questionnaires on the material explained in the theoretical classes.

Personalized assistance

Methodologies	Description
Lecturing	In order to resolve any doubts that may arise in relation to the lectures, students have at their disposal personal tutorials that will take place in the teacher's office PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).
Laboratory practical	The small size of the practical groups allows for personalized attention from the lecturer. Students will also have at their disposal personal tutorials that will take place in the teacher's office FUENCISLA SAN JUAN SERRANO (office 10, 3rd floor, Block B, Experimental Sciences Building).
Seminars	To resolve any doubts that may arise in relation to the seminars, students have at their disposal personal tutorials that will take place in the teacher's office FUENCISLA SAN JUAN SERRANO (office 10, 3rd floor, Block B, Experimental Sciences Building).
Tests	Description
Objective questions exam	To resolve any doubts that may arise during the preparation for the written exam, students have personalized tutorials available to them that will take place in the office of Professor PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).
Essay questions exam	To resolve any doubts that may arise during the preparation for the written exam, students have personalized tutorials available to them that will take place in the office of Professor PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).

Assessment									
Description		Qualification	Training and Learning Results						
Laboratory practical	Attendance is mandatory. The teacher will assess the experimental results, the student's responses and the conclusions about the experimentation carried out by presenting a practical report, which will account for 20% of the final grade for the Biochemistry I subject. It is essential to obtain a minimum score of 5 out of 10 in this section in order for it to count towards the final mark. This activity is not recoverable if the required minimum is not reached.	20	A1 A2 A3	B2 B3 B6	C3 C4 C6	D3 D4			
Seminars	During the academic year, two seminars of 1.5 hours each will be programmed. Knowledge of the topics covered will be evaluated by solving exercises, which will be delivered on the date indicated by the teacher. Attendance at the seminars as well as the delivery of the corresponding exercise is mandatory. To pass this activity it is essential to have a 5 out of 10 to be able to weigh the final grade with the rest of the sections.	20	A1 A2 A3	B2 B6	C6	D1 D3			
Objective questions exam	There will be a first written test corresponding to Structural Biochemistry (items 1-7). This test will consist of multiple choice questions and an exercise. It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 25% of the final grade.	25	A1 A2 A3	B2 B6	C3 C4 C6	D1 D2			
Essay questions exam	There will be a second written test corresponding to Metabolic Biochemistry (items 8-15). This test will consist of multiple choice questions and a metabolism integration question that includes the calculation of energy output (ATP). It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 35% of the final grade.	35	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2			

Other comments on the Evaluation

The evaluation of the Biochemistry I subject is continuous throughout the academic year. To be evaluated in this way, the student must carry out all the proposed activities (laboratory exercises, seminars and two written tests).

The particular situations that prevent participation in the usual activities (laboratory practices and seminars) (example: employment contract, illness, etc.) must be communicated as soon as possible to the teacher to find a solution.

Attendance is mandatory in the case of seminars and laboratory practices, admitting a single lack of attendance, which must be duly justified.

To pass the Biochemistry course (final grade as the sum of the weighted grades) it is essential to have obtained a grade equal to or higher than the minimum grade required in each of the activities that can be assessed separately (5.0 out of 10). Otherwise, the grades will not be added, and the grade that will appear in the Biochemistry I report will be the highest of the failed activities.

The activities that obtained a grade equal to or higher than the minimum required (5.0 out of 10) in the first opportunity (January) of an academic year are saved for the second opportunity (July). In the second opportunity (July) it will not be possible to recover laboratory practices and seminars, only the written tests not passed in the first opportunity can be carried out. The final grade for Biochemistry I (xullo) will be the sum of the weighted grades for each section as long as the minimum required grade (5.0 out of 10) has been reached.

If the student does not attend any of the evaluable activities, he will appear as NOT PRESENTED in the Biochemistry I report on both occasions (January and July). Carrying out any of the proposed evaluable activities, but not all, automatically implies a fail in the Biochemistry Act (both opportunities).

These criteria will be applied identically on both occasions.

Likewise, students who prefer a global evaluation of the Biochemistry I subject must notify them within the period provided by the center. The global exam will include laboratory practice questions, seminar exercises and all the theoretical part.

Students who do not pass the subject of Biochemistry I in either of the two opportunities, will keep the marks of the activities (practices and seminar) for the following two academic years, as long as they have reached the minimum required grade.

Only activities not passed will be repeated. Activities that have already been passed cannot be re-evaluated.

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

The exam schedule can be consulted at the following link: <http://bioloxia.uvigo.es/gl/docencia/exames>

Dates of the final exams: <http://bioloxia.uvigo.es/es/docencia/exames>

Sources of information

Basic Bibliography

STRYER, L.; BERG, J.M.; TYMOCZKO, J.L., **Bioquímica. Curso básico**, 1ª Edición, Reverté, 2014

NELSON D. L. & COX M. M, **Lehninger. Principios de Bioquímica**, 6ª Edición, Omega, 2014

José Mª Teijón Rivera y col., **Fundamentos de la Bioquímica estructural**, 3ª Edición, Tebar, 2016

MATHEWS, C.K.; VAN HOLDE, K.E; APPLING, D.R. & ANTHONY-CAHILL, S.J., **Bioquímica**, 4ª Edición, Pearson, 2013

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Biology: Basic laboratory techniques/V02G031V01108

Physics: Physics of biological processes/V02G031V01102

Chemistry: Chemistry applied to biology/V02G031V01105

IDENTIFYING DATA				
Botánica I: Algas e fungos				
Subject	Botánica I: Algas e fungos			
Code	V02G031V01202			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	1c
Teaching language	Castelán			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	García Molaes, Aida			
Lecturers	García Molaes, Aida			
E-mail	molaes@uvigo.es			
Web				
General description	- Introducción á Botánica - Sistemática, taxonomía e nomenclatura vexetal - Niveis de organización vexetal - Reproducción en vexetais. Ciclos biolóxicos - Biodiversidade de fungos, pseudofungos e algas - Simbiose fúnxicas - Aplicacións das algas e dos fungos. Usos e utilidade como bioindicadores			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de espécimes actuais e fósiles. Realizar análise filoxenéticos e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia		
Expected result from this subject	Training and Learning Results	
Comprender os tipos e niveis de organización vexetal.	A1	C2 C9
Coñecer a diversidade de fungos e algas.		C1 C7 C9
Identificar os ciclos biolóxicos de cada un dos grupos.	A1	
Comprender as interaccións entre especies vexetais e o medio.	A1	C2 C7 C9
Coñecer as adaptacións ao medio dos vexetais.	A1	C2 C7 C9
Analizar e interpretar o comportamento das algas e os fungos e a súa adaptación ao medio.	A1 A5	C7
Aplicar coñecementos e técnicas propios da Botánica (algas e fungos) en diferentes procesos relacionados coa xestión do medio ambiente.		C1 C9

Aplicar coñecementos e tecnoloxía relativos á Botánica (algas e fungos) en aspectos relacionados coa produción, explotación, análise e diagnóstico de procesos e recursos biolóxicos.	A5	B4	C9
Obter información, desenvolver experimentos e interpretar os resultados.		B4	C7
Comprender a proxección social da Botánica e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e a divulgación.		B1	D1
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Botánica.	A5	B4	D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Botánica.	A5	B1	C1
Desenvolver temas sobre as posibles aplicacións das algas e os fungos e presentalos publicamente.		B4	D5

Contidos

Topic	
Lección 1- Lección 1- A Botánica como ciencia.	A Botánica e o seu obxecto de estudo. Antecedentes históricos. Plantas non vasculares.
Lección 2- Taxonomía vexetal.	Concepto de especie. Categorías e unidades taxonómicas. Caracteres taxonómicos. Sistemas de clasificación. Nomenclatura taxonómica.
Lección 3- Clasificación dos vexetais inferiores.	Diferentes reinos implicados e criterios para a determinación das divisións.
Lección 4- Bacterias fotosintetizadoras e algas procariotas.	Caracteres citolóxicos. Morfoloxía. Reproducción. Filoxenia.
Lección 5- Vexetais eucariotas.	Caracteres citolóxicos diferenciais. Niveis morfolóxicos de organización: protófitos e talófitos. Talo e cormo. Teorías acerca das súas relacións evolutivas.
Lección 6- Modalidades de reprodución asexual en vexetais inferiores.	Reproducción vexetativa. Esporulación. Estructuras de resistencia. Exemplos ilustrativos.
Lección 7- Modalidades de reprodución sexual en vexetais inferiores.	Hologamia. Cistogamia. Somatogamia. Merogamia. Esporulación meiótica. Fenómenos de diferenciación sexual. Fenómenos de incompatibilidade sexual. Degradación da reprodución sexual.
Lección 8- Ciclos vitais.	Concepto de xeneración botánica. Ciclo monoxenético haplofásico. Ciclo monoxenético diplofásico. Ciclo dixenético haplo-diplofásico. Ciclo trixenético haplo-diplofásico. Teorías acerca das súas relacións evolutivas. Exemplos ilustrativos.
Lección 9- ALGAS I. Introducción ao estudo das algas.	Tipos morfolóxicos. Reproducción. Ciclos vitais. Nutrición. Amplitude ecolóxica.
Lección 10- ALGAS II. Divisións Glaucophyta e Rhodophyta.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Sistemática. Ecoloxía e usos. Exemplos ilustrativos.
Lección 11- ALGAS III. Divisións Chlorophyta e Charophyta.	División Chlorophyta: Clases Prasinophyceae, Chlorophyceae e Ulvophyceae. División Charophyta (Streptophyta): Orixe dos cormófitos; Clases Coleochaetophyceae, Zygnematophyceae e Charophyceae. Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Ecoloxía. Exemplos ilustrativos.
Lección 12- ALGAS IV. Divisións Euglenophyta e Pyrrophyta (Dinophyta).	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Sistemática. Ecoloxía. Exemplos ilustrativos.
Lección 13- ALGAS V. Divisións Cryptophyta e Prymnesiophyta (Haptophyta).	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Sistemática. Ecoloxía. Exemplos ilustrativos.
Lección 14- ALGAS VI. División Heterokontophyta I: Clases Chrysophyceae, Synurophyceae, Bacillariophyceae (Diatomeas), Pinguiphyceae, Dictyochophyceae e Pelagophyceae.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Sistemática. Ecoloxía e usos. Exemplos ilustrativos.
Lección 15- ALGAS VII. División Heterokontophyta II: Clases Raphidophyceae, Xanthophyceae, Phaeothamniophyceae e Phaeophyceae.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Esbozo da súa clasificación. Ecoloxía e usos. Exemplos ilustrativos.
Lección 16- PSEUDOFUNGOS E MOFOS MUCILAXINOSOS. Divisións Oomycota, Acrasiomycota e Myxomycota.	Caracteres xerais e reproductivos de cada grupo. Ciclos vitais. Exemplos ilustrativos.
Lección 17- FUNGOS I. Introducción ao estudo dos fungos verdadeiros. Divisións Cryptomycota, Chytridiomycota, Neocallismastigomycota e Blastocladiomycota.	Caracteres xerais e reproductivos de cada grupo. Ciclo vital. Ecoloxía. Exemplos ilustrativos.
Lección 18- FUNGOS II. Divisións Zoopagomycota e Mucoromycota.	Caracteres xerais e reproductivos de cada grupo. Ciclo vital. Ecoloxía. Usos. Exemplos ilustrativos.
Lección 19- FUNGOS III. SubReino Dikaya: Divisións Ascomycota e Basidiomycota.	Caracteres xerais e reproductivos de cada grupo. Ciclo vital. Ecoloxía. Usos. Exemplos ilustrativos.
Lección 20- SIMBIOSE FÚNXICAS. Liques, micorrizas e micoficobiose.	Características dos diferentes tipos de simbiose fúnxicas. Importancia ecolóxica.
PROGRAMA DE CLASES PRÁCTICAS	
Práctica 1- Fitoplancton mariño e de auga doce.	Toma de mostras. Recoñecimento de xéneros e das especies máis frecuentes.

Práctica 2- Algas bentónicas macroscópicas mariñas.	Observación de estruturas vexetativas e reproductoras de Cyanophyta, Chlorophyta, Rhodophyta e Phaeophyceae. Uso de claves de identificación.
Práctica 3- Fungos.	Observación de estruturas somáticas e reproductoras de Ascomycetes e Basidiomycetes. Uso de claves de identificación.
Práctica 4- Liques.	Observación de estruturas somáticas e reproductoras de líques. Uso de claves de identificación.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	40	70
Traballo tutelado	0	10	10
Seminario	3	5	8
Presentación	5.75	0	5.75
Prácticas de laboratorio	15	3	18
Autoavaliación	0	8	8
Práctica de laboratorio	1	0	1
Presentación	0.25	1	1.25
Exame de preguntas obxectivas	1	8	9
Exame de preguntas obxectivas	1	10	11
Exame de preguntas obxectivas	1	7	8

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

Metodoloxía docente

	Description
Lección maxistral	O programa teórico da materia desenvolverase durante as sesións maxistrais. Os materiais didácticos utilizados durante as exposicións e o texto completo das leccións estarán anticipadamente a disposición dos alumnos na plataforma MOOVI, coa finalidade de dinamizar as clases, aclarar conceptos ou resolver posibles dúbidas.
Traballo tutelado	Os traballos, de carácter colaborativo, versarán sobre distintas temáticas relacionadas coa materia. Poderán ser exclusivamente bibliográficos ou incorporar observacións de campo. Cada grupo terá un número mínimo de cinco compoñentes, asignados aleatoriamente ao principio do curso. Cada alumno será responsable de, al menos, un dos apartados en que se estructure o traballo e do resultado final de todo o conxunto. A profesora realizará o seguimento dos progresos da súa elaboración a través de tutorías individualizadas ao longo do cuadrimestre. Exporanse publicamente na data programada.
Seminario	Levaranse a cabo ao longo de tres sesións nas que se tratarán os contidos máis relevantes do programa teórico, resolveranse as posibles dúbidas xurdidas na resolución dos cuestionarios de autoavaliación e os cuestionarios de preparación das tutorías.
Presentación	Os grupos de traballo realizarán unha presentación conxunta, na que participarán todos os integrantes, do tema asignado para expoñela publicamente
Prácticas de laboratorio	Tras unha breve descrición do procedemento de toma de mostras e das características dos organismos estudados, en cada sesión de prácticas procederase ao seu exame utilizando lupa e microscopio óptico. Utilizaranse claves para a identificación das especies. As explicacións relativas a cada práctica estarán dispoñibles na plataforma MOOVI. A asistencia a todas as sesións é preceptiva para superar a materia, salvo que a falta estea debidamente xustificada. Realizaranse no laboratorio LD4 (Sección A, Planta 1ª, Porta 1)

Atención personalizada

Methodologies	Description
Lección maxistral	Previa cita, no horario de tutorías, a profesora aclarará todas as dúbidas que non quedaran resoltas durante as sesións maxistrais. Tamén se atenderán cuestións relativas á docencia teórica a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.
Traballo tutelado	Previa cita, no horario de tutorías, a profesora axudará a resolver os problemas que xurdan durante a realización do traballo. As consultas tamén se poderán facer a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.
Presentación	Previa cita, no horario de tutorías, a profesora axudará a resolver os problemas xurdidos durante a preparación da presentación do devandito traballo. As consultas tamén se poderán facer a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.

Prácticas de laboratorio Previa cita, no horario de titorías, a profesora aclarará todas as dúbidas que non quedaran resoltas durante as sesións prácticas. As consultas tamén se poderán facer a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.

Tests	Description
Autoavaliación	Previa cita, no horario de titorías, a profesora aclarará todas as dúbidas relativas aos cuestionarios de autoavaliación. Tamén se atenderá ao alumnado a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.

Avaliación				
	Description	Qualification	Training and Learning Results	
Traballo tutelado	Avaliarase a contribución individual de cada alumno ao conxunto do traballo. Terase en conta a estrutura, orixinalidade, uso do idioma en xeral e da terminoloxía científica. Tamén se terá en conta a adecuación ao formato previamente esixido. Os traballos poderán presentarse en galego ou castelán.	15	A1 A5	B1 B4 C9 D1 D5
Presentación	Ao final do cuadrimestre farase a exposición pública dos traballos realizados ao longo do período lectivo. Valorarase a claridade na exposición dos conceptos, o uso dos recursos informáticos e a capacidade de expresión oral do alumno e, en xeral, a súa capacidade para captar a atención do auditorio.	5		B4 C9 D1 D5
Autoavaliación	Na páxina da materia da plataforma MOOVI, o alumno disporá de cuestionarios de autoavaliación para axudarlle no estudo da materia. O período de realización de cada grupo de cuestionarios estará fixado pola profesora a fin de programar o estudo de xeito secuencial. A resolución dos mencionados cuestionarios de autoavaliación, xunto coa asistencia e os resultados obtidos nas probas que se desenvolverán nas titorías grupais, suporán un 10% da cualificación final.	10	A1 A5	B1 B4 C1 C2 C9 D1 D5
Práctica de laboratorio	Á finalización das prácticas de laboratorio deberase superar un exame práctico (nota mínima 5 puntos sobre 10) no que o alumno deberá demostrar a destreza no manexo das técnicas, a interpretación das súas observacións e o uso das claves de identificación. O resultado obtido suporá o 15% da cualificación final. A superación deste exame é preceptivo para sumar os outros compoñentes da cualificación global da materia.	15	A1 A5	B1 B4 C1 C2 C7 D1
Exame de preguntas obxectivas	O primeiro exame parcial versará sobre as oito primeiras leccións do programa teórico. A proba consistirá nun combinado de preguntas de resposta curta e preguntas tipo test. A cualificación mínima deberá ser igual ou superior a 4,5 puntos sobre 10.	20	A1 A5	B1 B4 C1 C2 C9 D1 D5
Exame de preguntas obxectivas	O segundo exame parcial versará sobre os contidos das leccións 9 a 15, ambas incluídas. A proba será semellante á do primeiro exame parcial e a nota mínima para superala deberá ser igual ou superior a 4,5 puntos sobre 10.	20		
Exame de preguntas obxectivas	O terceiro exame parcial versará sobre as cinco últimas leccións. A proba terá un formato semellante ás dúas anteriores e a nota mínima para superala deberá ser igual ou superior a 4,5 puntos sobre 10.	15	A1 A5	B1 B4 C1 C2 C9 D1 D5

Other comments on the Evaluation

Os horarios da materia figuran na páxina web da facultade:

§ GL: <http://bioloxia.uvigo.es/gl/docencia/horarios>

§ ES: <http://bioloxia.uvigo.es/es/docencia/horarios>

As datas de exame establecidas no calendario oficial pódense consultar nas seguintes ligazóns:

§ GL: <http://bioloxia.uvigo.es/gl/docencia/exames>

§ ES: <http://bioloxia.uvigo.es/es/docencia/examenos>

O método de avaliación establecido por defecto é a modalidade de avaliación continua; se algún alumno desexa acollerse á modalidade de avaliación global deberá indicalo mediante un documento asinado antes de que finalice o prazo sinalado polo decanato da facultade.

A asistencia ás clases prácticas de laboratorio é obrigatoria (salvo falta debidamente xustificada) nas dúas modalidades de avaliación; os alumnos que non cumpran este requisito figurarán nas actas como "non presentado". Á finalización das prácticas o alumno deberá superar un exame práctico, cunha cualificación igual o superior a 5 puntos sobre 10. No caso de non superalo, figurará nas actas como "suspense", coa cualificación obtida no exame práctico.

No caso de que o alumno se acolla á modalidade de avaliación continua deberá ter en conta o seguinte:

- Para superar a parte teórica da materia, a nota mínima obtida nos exames parciais deberá ser igual ou superior a 4,5 puntos sobre 10 e a nota media ponderada deberá ser igual ou superior a 5 puntos sobre 10. A parte teórica na modalidade de avaliación continua supón o 55 % da cualificación final da materia. Cando a cualificación media das probas teóricas sexa inferior a 5 puntos sobre 10, o alumno figurará nas actas como "suspenso", coa puntuación obtida na proba teórica, aínda que superara o exame práctico.

- A cualificación final é o resultado da suma das porcentaxes asignadas aos distintos apartados avaliados. Para poder superar a materia na primeira convocatoria é necesario obter nas probas teóricas unha nota media igual ou superior a 5 puntos sobre 10, e no exame práctico unha cualificación mínima de 5 sobre 10 puntos. De non conseguir a puntuación mínima non se lle sumarán os outros apartados e a nota final que figurará nas actas será a cualificación máis baixa das obtidas nos apartados suspensos (exame teórico ou exame práctico).

- Na segunda convocatoria manteranse as notas anteriores e será posible recuperar o exame práctico (15 % da cualificación final); tamén se poderá facer un exame final sobre todos os contidos teóricos da materia, que supoñerá o 55 % da cualificación final.

Na modalidade de avaliación global será requisito indispensable obter unha nota mínima de 5 puntos sobre 10 no exame teórico e no exame práctico da materia, que supoñerán o 80 % e o 20 % da cualificación final, respectivamente. Seguirase o mesmo criterio na segunda convocatoria.

A cualificación do exame práctico e do traballo tutelado contemplaranse durante tres cursos académicos consecutivos.

Requírese do alumnado que curse esta materia unha conduta responsable e honesta. Considérase inadmisíbel calquera forma de fraude (copia e/ou plaxio) encaminado a falsear o nivel de coñecemento ou destreza alcanzado por un/unha alumno/a en calquera tipo de proba, informe ou traballo deseñado con este propósito. Esta conduta fraudulenta será sancionada coa firmeza e o rigor que establece a normativa vixente.

Bibliografía. Fontes de información

Basic Bibliography

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Izco, J. et al., **Botánica**, 2ª, McGraw-Hill-Interamericana,

Bold, H.C., Alexopoulos, C.J. & Develoryas, T., **Morfología de las plantas y hongos**, Ed. Omega,

Abbeyes, H. des et al., **Vegetales inferiores**, Ed. Reverté,

Complementary Bibliography

Lee, R.E., **Phycology**, 4ª, Cambridge University Press,

Alexopoulos, C.J., Mims, C.W. & Blackwell, M., **Introductory Mycology**, Jhon Willey & Sons, Inc.,

Sze, P., **A Biology of the Algae**, WCB/McGraw-Hill, R.E.,

Carrión, J.S., **Evolución vegetal**, DM.,

Pérez Valcárcel, C. López Prado, M.C. & López de Silanes, M.E., **Guía dos líques de Galicia**, Baía Edicións,

Otero, J., Comesaña, P. & Castro, M., **Guía das macroalgas de Galicia**, Baía Edicións,

Bárbara, I. & Cremades, J., **Guía de las algas del litoral gallego**, Ayuntamiento de A Coruña,

Breitenbah, J. & Kränzahn, F., **Champignons de Suisse**, Societé de Mycologie de Lucerne,

Cabio'h, J. et al, **Guía de las algas del Atlántico y del Mediterráneo**, Omega,

Gayral, P., **Les algues des côtes françaises**, Éditions Doin,

Wirth, V. & Düll, R., **Guía de campo de los líquenes, musgos y hepáticas**, Omega,

Castro, M. et al., **Guía micológica dos ecosistemas galegos**, Baía Edicións,

Lange, J.E., Lange, D.M. & Llimona, X., **Guía de campo de los hongos de Europa**, Omega,

Recomendacións

Other comments

É importante repasar, alúmenos semanalmente, os contidos teóricos da materia, pois a terminoloxía utilizada é completamente descoñecida para o alumno e a súa correcta comprensión é fundamental para o aproveitamento da teoría e as prácticas.

IDENTIFYING DATA				
Animal and plant histology and cytology I				
Subject	Animal and plant histology and cytology I			
Code	V02G031V01203			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Pombal Diego, Manuel Ángel			
Lecturers	Megías Pacheco, Manuel Miguel Villegas, Encarnación de Molist García, María del Pilar Pérez Fernández, Juan Pombal Diego, Manuel Ángel			
E-mail	pombal@uvigo.es			
Web				
General description	(*)Mandatory subject of the 2nd year of the Degree in Biology. This subject presents the general characteristics of cells as well as their ultrastructural organization, finishing the programme with cell division processes and the first stages of living beings development.			

Training and Learning Results

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).			
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.			
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.			
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.			
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.			
C4	Isolate, identify and grow microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.			
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.			
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.			
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.			

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Know the types and levels of organization	A1 A3	B3 B6	C4	
Know the structure and function of the eukaryotic cell	A1 A3	B3 B6	C4	
Understand the biology of animal and plant development	A1 A2 A4	B1 B3 B6	C1 C6	
Apply Cytology and Histology knowledge to isolate, identify and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents	A2 A3	B3 B6	C4	D3

Apply knowledge and technology related to Cytology and Histology in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources	A3	B3 B6	C1 C4
Obtain information, carry out experiments and interpret the results	A3 A4	B3 B6	C1 C4 C6
Understand the social projection of Cytology and Histology and its impact on professional practice, as well as knowing how to use its contents to teach and disseminate	A2 A4		C6 D1 D3
Know and manage the concepts, terminology and scientific-technical instrumentation related to Cytology and Histology	A3 A4	B3 B6	C1 C4 C6

Contents

Topic	
CELL BIOLOGY	(*)
Introduction	Evolution of the cell concept Cell theory General organization of eukaryotic cells Differences and similarities between animal and plant cells.
Cell membrane and extracellular matrix	Structure, molecular composition and functions Membrane transport Cell adhesion.
Origin of membranes and intracellular trafficking	Endoplasmatic reticulum. Golgi apparatus. Vesicular trafficking. Endosomes.
Lysosomal system, peroxisomes and vacuoles	Cell digestion. Autophagy. Peroxisomes and glyoxysomes. Vacuoles: types, structure and functions.
Organelles involved in energy production	Mitochondrial structure and function. Chloroplast structure and function. Other plastids.
The Cytosol	Cytoplasmic inclusions. The Cytoskeleton: actin filaments, microtubules and intermediate filaments.
The nucleus	Nuclear envelop. Dynamic and structure of chromatin and chromosomes. The nucleolus.
DEVELOPMENTAL BIOLOGY	(*)
Cell cycle	Control of the cell cycle.
Cell division	Cell division Mitosis. Meiosis. Cell death: apoptosis and necrosis.
Gametogenesis and fertilization	Oogenesis and spermatogenesis. Fertilization.
Stages of the embryonic development	Early development. Determination and cell differentiation.
LAB SESSIONS	(*)
Session 1. Cell types and extracellular matrix	Observation of cell types and extracellular matrix at light microscopy.
Session 2. Organelles I	Identification of cell organelles at light microscopy
Session 3. Organelles II	Identification of cell organelles in electron microscopy images.
Session 4. Mitosis.	Observation and quantification of mitotic phases in animal and plant tissue
Session 5. Gonads.	Observation of spermatogenesis and oogenesis. Types of gonads.
Session 6. Early development.	Observation of the early development of invertebrates and vertebrates.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	33	82	115
Laboratory practical	12	12	24
Seminars	3	5	8
Objective questions exam	1	0	1
Objective questions exam	1	0	1
Laboratory practice	0.5	0	0.5
Laboratory practice	0.5	0	0.5

*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 contents of the subject will be explained with presentations and short videos.
Laboratory practical	Histology preparations related to different topics covered will be analyzed. In addition, a lab session will be dedicated to study the ultrastructure of the cell and another one to the early vertebrate development.
Seminars	Analysis and discussion of questions proposed by the students or by the instructor.

Personalized assistance

Methodologies	Description
Lecturing	Individual support is offered during tutor hours. Students will be able to contact the teacher for tutorial sessions via telematic tools (e-mail, video-chat, forums of FAITIC platform, etc.) in concerted appointments.
Laboratory practical	Individual support is offered during tutor hours. Students will be able to contact the teacher for tutorial sessions via telematic tools (e-mail, video-chat, forums of FAITIC platform, etc.) in concerted appointments.
Seminars	Some activities will be proposed for monitoring the evolution of each student.

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	Evaluation of the work developed during the seminars	10	A1 A2 A4	B6	C1 C6	D1 D3
Objective questions exam	Exam evaluating the theoretic classes	40	A1 A2 A3	B1 B6	C1 C6	
Objective questions exam	Exam evaluating the theoretic classes	30	A1 A2 A3	B1 B6	C1 C6	
Laboratory practice	Exam evaluating the lab sessions	10		B3	C4	D1 D3
Laboratory practice	Exam evaluating the lab sessions	10		B3	C4	D1 D3

Other comments on the Evaluation

- Attendance to the theoretical, practical and seminar classes is compulsory unless absence is duly justified.
- To pass the course it is necessary to score higher than 40 % in both the theoretical part (sum of the two tests) and the practical part (sum of the two tests). Otherwise, the final grade will be the result of multiplying the total grade (theory + practical + seminars) by 0.5.
- If the final mark of the course does not reach 5 points, but exceeds 40 % of any of the parts (theory, practical or seminars), these scores will be maintained for the second exam opportunity (July), provided that the student requests it.
- Repeat students from other courses must take all the classroom and laboratory activities (seminars and lab sessions), of which they will be evaluated.
- Lectures. The first thematic block (Cellular Biology) will be evaluated over 4 points in a first exam of objective questions that will be established in the official calendar. The second thematic block (Developmental Biology) will be evaluated over 3 points in a second exam of objective questions to be held on the date of the final exam to be established by the faculty. The maximum score of the theoretical part in the final grade will be 7 points (4+3).
- Lab sessions. The lab sessions will be evaluated in two tests over 1 point each one. The first test will be assessed over 1 point by means of an exam of objective questions that will include the identification of microscopic structures in photomicrographs and will be carried out on the date established by the faculty. The second test will also be evaluated over 1 point by means of an exam of the same type as the first test and will be carried out on the date established by the faculty. Therefore, a maximum of 2 points of the total grade can be obtained with this evaluation.
- Seminars. They will be evaluated in three tests over 0.33 points each one, that will be carried out during the seminar

itself. Therefore, with this evaluation a maximum of 1 point of the total grade can be obtained.

- Students who do not follow the continuous evaluation will be evaluated in a single test over 10 points that will include objective questions on the content of the subject and will be held on the date of the final exam set by the faculty.
- Exam to improve the mark. Students who pass the subject in the first term, and wish to improve their mark, may take an exam to improve their grade, which will be held on a date and time to be determined in agreement with the professor.
- Absent. It will be considered when the student does not perform any activity that involves evaluation.
- Date of the final exam. The exam dates are available on the faculty's website:
<http://bioloxia.uvigo.es/gal/docencia/exames>
- Schedules of the subjects. The schedules of the subject are available at the following address:
<http://bioloxia.uvigo.es/gal/docencia/horarios>

Sources of information

Basic Bibliography

Cooper, G. M. Adams, K. W., **The Cell: a Molecular Approach.**, 978-1605358635, 9th ed, OUP USA, 2023

Complementary Bibliography

Alberts, B.; Heald, R.; Johnson, A.; Morgan, D.; Raff, M.; Roberts, K.; Walter, P.; Wilson, J., **Molecular Biology of the Cell.**, 978-0-393-42708-0, 7th ed, . W. Norton & Company, 2022

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Slack, J. M. W.; Dale, L., **Essential Developmental Biology**, 978-1119512851, 4th ed, Wiley-Blackwell, 2021

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Recommendations

Subjects that are recommended to be taken simultaneously

Biochemistry I/V02G031V01201

Botany I: Algae and fungi/V02G031V01202

Microbiology I/V02G031V01204

Zoology 1: Non-arthropod invertebrates/V02G031V01205

IDENTIFYING DATA				
Microbiology I				
Subject	Microbiology I			
Code	V02G031V01204			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Bodelón González, Gustavo			
Lecturers	Bodelón González, Gustavo Combarro Combarro, María del Pilar			
E-mail	gbodelon@uvigo.gal			
Web	http://bioloxia.uvigo.es			
General description	Object and field of study of the Microbiology. Levels of organisation in microorganisms. Structures and function in microorganisms and acellular agents. Methods no dependent of crop for the study of microorganisms and virus. Nutrition, growth and physiology of microorganisms. Genetic and metabolic processes exclusive of microorganisms			

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.
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.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results	
New	A2	C2 C6
New		C6
New	B3	C1 C4
New		C6
New	B6	C3 C6
New	B3 B4	D5

Contents

Topic

1. INTRODUCTION TO MICROBIOLOGY	1.1. Object and Field of study of the Microbiology. 1.2. Subdisciplines and Specialitys. 1.3. Historical development and perspectives. 1.4. Professional fields of the microbiologist.
2. THE MICROORGANISMS IN THE BIOLOGICAL SCALE	2.1. Concept of microorganism. 2.2. Form, size and Relation Surface/Volume. 2.3. Evolutionary origin of the microorganisms. 2.4. Levels of cellular organisation. 2.5. Microbial multicellular structures.
3. STRUCTURE AND FUNCTION OF VIRUS AND BACTERIOPHAGES	3.1. General characteristics of virus and bacteriophages. 3.2. Architecture of eukaryote viruses. 3.3. Architecture prokaryote viruses. 3.4. Infective cycle of virus and phages. 3.5. Subviral particles.
4. STRUCTURE AND FUNCTION OF THE PROKARYOTIC CELL	4.1. External structures and function in prokaryotes 4.2. Internal structures and function in prokaryotes 4.3. Exceptions to the prokaryotic cellular organization. 4.4. Differences between Bacteria, Archaea and Eukarya
5. GROWTH IN CULTURE MEDIA	5.1. Microbial growth and cellular division. 5.2. Measure of the growth: direct and indirect methods. 5.3. Mathematical expression of growth kinetics. 5.4. Discontinuous and Continuous Growth. Applications. 5.5. Environmental factors that affect microbial growth.
6. GROWTH IN NATURAL ENVIRONMENTS. CONTROL OF THE GROWTH	6.1. Characteristics of the growth in natural environments. 6.2. Processes of communication and multicellularity. 6.3. VBNC state. 6.4. Physical and chemical agents to control microbial growth. 6.5. Biological agents to control microbial growth. 6.6. Antimicrobial resistance.
7. EXCLUSIVE METABOLIC ACTIVITIES OF MICROORGANISMS	7.1. Elements and Nutritional Categories. 7.2. ATP generation in lithotrophic microorganisms. 7.3. ATP generation in phototrophic microorganisms. 7.4. Generation of ATP in organotrophic microorganisms. 7.5. Anabolic processes of microorganisms.
8. CULTURE NON-DEPENDENT METHODS FOR THE STUDY OF MICROORGANISMS AND VIRUSES	8.1. U.V. light microscopy: non-specific fluorescence. 8.2. Flow cytometry. 8.3. In situ hybridization techniques. 8.4. Selective Amplification and Sequencing: PCR; Denaturing Gradient Gel Electrophoresis; NGS Sequencing Techniques. 8.5. Principles of Metagenomic Analysis.
9. GENETICS OF MICROORGANISMS	9.1. Mechanisms of prokaryotic gene expression regulation. 9.2. Extrachromosomal elements.. 9.3. Genetic exchange in bacteria. 9.4. Virus replication: generalities. 9.5. Bacterial immunity against viruses: CRISPR-CAS system.
PROGRAM OF PRACTICES	TABLE OF CONTENTS
1. Test to determine the effect of culture conditions on microbial growth.	1.1. Trial design. 1.2. Calculation of the inoculum volume. 1.3. Construction of a Straight Pattern Optical Density/Cellular Density. 1.4. Mathematical expression of growth. 1.5. Determination of yield in biomass.
2. Study of the density and population diversity of the epibiont microbiota in biological samples	1.6. Quantification of the effect of culture conditions. 1.7. Representation and Analysis of results. 2.1. Sample processing. 2.2. Quantification of Viable Cell Diversity and Density. 2.3. Characterization of isolates and population dynamics. 2.4. Analysis of results.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	30.15	12	42.15
Laboratory practical	15	18	33
Seminars	3	0.75	3.75
Objective questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Essay questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Essay questions exam	0.15	10	10.15

*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 professor-to structure and/or explains the aims and contents of each subject and answers to the exposed questions by the students. These have in Moovi of the presentations commented in the classroom, of documents of support of each subject, organised in aims, bibliographic sources and questionnaires of autoevaluación and of videos and links to texts of free access.

Laboratory practical	The professor-to explains the foundations and protocols of each practice, supervises his execution, resolves doubts and drives the discussion of results and solution of exercises and practical cases. The student has in Moovi a hypertext that it will used as a guide of the practices, with detailed protocols, questionnaires for selftest and solved exercises. Also it has documents and videos to complement the laboratory explanations.
Seminars	In two sessions of 90 minutes each, the teacher organizes, advises and supervises the integrated collaborative learning activities to be carried out in groups of three or four students. The calendars of classes (Seminars, Practices, and Theory) can be consulted in the following link: http://bioloxia.uvigo.es/es/docencia/horarios

Personalized assistance

Methodologies	Description
Seminars	The students will be able to resolve doubts with the teacher, making an appointment by email within their tutorial hours.
Laboratory practical	The students will be able to resolve doubts with the teacher, making an appointment by email within their tutorial hours.
Lecturing	The students will be able to resolve doubts with the teacher, making an appointment by email within their tutorial hours.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	1) Presentation of daily summaries of each practices made (5%) at the end of each session. 2) individual exam of multiple choice questions, of development and solving of exercises (28%) at the last day of practices. Failed exam, or not presented, is retaken in the Second Call.	33	B3 B4	C1 C3 C4
Seminars	Seminar I (6%): delivery of a group work. Seminar II (6%): individual written test of short/essay questions. Both the work and the test will be carried out during the seminars. Neither the group work, nor the individual test, will be retaken.	12	B4 B6	D5
Objective questions exam	(*)Cuestionario de preguntas objetivas relativo a la parte I del programa	11	A2	C1 C2 C4 C6
Objective questions exam	(*)Cuestionario de preguntas objetivas relativo a la parte II del programa	11	A2	C1 C2 C4 C6
Objective questions exam	(*)Cuestionario de preguntas objetivas relativo a la parte III del programa	11	A2	C1 C2 C4 C6
Objective questions exam	(*)Cuestionario de preguntas objetivas relativo a la parte IV del programa	8	A2	C1 C2 C4 C6
Essay questions exam	(*)Examen de preguntas de desarrollo relativo a la parte IV del programa	3	A2	C1 C2 C4 C6
Objective questions exam	(*) de preguntas objetivas relativo a la parte V del programa	8	A2	C1 C2 C4 C6
Essay questions exam	(*)Examen de preguntas de desarrollo relativo a la parte V del programa	3	A2	C1 C2 C4 C6

Other comments on the Evaluation

CONTINUOUS ASSESSMENT:

- The students will have to pass, with at least 5 points out of 10, each one of the six partial examinations (five of Theory and

one of Practices). In case of not reaching the minimum note in any of the partial proofs, the qualification in Records (First Call) will be always the average note of the failed partial examinations. Students will be able to retake in Second Call only the failed partial examinations, keeping the grades approved during the semester

GLOBAL ASSESSMENT:

Exceptionally, students who decide to do so and communicate it within the period established by the center, may waive the Continuous Assessment and take the full subject exam only in a global exam at the end of the semester (and/or in Second Call). The student who fails any of the 6 tests will not pass the subject.

IN BOTH MODALITIES OF ASSESSMENT:

The students who, having failed the global examination or any of the partial tests of the semester, do not present for their retaken in Second Call will appear in the Records as "Not Presented".

To pass the subject, students must attend Laboratory Practices. A single lack of attendance is allowed, if documentally justified.

In case of not passing the subject, the student will have to take the failed part (Practices or COMPLETE Theory) in the official calls of subsequent courses.

Date of final exams: <http://bioloxia.uvigo.es/en/teaching/exams/>

Sources of information

Basic Bibliography

M. Madigan, J.M. Martinco, Bender, K.S., Buckley, D.H. y Stahl, D.A., **Brock. Biología de los microorganismos**, 14ª edición, Pearson prentice Hall, 2014

Madigan, M.T. , K. S. Bender, D. H. Buckley, W.M. Sattley, D. A. Stahl, **Brock. Biology of microorganisms**, 16ª edición, Pearson prentice Hall, 2022

Willey, J.M., L.M. Sherwood, C.J. Woolverton, **PRESCOTT-Microbiología**, 10ª edición, McGraw-Hill, 2016

Willey, J., K. Sandman, D. Wood, **PRESCOTT'S Microbiology**, 11ª edición, McGraw-Hill, 2019

Complementary Bibliography

Tortora G.J., Funke B.R., Case C.L., **Microbiology: An Introduction**, 12ª edición, Pearson prentice Hall, 2015

Rigel, N, Izquierdo, J., **Laboratory Exercices in Microbiology**, 12ª edición, McGraw-Hill,

Recommendations

Subjects that continue the syllabus

Microbiology II/V02G030V01605

Subjects that it is recommended to have taken before

Biology: Basic laboratory techniques/V02G031V01108

Other comments

It is recommended to previously study Basic Laboratory Techniques.

It is important to have taken this course to be able to take the Microbiology II course later.

IDENTIFYING DATA				
Zooloxía I: Invertebrados non artrópodos				
Subject	Zooloxía I: Invertebrados non artrópodos			
Code	V02G031V01205			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	1c
Teaching language	Castelán Galego			
Department	Ecoloxía e bioloxía animal			
Coordinator	Mariño Callejo, María Fuencisla			
Lecturers	Mariño Callejo, María Fuencisla Noguera Amoros, Jose Carlos Velo Antón, Guillermo			
E-mail	mmarino@uvigo.es			
Web				
General description	En función da súa denominación académica a materia ocúpase de todos os fillos animais considerados nas clasificacións tradicionais como Invertebrados non Artrópodos.			

Resultados de Formación e Aprendizaxe

Code				
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.			
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.			
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.			
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.			
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.			
B6	Desenvolver as capacidades de análises e sínteses, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.			
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.			
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de espécimes actuais e fósiles. Realizar análise filoxenéticas e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.			
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.			
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.			
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.			
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.			
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Recoñecer a orixe e evolución dos animais: os tipos e niveis de organización, os mecanismos e modelos evolutivos.	A2 A3 A4	B1 B3 B6	C2	D1
Recoñecer a biodiversidade e filoxenia: diversidade animal e plans corporais, posición dos distintos grupos na árbore evolutiva.	A2 A3 A4	B1 B3 B6	C2 C6	D5
Explicar a estrutura, desenvolvemento e organización dos animais: anatomía e morfoloxía animal; Bioloxía do desenvolvemento animal, ciclos biolóxicos.	A2 A3 A4	B1 B3 B6	C6	D5
Aplicar coñecemento da Zooloxía para illar, identificar, manexar e analizar espécimes e mostras de orixe biolóxica, así como para caracterizar os seus constituíntes celulares e moleculares.	A2 A3 A4	B1 B3 B6	C6	D5

Analizar e interpretar o comportamento dos animais e a súa adaptación ao medio.	A2 A3 A4	B1 B3 B6	C6	
Aplicar coñecementos e técnicas propios da Zooloxía en diferentes procesos relacionados coa xestión do medio ambiente.	A2 A3 A4	B1 B3 B6	C9	D5
Aplicar coñecementos e tecnoloxía relativos á Zooloxía en aspectos relacionados coa produción, explotación, análise e diagnóstico de procesos e recursos biolóxicos.	A2 A3 A4	B1 B3 B6	C6	D5
Comprender a proxección social da Zooloxía e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e a divulgación.	A2 A3 A4	B1 B3 B6	C9	D1 D4 D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Zooloxía.	A2 A3 A4	B1 B3 B6	C1	D5

Contidos

Topic	
PROGRAMA TEÓRICO	CONTIDOS
Tema 1. A ciencia zoolóxica. Introducción á zooloxía	Introdución á Zooloxía. De onde veñen os animais? Onde viven? Definición de animal.
Tema 2. Sistemática, filoxenia e clasificación	Clasificación. Nomenclatura. Taxonomía e sistemática. Monofilia, parafilia e polifilia. Caracteres e concepto de homología. Plesiomorfía e apomorfía. Árbores filoxenéticas. Concepto de especie. Escolas sistemáticas.
Tema 3. Arquitectura animal e plans corporais	Organización da complexidade animal. Arquetipos dos animais.
Tema 4. Desenvolvemento, ciclos e orixe	Desenvolvemento animal. Ciclos de vida. Orixe dos Metazoos.
Tema 5. Esponxas e Placozoos	Poríferos: Caracteres xerais. Forma e función. Sistemática do grupo. Relacións filoxenéticas. Importancia do grupo; Placozoos: Caracteres xerais.
Tema 6. Cnidarios e Ctenóforos	Cnidarios. Caracteres xerais. Forma e función. Sistemática do grupo. Relacións filoxenéticas. Importancia do grupo; Ctenóforos: Caracteres xerais. Forma e función. Relacións filoxenéticas.
Tema 7. Xenacelomorfos. Platizoos e Mesozoos	Xenacelomorfos: Caracteres xerais; Platelminfos: Caracteres xerais. Forma e función. Sistemática do filo. Relacións filoxenéticas; Gastrotricos, Gnatostomúlidos, Micrognatozoos, Rotíferos e Acanthocéfalos: Caracteres xerais. Filoxenia dos grupos e importancia; Mesozoos: Caracteres xerais. Relacións filoxenéticas.
Tema 8. Polizoos e Trocozoos	Ciclióforos, Endoproctos: Caracteres xerais; Ectoproctos, Braquiópodos, Foronídeos: Caracteres xerais. Forma e función. Nemertinos: Caracteres xerais. Forma e función. Filoxenia dos grupos e importancia.
Tema 9. Moluscos	Caracteres xerais. Morfoloxía do molusco ancestral. Forma e función. Clasificación e estudo das distintas clases de moluscos. Relacións filoxenéticas. Importancia do filo.
Tema 10. Anélidos e taxóns relacionados	Anélidos (Pogonóforos incluídos). Caracteres xerais. Forma e función. Sistemática do filo. Relacións filoxenéticas e importancia como grupo. Taxóns próximos a Anélidos: Sipuncúlidos e Equiúridos. Relacións filoxenéticas.
Tema 11. Ecdisozoos	Nematodos, Nematomorfos, Loricíferos, Quinorrincos, Priapúlidos: Caracteres xerais. Forma e función. Filoxenia dos grupos e importancia.
Tema 12. Quetognatos	Caracteres xerais. Forma e función. Sistemática do filo. Relacións filoxenéticas.
Tema 13. Equinodermos	Caracteres xerais. Forma e función. Clasificación e estudo das distintas clases de Equinodermos. Relacións filoxenéticas.
Tema 14. Hemicordados	Caracteres xerais. Forma e función. Sistemática do filo. Relacións filoxenéticas.
PROGRAMA PRÁCTICO	CONTIDOS
Práctica 1	Esponxas: observación de tipos xerais. Preparación e observación de distintos tipos de espículas.
Práctica 2	Cnidarios: observación e estudo de varios exemplares.
Práctica 3	Filos varios: observación e estudo de exemplares de Platelminfos, Nemertinos, Acanthocéfalos, Rotíferos, Gastrotricos, Quinorrincos, Quetognatos, Sipuncúlidos, Equiúridos, Braquiópodos e Ectoproctos.
Práctica 4	Moluscos: estudo da morfoloxía externa de representantes das diferentes clases de Moluscos. Disección dun molusco bivalvo.
Práctica 5	Anélidos: estudo da morfoloxía externa de representantes das diferentes clases de Anélidos. Observación de Sipuncúlidos e Equiúridos. Disección dun anélido oligoqueto.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	0	30
Seminario	3	1	4
Prácticas de laboratorio	14.5	0	14.5
Traballo tutelado	1	20	21
Práctica de laboratorio	0.5	22	22.5
Estudo de casos	0	8	8
Exame de preguntas obxectivas	2	45	47
Observación sistemática	3	0	3

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

Metodoloxía docente

	Description
Lección maxistral	Uso de material infográfico e documental para explicar conceptos zoolóxicos relacionados cos invertebrados non artrópodos incentivando a participación dos alumnos.
Seminario	Consulta de dúbidas e resolución de cuestións expostas polo profesor e polo alumno. Aclaración de conceptos en sesións planificadas e organizadas polo profesor. O alumnado levará a cabo distintas actividades deseñadas para os seminarios onde basicamente trabállase en grupo. Estas actividades están deseñadas para afianzar coñecementos e competencias basicamente transversais que o alumnado debe adquirir.
Prácticas de laboratorio	Actividade experimental no laboratorio, complemento das clases teóricas. O alumnado realizará 6 prácticas no laboratorio ao longo do curso onde se verán de forma práctica os contidos desenvolvidos na teoría. As prácticas da materia inclúen entre outras cousas, manexo, observación, identificación, estudo de morfoloxía externa e anatomía interna e disección de distintos exemplares da maioría dos fíos estudados.
Traballo tutelado	Explicación da metodoloxía para seguir para a realización de traballos relacionados coa zooloxía por parte do alumno. O alumnado o levará a cabo en grupos de 3, 4 ou 5 participantes en función dos alumnos matriculados.

Atención personalizada

Methodologies	Description
Prácticas de laboratorio	Durante a realización das prácticas de laboratorio e debido ao número reducido de alumnos, pode levarse a cabo unha atención personalizada resolvendo todas as dúbidas que xurdan durante o desenvolvemento das mesmas.
Traballo tutelado	A atención personalizada será durante as horas de titoría que figuran no despacho do profesor e durante as titorías incluídas na metodoloxía con grupos pequenos de alumnos.

Avaliación

	Description	Qualification	Training and Learning Results
Traballo tutelado	Traballo en grupo (relacionado coa teoría).- o alumnado levará a cabo en grupos de 3, 4 ou 5 participantes en función dos alumnos matriculados un traballo relacionado coa parte teórica (15 %) segundo normas que figurarán na plataforma Moovi. Traballo individual (relacionado coas prácticas).- o alumnado levará a cabo de forma individual a preparación dunha colección de 10 fichas sobre 10 especies elixidas da listaxe de especies do visu· seguindo as normas que figurarán na plataforma da materia (10 % da nota). Con este traballo serán avaliadas parte das competencias transversais que debe adquirir o alumnado.	25	A2 B1 C1 D1 D4 D5
Práctica de laboratorio	A avaliación dos coñecementos e competencias alcanzados nesta parte levará a cabo no laboratorio mediante un exame sobre as prácticas e que incluírá ademais un recoñecemento de visu de 5 especies de invertebrados non artrópodos das que figuran na listaxe incluída na plataforma Moovi.	15	A2 B1 C2 D1 A3 B3 D4 A4 B6
Estudo de casos	Cuestionarios: parte dos contidos teóricos serán avaliados a través de 3 cuestionarios on- line (consultar datas de realización e entrega no calendario da materia dispoñible na plataforma da materia).	15	

Exame de preguntas obxectivas	Os contidos teóricos da materia serán explicados na aula a través de sesións maxistrais. Para avaliar os coñecementos e competencias adquiridas polo alumnado sobre estes contidos teóricos realizaranse 2 probas escritas na aula que incluírán preguntas tipo test, de resposta curta, de relacionar, de desenvolvemento, etc.	40	A2 B1 C2 D5 A3 B3 C6 A4 B6
Observación sistemática	O alumnado levará a cabo distintas actividades deseñadas para os seminarios onde basicamente trabállase en grupo. Estas actividades están deseñadas para afianzar coñecementos e competencias que o alumnado debe adquirir. Valorarase a participación resolvendo cuestións expostas polo alumno e o profesor. Así mesmo valorarase a participación do alumnado nas clases teóricas.	5	A2 B1 C1 D1 A3 B3 C2 D4 A4 B6 C6 D5 C9

Other comments on the Evaluation

AVALIACIÓN CONTINUA

A avaliación é continua ao longo do curso. Para poder ser avaliado de forma continua, o alumnado deberá realizar todas as actividades planificadas para cada un dos bloques.

É obrigatorio incluír no perfil de usuario da plataforma Moovi, unha fotografía que debe permitir identificar á persoa (tipo DNI e actualizada) e unha dirección de correo electrónico (e-mail) útil (de preferencia @alumnos.uvigo.gal). En ausencia da fotografía o alumno non será avaliado polo que non recibirá nin as cualificacións nin as correccións das distintas actividades.

As situacións particulares que impidan participar nas actividades de forma regular, por exemplo ter un contrato de traballo, enfermidade, etc. deberán ser comunicadas á coordinadora da materia nos 5 días inmediatos á aparición do problema, co fin de buscar unha solución.

A asistencia ás prácticas e seminarios é obrigatoria para poder presentarse ás probas teóricas e/ou prácticas nas dúas convocatorias.

Para poder superar a materia é necesario superar teoría, prácticas e traballo tutelado por separado cunha nota igual ou superior á mínima esixida en cada parte. No caso de non ser así, non se fará suma e a nota que figurará na acta será a máis alta dos apartados suspensos.

Presentarse a dous das actividades avaliáveis independentemente de que o alumno realice ou non o resto figurará como suspenso na Acta. Só os alumnos que nunca asistisen ás clases teóricas, seminarios, prácticas ou non realicen ningunha das actividades avaliáveis figurarán na acta como non presentados.

Aínda que co sistema de avaliación continua resulta máis fácil aprobar unha materia, é máis difícil conseguir unha boa nota. Para non prexudicar ao alumnado, no caso de que se supere a materia sumaráselle entre un 5 e un 10 % da nota só na primeira convocatoria.

Confusións repetidas de conceptos básicos ou mala utilización da nomenclatura científica nas distintas probas, pode implicar un 0 no conxunto da proba.

Se en calquera das actividades detéctase copia, o alumno suspenderá automaticamente esa parte da materia.

Avaliación dos bloques

Bloque teórico

A avaliación dos contidos teóricos (55 %) será continuada ao longo do curso e consistirá en 5 probas, 2 escritas sobre contidos impartidos nas clases de teoría (40 %) e 3 cuestionarios en liña que valerán un 15 %. Para poder superar esta parte debe obterse como mínimo un 5 sobre 10 en cada unha das 2 probas escritas e un 4,5 en cada un dos 3 cuestionarios.

Bloque de prácticas

A parte práctica equivale ao 15 % da nota final. As prácticas de laboratorio son obrigatorias e avalíaranse a través dun exame práctico, que se realizará no laboratorio en horario de mañana o día seguinte da 2ª proba de teoría (ver data en <http://bioloxia.uvigo.es/es/docencia/examenes>).

Para poder superar esta parte debe obterse como mínimo un 5 sobre 10.

Seminarios e clases teóricas

A asistencia e participación nas clases teóricas e seminarios implica un 5 % da nota.

A asistencia a seminarios é obrigatoria.

A asistencia ás clases teóricas controlárase algúns días ao azar e terase en conta a participación dos alumnos en clase.

Traballo tutelado

A presentación dun traballo relacionado coa zooloxía valorarase cun 15 % da nota. Para poder superar esta parte debe obterse como mínimo un 4.5 sobre 10.

A presentación dunha colección de fichas valorarase cun 10 % da nota. Para poder superar esta parte debe obterse como mínimo un 4.5 sobre 10.

2ª OPORTUNIDADE

As actividades avaliadas superadas na primeira oportunidade gardaranse para a segunda oportunidade. Si non se supera a materia o matricularse de novo no seguinte curso, implicará repetir todas as actividades avaliadas.

AVALIACIÓN GLOBAL

Os estudantes que renuncien a avaliación continua, poderán solicitar avaliación global no período establecido polo centro. Dicha avaliación levarase a cabo nas datas oficiais de primeira e segunda oportunidade. Esta avaliación permitirá alcanzar o 100 % da puntuación da materia nun exame desglosado en dúas partes:

Contidos teóricos (65 %)

Contidos prácticos (35 %)

Bibliografía. Fontes de información

Basic Bibliography

Brusca, R.C., Moore, W. y Shuster, S.M., **Invertebrates**, 1ª edición, Sinauer, 2017

Ruppert E.E. y Barnes, R.D., **Zoología de los Invertebrados**, 6ª ed., McGraw-Hill., 1996

Hickman, C.P., Keen, S.L., Eisenhour D.J., Larson, A. y I'Anson, H., **Integrated Principles of Zoology**, 18ª ed., McGraw-Hill, 2020

Hickman, C.P., Keen, S.L., Eisenhour D.J., Larson, A. y I'Anson, H., **Principios Integrales de Zoología**, 18ª ed., McGraw-Hill, 2021

Complementary Bibliography

Brusca, R.C. y Brusca, G.J., **Invertebrados**, 2ª ed., McGraw-Hill., 2005

Calow, P. y Olive, P.J.W., **The invertebrates: a new synthesis**, 2ª ed., Blackwell Sc. Flub., 1993

Díaz, J.A. y Santos T., **Zoología: aproximación evolutiva a la diversidad y organización de los animales**, Síntesis, 1998

Hickman, F.M. y Hickman, C.P., **Zoología: manual de laboratorio**, 8ª ed., McGraw-Hill, 1998

Hickman, C.P., Roberts, L.S., Keen, S.L., Larson, A., I'Anson, H., Eisenhour, D.J., **Principios integrales de Zoología**, 14ª ed., McGraw-Hill, 2009

Jessop, N.M., **Zoología: Invertebrados. Teoría y Problemas**, McGraw-Hill, 1981

Rodríguez Iglesias F. (ed): varios autores, **Galicia naturaleza: zoología (tomos XXXVII y XXXVIII)**, Hércules ediciones, 2002

Wallace, R.L. y Taylor, W.K., **Invertebrate zoology: a laboratory manual**, 6ª ed., Pearson Education, 2003

Recomendacións

Subjects that it is recommended to have taken before

Biología: Evolución/V02G031V01101

Biología: Técnicas básicas de campo/V02G031V01109

Other comments

O horario da materia pode consultarse en:

<http://bioloxia.uvigo.es/es/docencia/horarios>

As datas de exames teóricos poden consultarse en:

<http://bioloxia.uvigo.es/es/docencia/horarios>

e <http://bioloxia.uvigo.es/es/docencia/examenes>

As datas de entrega do resto de actividades indícanse na plataforma (horario da materia). Non se recollerá ningunha actividade solicitada fóra do prazo convindo. As datas indicadas no horario da materia son inamovibles.

Non se pode cambiar de grupo de prácticas e/ou grupos de seminario salvo causas excepcionais e, previa solicitude á coordinadora da materia que decidirá se o cambio é factible ou non unha vez realizada a consulta co coordinador de 2º de grao.

A non asistencia a calquera das actividades obrigatorias só será xustificada en casos excepcionais (p.e. motivos de saúde, problemas familiares, esixencias dun contrato de traballo...) e non se xustificará ningunha ausencia debido a actividades extra curriculares (p.e. competicións deportivas non oficiais, obter o carné de conducir, irse de viaxe...).

Independentemente dos contidos transmitidos na aula, o material necesario para o correcto desenvolvemento da materia, así como a información, notas, avisos, etc. relacionados coa mesma faranse a través da plataforma Moovi.

Para un bo desenvolvemento da materia, é conveniente e aconsellable unha lectura detallada da guía docente da materia (metodoloxía e avaliación) así como toda a información que vaia aparecendo na plataforma Moovi.

Xa que o material necesario para o correcto desenvolvemento da materia figura na plataforma Moovi é recomendable imprimir e levar á aula os resumos de cada un dos temas. Isto facilitará a comprensión das explicacións, permitirá facer anotacións e resolver cuestións e dúbidas así como rendibilizarase o tempo nas clases maxistras. En ningún caso dítanse directa ou indirectamente apuntamentos xa que debido ao escaso número de horas presenciais e á densidade do programa, para poder traballar os conceptos é necesario axilizar as clases.

Non se permite o uso de computadores, teléfonos móbiles e outros aparellos parecidos durante as clases teóricas, prácticas e seminarios.

É OBRIGATORIO o uso de bata no laboratorio e o CUMPRIMENTO das normas de seguridade (atópanse dispoñibles na plataforma). A docencia práctica terá lugar no laboratorio de prácticas de Zooloxía (laboratorio de docencia LD10, pavillón B, 2º piso). O incumprimento das normas de riscos laborais implica non poder realizar a práctica correspondente.

O laboratorio debe quedar recolleito e organizado antes de marchar.

É recomendable ler o guión de prácticas antes da súa realización.

Rógase puntualidade.

LER atentamente a guía docente (metodoloxía e avaliación), así como a información presentada na plataforma Moovi.

CONDICIÓN DE USO DO MATERIAL DEPOSITADO NA PLATAFORMA Moovi

O alumnado matriculado na materia NON PODERÁ DIFUNDIR, total ou parcialmente, ningunha das imaxes, vídeos, ou calquera outro contido do curso. Este material é para uso exclusivo da materia.

PARA UN MELLOR DESENVOLVEMENTO DA MATERIA RECOMÉNDASE:

- Realizar, para unha mellor comprensión da materia, os exercicios sobre os conceptos teóricos e as prácticas dispoñibles na plataforma tema.
 - Consultar a bibliografía recomendada.
 - Facer uso frecuente das titorías para resolver as dúbidas que se presenten ao longo do curso, tanto no que se refire a cuestións teóricas como prácticas da materia.
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IDENTIFYING DATA				
Biochemistry II				
Subject	Biochemistry II			
Code	V02G031V01206			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Suárez Alonso, María del Pilar			
Lecturers	San Juan Serrano, María Fuencisla Suárez Alonso, María del Pilar			
E-mail	psuarez@uvigo.es			
Web	http://fatic.uvigo.es			
General description	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.			

Training and Learning Results	
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.
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.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
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.
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
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.
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
Describe the regulation and integration of metabolism.	A1 B2 C4 D1 B3 C6 D2
Identify metabolic specialization.	A1 B2 C4 D1 A2 B3 C10 D2 B6 C11
Know and apply the molecular mechanisms of the processes responsible for the maintenance, modification and expression of genetic information.	A1 B2 C4 D1 A2 B3 C6 D2 B6 C10
Know the fundamentals of molecular biology.	A1 B2 C4 D1 A2 B3 C6 D2 B6

Apply the knowledge of Biochemistry to isolate, identify, handle and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents.	A1 A2	B2 B3 B6	C4 C6 C10 C11	D1 D2
Analyze and interpret the functioning of living beings and their adaptation to the environment.	A1 A2	B2 B3 B6	C4 C6 C10 C11	D1 D2
Apply knowledge and technology related to Biochemistry in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11	D1 D2 D4
Obtain information, develop experiments and interpret the results.	A1	B2	C1	D1
Understand the social projection of Biochemistry and its impact on professional practice, as well as know how to use its contents to teach and disseminate.	A2	B3 B6	C4 C6 C10 C11 C13	D2 D4
Application and management of the concepts, terminology and scientific-technical instrumentation related to Biochemistry.	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2 D4
New	A1 A2	B2 B3 B6	C1 C10 C13	D1 D2 D4

Contents

Topic	
1. Cell signalization.	Signaling systems. Intracellular receptors. Membrane receptors. Tyrosine kinase receptors . Receptors of cytokines. Receptors linked to protein G. Signaling routes.
2. Hormonal regulation.	Hormone regulation of metabolism. Main hormones involved in metabolism regulation.
3. Regulation of glycogen metabolism.	Regulation of glycogen degradation and synthesis: glycogen phosphorylase and glycogen synthase. Hormonal regulation of glycogen metabolism in muscle and liver.
4. Regulation of glucose metabolism.	Incorporation of carbohydrates from the diet to the glucidic metabolism. Uptake of glucose by tissues. Regulation of glycolysis. Regulation of gluconeogenesis. Regulation of the pentose phosphate route.
5. Regulation of lipidic metabolism.	Incorporation of lipids from the diet to lipid metabolism. Lipid transport: lipoproteins. Regulation of cholesterol synthesis and degradation. Regulation of the synthesis and degradation of triacylglycerols and fatty acids.
Integration and metabolism central route regulation	Regulation of the enzymatic complex pyruvate dehydrogenase. Regulation of the respiratory chain and oxidative phosphorylation.
Metabolic specialization of the main organs	Metabolic interrelations in various nutritional states. Metabolic specialization of the organs.
Metabolism of proteins.	Protein destinations. Degradation of proteins. Ubiquitin and proteasome. Metabolism of ammonium ion.
Practice 1	Determination of the activity of the enzyme pyruvate kinase.
Practice 2	Determination of the activity of the enzyme succinate dehydrogenase
Practice 3	Kinetics of a metabolic enzyme
Practice 4	Respiratory chain and oxidative phosphorylation. Theoretical experiments
Practice 5	Determination of the activity of the alkaline phosphatase enzyme.
Practice 6	Isolation of glycogen from liver and kidney
Practice 7	Quantification of glycogen concentration

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	7.5	22.5
Lecturing	29	29	58
Seminars	3	1.5	4.5

Objective questions exam	1	14	15
Essay questions exam	2	48	50

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

Methodologies	
	Description
Laboratory practical	They will be carried out in the teaching laboratory of Biochemistry. The assistance to practic classes is obligatory. During the practices, the student will follow a practice script prepared by the teacher to develop the experimental protocols. The student makes a series of determinations of metabolites and enzymes and, according to his experimental results, he must identify organs and subcellular fractions with different metabolic functions. During the development of the practices, students must present the results obtained, answer a series of questions and when they finish all the practices they will have to prepare their corresponding report.
Lecturing	The teacher will explain contents of the subject through master classes, with slide shows and videos. Students will have support copies with figures, diagrams and tables. The classes will be developed interactively with the students. The Moovi Platform will be used as a support tool.
Seminars	There will be different activities that allow the student to consolidate the knowledge of the subject. They will be done in the classroom and in the presence of the teacher. Students must answer questions raised by the teacher. Your assistance is also mandatory.

Personalized assistance	
Methodologies	Description
Laboratory practical	Students will be attended individually in the tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Lecturing	Students will be attended individually in the tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Seminars	Students will be attended individually in the tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Tests	Description
Objective questions exam	Students will be attended individually in tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Essay questions exam	Students will be attended individually in tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.

Assessment		Qualification	Training and Learning Results			
	Description		A1	B2	C1	D1
Laboratory practical	Mandatory attendance. The teacher will evaluate the ability and behavior in the laboratory (5% of the final mark) as well as the realization of a practical report (15% of the final mark), in which the students must show the results obtained including a brief discussion. It is essential to obtain a minimum score of 5 out of 10 to be able to weigh with the rest of the sections. This activity is not recoverable if the required minimum is not reached.	20	A2	B3	C4	D2
				B6	C6	D4
					C10	
					C11	
					C13	
Seminars	Knowledge of the topics covered will be assessed by solving exercises, which will be handed in on the date set by the teacher. Attendance and delivery of the exercises is mandatory. It is necessary to obtain a minimum grade of 5 out of 10 to be able to weigh the final grade with the rest of the sections. This activity is not recoverable if the required minimum is not reached.	20	A1	B2	C1	D1
			A2	B3	C4	D2
				B6	C6	D4
					C10	
					C11	
					C13	
Objective questions exam	A first written test corresponding to topics 1-3 will be carried out on the date approved by the Faculty Board (see the center's website). This test will consist of multiple choice questions. It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 25% of the final grade.	25	A1	B2	C1	D1
			A2	B3	C4	D2
				B6	C6	
					C10	
					C11	
					C13	

Essay questions exam	A second written test corresponding to topics 4-7 will be carried out on the date approved by the Faculty Board (see the center's website). This test will consist of multiple choice questions and a question on the integration of metabolism regulation. It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 35% of the final grade.	35	A1 A2 B6 C10 C11 C13	B2 B3 C4 C6 C11 C13	D1 D2
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Other comments on the Evaluation

The **evaluation** of the **Biochemistry II** subject is **continuous** throughout the academic year. To be evaluated in this way, the student must carry out all the proposed activities (laboratory exercises, seminars and two written tests).

The particular situations that prevent participation in the usual activities (laboratory practices and seminars) (example: employment contract, illness, etc.) must be communicated as soon as possible to the teacher to find a solution.

Attendance is mandatory in the case of **seminars** and **laboratory practices**, admitting a single lack of attendance, which must be duly justified.

To pass the course of Biochemistry II (final grade as the sum of the weighted grades) it is essential to have obtained a grade equal to or higher than the minimum grade required in each of the activities that can be evaluated separately. Otherwise, the grades will not be added, and the grade that will appear in the Biochemistry II report will be the highest of the sections passed.

The activities approved in the first opportunity (May) of an academic year are maintained for the second opportunity (July). In the second opportunity (July) it will not be possible to recover laboratory practices and seminars, only partial exams not passed in the first opportunity can be taken.

In the event that the student does not attend any of the evaluable activities, it will appear as NOT PRESENTED in the Biochemistry II report on both occasions (May and July). Carrying out some of the proposed evaluable activities, but not all, automatically implies a fail in the Biochemistry II report (both opportunities).

These criteria will be applied identically on both occasions.

Likewise, students who prefer a global assessment of the Biochemistry II subject must notify them as soon as possible. The global exam will include questions from the laboratory practices, exercises from the seminars and all the theoretical part.

Students who do not pass the Biochemistry II subject on either of the two occasions, will keep the grade for the activities (practices and seminar) for the following two academic years, provided they have reached the minimum grade required.

Only activities not passed will be repeated. Activities that have already been approved cannot be re-evaluated.

The academic calendar can be consulted at the following link: <http://bioloxia.uvigo.es/gl/docencia/horarios> The exam schedule can be consulted at the following link: <http://bioloxia.uvigo.es/gl/docencia/exames>

Sources of information

Basic Bibliography

Stryer, L., Berg, J.M., Tymoczko, J. L., **Bioquímica**, 7ª edición., Reverté, 2013

Voet, D.; Voet, J.G.; Pratt, C.W., **Fundamentos de Bioquímica. la vida a nivel molecular**, 4ª Edición, Editorial Médica Panamericana, 2016

Nelson, D. L. y Cox, M. M., **Lehninger Principios de Bioquímica**, 7ª Edición, Omega, 2019

Lodish, H; Beck, A; Kaiser, C.A.; Krieger, M; Bretscher, A; Ploegh, H; Amon, A; Scott, M.P., **Biología Celular y Molecular**, 7ª Edición., Editorial Médica Panamericana, 2016

José María Teijón Rivera y Mª Dolores Blanco Gaitáncol., **Fundamentos de la Bioquímica metabólica**, 4ª edición, Tebar, 2016

Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Botánica II: Arquegoniadas				
Subject	Botánica II: Arquegoniadas			
Code	V02G031V01207			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	2c
Teaching language	Castelán Galego			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	García Molares, Aida			
Lecturers	García Molares, Aida Muñoz Sobrino, Castor			
E-mail	molares@uvigo.es			
Web				
General description	Biodiversidade e bioloxía de Briófitas, criptógamas vasculares e Espermatófitas. Nocións básicas sobre ecoloxía vexetal.			

Resultados de Formación e Aprendizaxe

Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretarlos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de espécimes actuais e fósiles. Realizar análise filoxenéticos e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Comprender os mecanismos de reprodución e ciclos biolóxicos das arquegoniadas.	A1 A5	B1 B2	C2	
Recoñecer a biodiversidade de briófitas, criptógamas vasculares e espermatófitas, e as súas relacións evolutivas.	A1 A5	B2	C1 C2 C9	D3 D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Botánica.	A1 A5	B1 B2	C1	
Ser capaz de describir e identificar espécimes mediante a utilización de claves ao uso.	A1 A5	B1 B2	C1 C7 C9	D3 D5
Manexar conceptos básicos utilizados no estudo da vexetación.	A1		C7 C9	D3
Comprender a proxección social da Botánica e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e a súa divulgación.			C9	D3 D5

Contidos

Topic
BLOQUE I: INTRODUCCIÓN

Lección 1: NIVEL DE ORGANIZACIÓN CORMÓFITOS	Caracteres que determinan a adaptación ao medio terrestre dos embriófitos: aparello vexetativo, reprodución e alternancia de xeneracións. Filoxenia e clasificación.
BLOQUE II. BRIÓFITAS	
Lección 2: BRIÓFITAS	División Bryophyta. Carateres xerais e reprodutivos. Ciclo vital. Sistemática: clases Hepaticae, Musci e Anthocerotae. Filoxenia.
BLOQUE III: ESTRUCTURA E ORGANIZACIÓN DAS PLANTAS VASCULARES	
Lección 3: A RAÍZ	Concepto e función. Estrutura primaria e secundaria. Morfoloxía do sistema radicular. Tipos de raíces. Simbiose con bacterias, cianobacterias e fungos.
Lección 4: O CAULE	Concepto e función. Estrutura primaria e secundaria. Teoría estélica. Desenvolvemento. Estrutura externa do eixo caulinar. Diversidade de tipos caulinares. Formas vitais.
Lección 5: AS FOLLAS	Concepto e función. Estrutura anatómica. Vernación e filotaxe. Morfoloxía foliar. Polimorfismo foliar. Adaptacións especiais.
BLOQUE IV: CRIPTÓGAMAS VASCULARES	
Lección 6: CARACTERES XERAIS DAS CRIPTÓGAMAS VASCULARES	Ciclo vital. Caracteres xerais do gametófito e do esporófito. Órganos reprodutores. Anomalías espontáneas do ciclo sexual. Filoxenia. Clasificación.
Lección 7: DIVERSIDADE DE CRIPTÓGAMAS VASCULARES	División Lycophyta: clases Zosterophyllopsida e Lycopside. División Monilophyta: clases Equisetopsida, Psilotopsida, Marattiopsida e Polypodiopsida.
BLOQUE V: ESPERMATÓFITAS	
Lección 8: CARACTERES XERAIS DAS PLANTAS CON SEMENTE	Caracteres do aparello vexetativo. Reprodución asexual. Reprodución sexual; ciclo vital xeral. Concepto de flor, semente e froito. Clasificación das espermatófitas.
Lección 9: XIMNOSPERMAS I.	Os precursores das ximnospermas: clases Progymnospermopsida e Pteridospermopsida. Características xerais das ximnospermas. Clasificación. Caracteres vexetativos e reprodutores das subclases Cycadidae e Ginkgoideae.
Lección 10: XIMNOSPERMAS II	Caracteres vexetativos e reprodutores da Subclase Pinidae; esbozo da súa clasificación. Principais familias do orden Pinales; representación na flora ibérica. Subclase Gnetidae: Gnetum, Ephedra e Welwitschia; caracteres vexetativos, reprodutores, ecoloxía e distribución.
Lección 11: ANXIOSPERMAS I: CARACTERES XERAIS DAS ANXIOSPERMAS	Caracteres xerais do aparello vexetativo. A flor das anxiospermas; fórmulas e diagramas florais. Inflorescencias. Polinización. Froitos e infrutescencias. Mecanismos de diseminación de froitos e sementes. Clasificación.
Lección 12. ANXIOSPERMAS II. ANXIOSPERMAS BASAIS, CLADO MAGNOLIIDAE E CLADO MONOCOTYLEDONEAE	Anxiospermas basáis: familias Amborellaceae e Nymphaeaceae. Clado Magnoliidae: Familia Magnoliaceae. Clado Monocotyledoneae: familias Liliaceae e Orchidaceae.
Lección 13: ANXIOSPERMAS III. CLADO EUDICOTYLEDONEAE	Eudicotiledóneas basáis: Familia Ranunculaceae. Clado Gunneridae. Clado Rosidae: familias Brassicaceae, Fabaceae, Fagaceae e Rosaceae. Clado Superasteridae: Familia Cayophyllaceae, Familia Asteraceae.
PROGRAMA DE CLASES PRÁCTICAS	
Práctica 1	Observación e identificación de briofitas.
Práctica 2	Observación e identificación de criptógamas vasculares e ximnospermas.
Prácticas 3, 4 e 5	Observación e identificación de anxiospermas.
SEMINARIOS	
(*)En los tres seminarios programados se tratarán temas complementarios de la asignatura.	
Nos tres seminarios programados trataranse temas complementarios da materia	

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	40	70
Prácticas de laboratorio	15	15	30
Prácticas de campo	0	15	15
Seminario	3	5	8
Práctica de laboratorio	1	2	3
Autoavaliación	0	6	6
Exame de preguntas obxectivas	1	5	6
Exame de preguntas obxectivas	1	6	7

Metodoloxía docente

	Description
Lección maxistral	O programa teórico da materia se desenvolverá durante as sesións maxistrais. Os materiais didácticos utilizados nas exposicións estarán a disposición dos estudantes de xeito anticipado.
Prácticas de laboratorio	Procederáse á observación dos caracteres taxonómicos de exemplares dos diferentes grupos de plantas utilizando a lupa binocular e o microscopio composto. Utilizaranse claves de identificación.
Prácticas de campo	Os alumnos, individualmente ou por parellas, confeccionarán un herbario virtual que debe incluír, polo menos, 30 especies distintas de árbores e arbustos espontáneos e ornamentais da súa contorna. Ademais da identificación e fotografías, deben indicar a súa posición taxonómica e os caracteres máis relevantes que os diferencian doutras especies próximas.
Seminario	Durante os seminarios tratarase de xeito monográfico algúns aspectos relacionados coa materia.

Atención personalizada

Methodologies	Description
Lección maxistral	Mediante cita previa, no horario de tutorías, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, a profesora atenderá todas aquelas cuestións que non quedaran resoltas durante as sesións maxistrais.
Prácticas de laboratorio	Mediante cita previa, no horario de tutorías, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, os profesores atenderán todas aquelas cuestións que non quedaran resoltas durante as prácticas.
Seminario	No horario de tutorías, ou previa cita, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, o profesorado encargado de impartilos atenderá todas aquelas cuestións que non quedaran resoltas durante as sesións de seminario.
Prácticas de campo	En horario de tutorías, previa cita, por correo electrónico, a través do despacho virtual do Campus remoto ou o foro de MOOVI, o profesorado encargado das clases prácticas da materia liquidará as dúbidas que puideran xurdir durante a confección do herbario virtual
Tests	Description
Autoavaliación	En horario de tutorías, previa cita, ou ben a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, a profesora encargada da docencia teórica resolverá as dúbidas xurdidas durante a realización das probas de autoevaluación.

Avaliación

	Description	Qualification	Training and Learning Results
Prácticas de campo	Para a avaliación do herbario virtual de polo menos 30 pliegos de árbores e arbustos autóctonos e ornamentais, terase en conta a orixinalidade das fotografías, a precisión da identificación e a idoneidade dos caracteres taxonómicos destacados no texto, a precisión dos datos de localización, así como a orde e coidado da súa presentación. Pódese facer individualmente ou por parellas. A elaboración do herbario fotográfico é unha actividade obrigatoria para os alumnos que opten pola modalidade de avaliación continua.	15	A1 B1 C1 D3 B2 C2 D5 C7 C9
Seminario	Será valorada a asistencia á totalidade das sesións de seminario (únicamente descontaranse as faltas debidamente xustificadas). O grao de atención e aproveitamento por parte do alumno será avaliado mediante un cuestionario.	15	A1 B1 C1 D5 A5 C7 C9
Práctica de laboratorio	O examen práctico consistirá nunha proba de descrición e identificación dun exemplar utilizando as claves. É preceptivo superalo cunha cualificación igual ou superior a 5 puntos sobre 10 para superar a materia. Esta proba é obrigatoria para todos os alumnos, aínda que no caso dos alumnos que opten pola modalidade de avaliación global supoñerá o 20 % da cualificación final, mentres que no caso da avaliación continua a porcentaxe sobre a cualificación final será do 15 %.	15	A1 B1 C1 D5 A5 B2 C2 C7 C9
Exame de preguntas obxectivas	O primeiro exame parcial versará sobre as cinco primeiras leccións do programa teórico. A cualificación obtida deberá ser igual ou superior a 4,5 sobre 10 puntos para superar a materia.	20	A1 B1 C1 D5 A5 C2
Exame de preguntas obxectivas	O segundo exame parcial versará sobre os contidos das leccións 6 a 12, ambas dúas incluídas. A cualificación obtida deberá ser igual ou superior a 4,5 puntos sobre 10 para superar a materia.	20	A1 B1 C1 D5 A5 C2

Exame de preguntas obxectivas	O terceiro exame parcial versará sobre as tres derradeiras leccións do programa teórico, e para superar a materia a nota obtida deberá ser igual ou superior a 4,5 puntos sobre 10.	15	A1 A5	B1 C2	D5
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Other comments on the Evaluation

Os horarios da materia figuran na páxina web da facultade:

§ GL: <http://bioloxia.uvigo.es/gl/docencia/horarios>

§ ES: <http://bioloxia.uvigo.es/es/docencia/horarios>

As datas de exame establecidas no calendario oficial pódense consultar nas seguintes ligazóns:

§ GL: <http://bioloxia.uvigo.es/gl/docencia/exames>

§ ES: <http://bioloxia.uvigo.es/es/docencia/exames>

O método de avaliación establecido por defecto é a modalidade de avaliación continua; se algún alumno desexa acollerse á modalidade de avaliación global deberá indicalo mediante un documento asinado antes de que finalice o prazo sinalado polo decanato da facultade.

Os requisitos no caso da modalidade de avaliación continua son os seguintes:

- A asistencia ás clases prácticas de laboratorio é obrigatoria (salvo falta debidamente xustificada); os alumnos que non cumpran este requisito figurarán en actas como "non presentado".
- Para superar a parte teórica da materia, a nota mínima obtida nos exames parciais deberá ser igual ou superior a 4,5 puntos sobre 10 e a nota media ponderada deberá ser igual ou superior a 5 puntos sobre 10. A parte teórica na modalidade de avaliación continua supón o 55 % da cualificación final da materia.
- O exame práctico de laboratorio representa o 15 % da cualificación global da materia. Consistirá na descrición dun espécime, incluíndo a elaboración do diagrama e a fórmula floral, que deberá ser correctamente identificado coa axuda de claves. A superación desta proba cunha nota igual ou superior a 5 puntos sobre 10 é imprescindible para superar a materia.
- A elaboración do herbario virtual de forma individual ou por parellas, cun número mínimo de 30 pregos debidamente etiquetados e ordenados, supón o 15 % da cualificación global.
- Para avaliar o grao de aproveitamento dos seminarios (15 % da cualificación global), os alumnos deberá realizar os exercicios que lles formularán e entregalos antes de que termine o prazo establecido.
- A cualificación final é o resultado da suma das porcentaxes asignadas aos distintos apartados avaliados. Para poder superar a materia en primeira convocatoria é necesario obter nas probas teóricas unha nota media igual ou superior a 5 puntos sobre 10 e no exame práctico unha cualificación mínima de 5 puntos sobre 10. No caso de non conseguir estas puntuacións mínimas non se sumarán os outros apartados, e a nota final que figurará nas actas será a cualificación máis baixa das obtidas nos apartados suspensos (media exames teóricos ou exame práctico).
- Na segunda convocatoria manteranse as notas anteriores e será posible recuperar o exame práctico (15 % da cualificación final); tamén se poderá facer un exame final sobre todos os contidos teóricos da materia, que supoñerá o 55 % da cualificación final.

Na modalidade de avaliación global será requisito indispensable obter unha nota mínima de 5 puntos sobre 10 no examen teórico e no exame práctico da materia, que supoñerán o 80 % e o 20 % da cualificación final, respectivamente. Seguirase o mesmo criterio na segunda convocatoria.

A repetición da materia en cursos posteriores implica repetir a totalidade das actividades.

Bibliografía. Fontes de información

Basic Bibliography

Raven, P.H., Evert, R.F. Eichhorn, S.E., **Biología de las Plantas**, Editorial Reverté., 1991-1992

Carrión, J.S, **Evolución vegetal**, DM. Murcia, 2003

Heywood, V.H., **Las Plantas con Flores**, Editorial Reverté, 1985

Díaz González, T.E e outros, **Curso de Botánica**, Ediciones Trea, 2004

Izco, J., **Botánica**, McGraw-Hill, 2005

Complementary Bibliography

Font Quer, P., **Diccionario de Botánica**, Editorial Labor, 2009

Gómez-Manzanque, F., **Los Bosques Ibéricos: una interpretación geobotánica**, Editorial Planeta, 2005

García, X.R., **Guía das plantas de Galicia**, Edicións Xerais, 2008

Castro, M. e outros, **Guía das árbores autóctonas e ornamentais de Galicia**, Edicións Xerais, 2007

Merino, B., **Flora descriptiva e ilustrada de Galicia**, La Voz de Galicia, 1980

Smith, A.J.E., **The moss flora of Britain and Ireland.**, Cambridge University Press, 2004

Smith, A.J.E., **The liverworts of Britain and Ireland**, Cambridge University Press, 1990

Castroviejo, S. et al., **Flora Ibérica**, Jardín Botánico de Madrid (CSIC), varios anos

Recomendacións

Subjects that continue the syllabus

Análise e diagnóstico medioambiental/V02G030V01902

Biodiversidade: Xestión e conservación/V02G030V01905

Avaliación de impacto ambiental/V02G030V01904

Other comments

Os horarios da materia figuran na páxina web da facultade:

http://bioloxia.uvigo.es/docs/docencia/horarios/hor_2grado_2sem1618.pdf

- É aconsellable repasar semanalmente os contidos teóricos da materia para assimilar de xeito adecuado os conceptos e a terminoloxía científica, o que redundará nun mellor aproveitamento das clases prácticas.

- O alumno debe asistir ás clases prácticas provisto dunha bata de laboratorio. Trátase dunha norma de obrigado cumprimento.

IDENTIFYING DATA				
Animal and plant histology and cytology II				
Subject	Animal and plant histology and cytology II			
Code	V02G031V01208			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Molist García, María del Pilar			
Lecturers	Molist García, María del Pilar			
E-mail	pmolist@uvigo.es			
Web	http://https://mmegias.webs.uvigo.es			
General description	Cytology and plant and animal histology II is one of the mandatory subjects that is taught in the second semester of the 2nd year of the Degree of Biology. This course exposes the basic biological principles of microscopic organization of animal and plant tissues, and their assembly in the constitution of organs. It aims to know the anatomy and morphology of plant and animal tissues and organs and the various cell types that compose them. It is a english friendly subject.			

Training and Learning Results				
Code				
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 able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).			
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.			
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.			
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.			
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.			
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.			
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.			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
To know the histology and anatomy of animal and plant tissues and organs.	A4	B6	C2	D3
Knowledge of the different cell types that make up plant and animal tissues.	A3	B6	C2	D3
	A4		C6	
To apply knowledge of cytology and histology to isolate, identify, handle and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents.	A4	B2 B3	C1	D1
To apply knowledge and technology related to Cytology and Histology in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A3	B6	C1	D1
Obtaining information, carrying out experiments and interpreting the results.	A3	B3 B6	C6	D1 D3
Understanding the social projection of Cytology and Histology and its repercussions on professional practice. Be able to use its contents for teaching and dissemination.	A4	B3	C1	D2
Knowledge and handling of the concepts, terminology and scientific-technical instrumentation related to cytology and histology.	A3	B2 B6	C1	D3

Contents

Topic

I. Thematic block. Histology and microscopic animal Organography

Lesson 1.- INTRODUCTION TO THE ANIMAL TISSUES: COATED AND GLANDULAR EPITHELIA.

Histogenesis and differentiation of animal tissues. General characteristics of the epithelia. Types of epithelial cells and functions. The basement membrane: location and composition. Histogenesis. Coating epithelia: classification and localization. Special types. Epithelial regeneration and regeneration. Glandular epithelia. Secretion: concept and types. Classification and function. Exocrine and endocrine glands. Control of secretion.

Lesson 2.- THE CONNECTIVE TISSUE: VARIETIES. ADIPOSE TISSUE.

General characteristics: cell types and extracellular matrix. Varieties of connective tissue: characteristics and location. Adipose tissue: types, morphological and functional characteristics. Histogenesis.

Lesson 3.- SUPPORTING TISSUES: CARTILAGINOUS, BONE AND CORDAL TISSUES.

Cartilage: general characters: cell types and extracellular matrix. Histogenesis and growth. Varieties. Degeneration and regeneration. Cordial tissue. Bone tissue: cell types and extracellular matrix. Types of bone and varieties. Ossification: intramembranous and endochondral. Functional aspects

Lesson 4.- BLOOD AND LYMPH. THE IMMUNE RESPONSE.

Blood: general characteristics. Plasma. Blood elements: types and functions. Agglutination and coagulation. Lymph: composition and formation. Hematopoiesis. Lymphopoiesis. Cellular bases of immunity. Humoral and cellular immunity.

Lesson 5.- THE MUSCLE TISSUE.

Generalities and classification. Skeletal, smooth and cardiac muscle: organization and structure, innervation and contraction. Histogenesis, growth and regeneration. Modifications of muscle tissue: the electrical organs.

Lesson 6.- THE NERVOUS TISSUE.

Generalities. Neurons: characteristics, classification and organization. Glia: types, characteristics and functions. Synapsis: types and classification. CNS: organization. PNS: organization. Clinical examples of synaptic function.

II. Thematic block. Histology and microscopic plant organography

Lesson 7.- THE VEGETABLE CELL AND THE VEGETABLE ORGANISM.
Characteristics of the plant cell. The cell wall: structure, formation and growth. Specializations of the cell wall: plasmodesms and pits. Basic organization of the upper floors. Plant organs: general arrangement of tissue systems: Main features. Formation of the body of the plant.

Lesson 8. MERISTEMS

Concept. Cytological characteristics. Classification: primary and secondary meristems.

Lesson 9.- PARENCHYMA AND nd FABRICS OF SUSTAIN.

Parenchyma: structure, functions and types. Collenchyma: structure and varieties. Sclerenchyma: cellular types.

Lesson 10.- VASCULAR TISSUES: XYLEM AND PHOEM.

Characteristics and celular types of xylem. Organization of primary and secondary xylem. Phloem: organization and cell types. Function and structure. Vascular tissues in the primary and secondary growth of the plant: structure and differentiation.

Lesson 11.- PROTECTION AND GLANDULAR TISSUES.

Epidermis: cell types. The cuticle. Stomas: structure, function and differentiation. Trichomes. Periderm: structure. Lenticel. Activity of the phellogen: the rhytidom. External and internal secretory structures.

Lesson 12.- VEGETATIVE ORGANS.

Root, stem and leaves: tissues organization in primary and secondary growth.

Lesson 13.- REPRODUCTIVE ORGANS. FLOWER, FRUIT AND SEED

Structure of the flower. Histology of stamens: microsporogenesis and formation of pollen grain. Histology of carpels: megasporogenesis and development of the embryonic sac. Germination of pollen grain. Fertilization. The fruit and the seed.

III thematic Block: Practices

Practice 1. Tegument and associated glands. Hair follicle. Glands of the endocrine system: thyroid and adrenal.

Practice 2. Digestive system: tongue, esophagus, stomach, intestine. Glands associated with digestive I: salivary.

Practice 3. Glands associated with digestive II: pancreas and liver. Circulatory system: blood and heart.

Practice 4. Respiratory system: trachea and lung. Excretory system: kidneys.

Practice 5. Nervous system: spinal cord. Plant organography: root and leaves.

Practical 6. Plant organography: stems.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	33	76	109
Laboratory practical	12	18	30
Seminars	3	5	8
Objective questions exam	1	0	1
Objective questions exam	2	0	2

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

Methodologies

Description

Lecturing	Presentation by the teacher of the basic concepts of the subject in order for the student to acquire the skills. Dialogue and discussion in class will be promoted based on some practical example. Questionnaires will be conducted after each topic or group of topics, whose questions will be asked mostly in English. The presentations will also have a percentage of slides in English to facilitate learning for foreign students. It is an English friendly subject. Questionnaires will be taken after each topic or group of topics, the questions will be asked mostly in English. The presentations will also have a percentage of slides in English to facilitate learning for foreign students. It is an English friendly subject.
Laboratory practical	Introduction of the practice by the teacher followed by the microscopic identification of tissues and organs, following the script that will be available on the Tema platform prior to its realization. Acquisition of basic skills associated with observation and histological description.
Seminars	In the seminars the teacher will give a general explanation of several topics, after which each student will have to expose with the support of two or three photographs the knowledge previously explained. In addition there will be problems that students will have to solve in small groups.

Personalized assistance

Methodologies	Description
Lecturing	In addition to the advice and clarifications that are made during the theory classes, students will be attended individually in the tutoring hours. Attention to the student can be done via telematics (email, videoconference, Moovi forums, etc.) under the modality of prior agreement.
Laboratory practical	Histological preparations related to the topics covered in the theoretical part will be analyzed. Histological studies will be carried out on the different organs where the different tissues are analyzed. The students will be able to ask the teacher and they can also support their analysis in a script that is sent to them before each practice. The script also presents a series of exercises that students will have to fill in during practice.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Throughout the development of the subject, 5 self-assessment questionnaires will be carried out using the Moovi platform. Each questionnaire will include questions corresponding to a group of theoretical lessons. They will be carried out in the classroom before the theoretical class.	15	A4	B6	C2	D3
Laboratory practical	The concepts acquired in the laboratory sessions will be evaluated in three follow-up tests carried out every two practices and a final test coinciding with the official examination of the subject. In all of them the student will have to identify different structures in images or schemes, such as cell types, tissues, organs, type of growth or group of plants, structures also explained in the classroom	24	A3 A4	B3 B6	C2	D2 D3
Seminars	The evaluation of the seminar will be made on a continuous basis throughout the course, based on the quality of the student's participation.	11	A3 A4	B2 B3	C1	D1 D2 D3
Objective questions exam	Written exam that includes the evaluation of the theoretical classes of animal histology.	35	A3	B6	C1	D1 C6 D3
Objective questions exam	Written exam that includes the evaluation of the theoretical classes of plant histology.	15	A3 A4	B6	C1	D1 C6 D3

Other comments on the Evaluation

Attendance to theory classes, practices and seminars is mandatory for all students and will be subject to rigorous control in the second year students. Continuous monitoring of attendance to theory and practice, as well as intervention in the seminar debates, will be used to monitor the performance of the student. The student will have to have at least 80% of attendance to the different activities to be evaluated.

The evaluation of the subject Cytology and Histology Animal and Plant II will combine written tests and continuous evaluation throughout the course.

A) Evaluation of the seminar.

The evaluation of the seminar (maximum value: 1,1 point out of 10) will be carried out continuously during the course. As there are three seminars the value of each will be 0.3 points. This note is achieved by assessment of knowledge, and attendance at the three seminars will add the remaining 0.2. The inclusion of the value of the seminar in the final grade of the subject will be carried out if and only if the student is submitted to the official examination of the subject.

The qualification of the seminar will be kept within the current course.

B) Practical Assessment

Throughout the practices will be carried out three tests that will mainly consist of the identification of tissues and / or organs through the observation of slides. Each test will have a maximum value of 0.8 points over 10. The qualification of the practices will remain within the current course.

C) Theoretical valuation

There will be two written tests where the theoretical knowledge of the subject will be assessed. In these tests, questions integrating theoretical and practical knowledge may be asked. The maximum value of both tests is 5 points out of 10, of which 3.5 points will correspond to the part of animal histology that will be carried out on the official date and the rest, 1.5 points will correspond to the part of plant histology, which will take place once that part is finished.. The format of questions will be varied and may include:

- 1) Short answer questions.
- 2) Questions that link the identification of images / schemes with theoretical concepts.
- 3) Test questions (single / multiple answer), based on knowledge acquired in the classroom and in the laboratory.

D) Assessment of the questionnaires (self-evaluation)

Throughout the development of the subject, 5 self-assessment questionnaires will be carried out using the Moovi platform. Each questionnaire will comprise questions corresponding to a group of theoretical lessons. They will take place in the classroom and each one will have a value of 0.3 points.

E) Final grade of the subject. To pass the subject, it is necessary to surpass 50% of the theoretical part (2,5) and 50% of the practical part (1,2). Otherwise, the final grade will be the result of multiplying the total grade (theory + practices + seminars+ questionnaires) by 0.5.

Students who reject the continuous assessment may request the global assessment in the period established by the center. The evaluation will be carried out on the official dates of first and second opportunity. This evaluation will make it possible to achieve 100% of the score for the subject in an exam broken down into three parts: theoretical content (5 points), practical content (3 points) and seminars (2 points).

Repeating students from other courses must take the seminars and quizzes. If they consider and voluntarily, they may or may not attend the practices, but it is mandatory to take the exams that are carried out during the course.

According to the scale determined by the University of Vigo, the subject of Cytology and Histology Animal and Plant II will have numerical qualification with only one decimal, with the following equivalence:

NOT SUBMITTED, will be the student who does not take the final exam.

NOT PASS: 0-4,9

PASS: 5-6.9

NOTABLE: 7-8.9

OUTSTANDING: 9-10

HONOR REGISTRY: Awarded to students who have obtained a grade of 9 or higher. Their number may not exceed 5% of students enrolled in a subject in the corresponding academic year, unless the number of students enrolled is less than 20 , In which case, a single Matriculation of Honor may be granted.

The dates of the exams and the class schedules can be consulted in the web page of the faculty being susceptible of modification in special circumstances.

<http://bioloxia.uvigo.es/es/docencia/grado-en-biologia/horarios>

Sources of information

Basic Bibliography

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Brüel, A., Christensen, E.I., Qvortrup, K., Tranum-Jensen, J., Geneser, F., **Geneser Histología.**, 4ª edición, Médica Panamericana, 2014

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- Welsch, U., **Sobotta. Histología (con la colaboración de T. Deller).**, 3ª edición, Médica Panamericana, 2014
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- LaDouceur E.E.B, **Invertebrate histology**, 9781119507659, 1ª, Wiley, 2021
- García-Garza, R., **Cuaderno de histologhía para colorear**, 9788413823805, 1ª, Elsevier, 2023

Recommendations

Other comments

A responsible commitment to learning reflected in the attitude throughout the course and in the aptitude associated with the acquisition of knowledge, will enable the passing of the subject. Studying the subject in a continuous way will enable the student to participate actively in the course. Knowing, understanding, reflecting and reasoning about the basic knowledge of the course, with a mature attitude, will be useful to participate in the different activities proposed by the teaching staff and guarantee of success in the course

IDENTIFYING DATA				
Genetics I				
Subject	Genetics I			
Code	V02G031V01209			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish English			
Department				
Coordinator	Quesada Rodríguez, Humberto Carlos Pérez Diz, Ángel Eduardo			
Lecturers	Canchaya Sanchez, Carlos Alberto Fernández Silva, Íria Pasantes Ludeña, Juan José Pérez Diz, Ángel Eduardo Quesada Rodríguez, Humberto Carlos Rolán Álvarez, Emilio			
E-mail	angel.p.diz@uvigo.es hquesada@uvigo.es			
Web				
General description	The contents of the Course Genetic I include: Mendelian Genetics. Linkage and recombination. Structure, replication and organisation of the DNA. Gene expression and its regulation. After taking Genetics I, the students will have to know and comprehend: ☐ The mechanisms of the inheritance. ☐ The structure and function of the nucleic acids. ☐ The expression, replication, transmission and modification of the genetic material. ☐ The genetic regulation and the genetic bases of development.			

Training and Learning Results

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.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
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.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know and handle concepts, terminology and instrumentation related to Genetics.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
Understanding the logic of the transmission of hereditary material.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
To comprehend the techniques of genetic mapping.	A1 A2 A3	B1 B3 B6	C1 C5	

To know the structure, organization and replication of hereditary material.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
Understanding how hereditary material functions and is expressed.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
Understanding the basis of the regulation of gene expression.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5

Contents

Topic	
Transmission of the hereditary material	Inheritance and chromosomes. Segregation and independent transmission. Gene interaction. Inheritance and environment.
Linkage and genetic maps	Genetic Linkage and recombination. Chromosomal cartography in eukaryotes.
Nature and replication of the hereditary material	Nature and structure of the hereditary material. The replication of the DNA. Organisation of the DNA in the chromosomes. Methods of study of the DNA.
Expression of the genetic information.	Gene transcription. Genetic code. Translation.
Regulation of the gene expression	Regulation of the gene expression in prokaryotes. Regulation of the gene expression in eukaryotes.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	25	50.5	75.5
Problem solving	8	21	29
Laboratory practical	15	6	21
Practices through ICT	0	24.5	24.5

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

Methodologies

	Description
Lecturing	They will follow the course schedule. They are organized in lessons, 50 minutes each. In most cases, it is dedicated to explain and develop the contents of the course (concepts and methodologies), but due to time constraints, students need to complete them (before and after lectures), by self-study using textbooks, complementary readings, computer animations, and reference web pages.
Problem solving	The purpose of working through problems is to better understand the concepts covered during theoretical lectures. A number of problems (available in Moovi) will be assigned throughout the semester. Students may be called upon to solve examples of the completed problems (on the board on their corresponding due dates).
Laboratory practical	The aims of the laboratory sessions are to present to the student experimental procedures related to the course. Students are expected to read the corresponding lab material BEFOREHAND. The contents of the lab sessions are connected with the contents of the lectures both theoretical and problem-solving, so that their content is also part of the knowledge necessary to pass the course. There will be 5 practical sessions lasting 3 hours each.
Practices through ICT	One of the competences that the university student must achieve throughout his / her training is the ability to work autonomously. It is necessary to provide non-contact activities that guide this learning. In order for the learning to be carried out according to the progress of the course, the Moovi platform will be used. Students will take self-assessment tests and solve practical problems.

Personalized assistance

Methodologies	Description
Lecturing	The students can interact with the professor in relation to any aspect of the discipline through personalized tutoring for the resolution of questions, or by mail through the Moovi platform. The tutorials can also be done through the virtual campus by agreeing dates and times previously with the students through email.

Problem solving	The students can interact with the professor respect to any subject related to the resolution of practical problems during the class, using personalized tutoring, or by mail through the Moovi platform. The tutorials can also be done through the virtual campus by agreeing dates and times previously with the students through email.
Laboratory practical	The student will have access through the Moovi platform to all the documentation of each practice: script of practices, presentations used in class, and complementary information of each practice. Students can interact directly with the teacher during the development of each practical session to clarify questions or expand concepts, or through email through the Moovi platform. The tutorials can also be done through the virtual campus by agreeing dates and times previously with the students through email.
Practices through ICT	The learning process of the student that complements the master classes and the practices will be carried out through the development of non-contact activities through the teaching platform Moovi. In this platform the student will find the material with the presentations of the theory classes, complementary readings, useful documents to study, the script of practices, lists of problems and exercises that must realize in a given term, and self-assessment exams. The teachers will reserve a time to attend and resolve the doubts of the students. In these activities the teacher has as a function to guide and guide the process of student learning and help him to successfully complete the corresponding autonomous work. The teachers will indicate the first days of class the place, day and hours for that personalized attention.

Assessment						
	Description	Qualification	Training and Learning Results			
Lecturing	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Two mid-term exams - One final exam	40	A2 A3	B6	C1 C2	D5
Problem solving	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Two mid-term exams - One final exam	35	A1 A2 A3	B1 B6	C1	D5
Laboratory practical	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Knowledge and performance - A multiple choice test at the end of each laboratory session	15	A2 A3	B3 B6	C1 C2 C5	D5
	Attendance to laboratory sessions is mandatory. For repeating students, grade obtained on the previous year will be kept. So that, only for them attendance will be voluntary					
Practices through ICT	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Online self-evaluations - Presentation of exercises within the established period	10	A1 A2 A3	B1 B3 B6	C1 C2	D5

Other comments on the Evaluation

Evaluation

The calendar of the tests is in this link: <http://bioloxia.uvigo.es/en/teaching/exams>

1. Evaluation in June

Option A (Continuous assessment):

- Two mid-term non-eliminary tests (35% of the final grade). It involves theory and problem- solving material.
- One final exam (40% of the final grade). It involves theory and problem- solving material. It will be necessary to obtain at least 4 points (out of 10) to pass the exam. If this minimum grade is not obtained, the final mark in the subject will be obtained with the global qualifications if it is less than 5, or 4.5 if it is greater than 5.
- Knowledge and performance in the laboratory session (15% of the final grade). A multiple choice type test will take place at the end of each laboratory session. Attendance to laboratory session is mandatory. For repeating students , grades obtained the previous year will be kept. So that, only for them, attendance will be voluntary.
- Work outside the classroom (10% of final grade). In order to obtain grading, each student must have their own set of completed problems to turn in before due dates and each student should follow the learning sequence in Moovi for all the units.

- To overcome the subject, it will be necessary to obtain 5 points out of 10 in the global qualification.

All grades, except the final exam, will be saved for the 2nd opportunity in July. For subsequent courses, only the qualification of practices will be saved.

Students who are absent from the final exam will not be graded

Option B (for students who waive continuous assessment within the period established by the Dean of the Faculty of Biology, and for students who attend extraordinary calls):

- One final exam (85% of final grade). It involves theory and problem- solving material. In this exam, it will be necessary to obtain at least 5 points to pass the subject.
- Knowledge and performance in the laboratory sessions (15% of the final grade). A multiple choice type questions will take place at the end of each laboratory session. Attendance to laboratory sessions is mandatory. Practice grades will be saved for the 2nd opportunity in July. For repeating students, practice grade obtained on the previous year will be kept. So that, only for them attendance will be voluntary.

Students who are absent from the final exam will not be graded

Academic Ethics :

- Cheating in this course will not be tolerated.
- Cheating includes but is not limited to: plagiarism, copying during the exams, falsifying documentation related to absences, use of unauthorized electronic devices during an exam
- Penalties for cheating can include failing course

Teaching timetable: <http://bioloxia.uvigo.es/es/docencia/horarios>

Sources of information

Basic Bibliography

Complementary Bibliography

Griffiths AJF, Doebley J, Peichel C, Wassarman DA, **Introduction to Genetic Analysis**, 12, WH Freeman, 2020

Michael R. Cummings, William S. Klug, Charlotte A. Spencer, Michael A. Palladino, Darrell Killian, **Concepts of Genetics**, 12, Pearson Education, 2020

Pierce, Benjamin A, **Genética : un enfoque conceptual**, 5, Médica Panamericana, 2015

Watson, Baker, Bell, Gann, Levine, Losick, **Biología molecular del gen**, 7, Médica Panamericana, 2016

Benito Jiménez, César, **141 problemas de genética : resueltos paso a paso**, 1, Síntesis, 2015

Mensúa, Jose Luis, **Genética: problemas y ejercicios resueltos**, 1, Alhambra, 2003

Recommendations

Subjects that continue the syllabus

Genetics II/V02G030V01505

Other comments

It is recommended to study the subject continuously

IDENTIFYING DATA				
Zoology 2: Arthropod invertebrates and chordates				
Subject	Zoology 2: Arthropod invertebrates and chordates			
Code	V02G031V01210			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Iglesias Briones, Maria Jesús Mato de la Iglesia, Salustiano			
Lecturers	Garrido González, Josefa Iglesias Briones, Maria Jesús Kim , Sin-Yeon Mato de la Iglesia, Salustiano Noguera Amoros, Jose Carlos			
E-mail	mbriones@uvigo.es smato@uvigo.es			
Web	http://http://bioloxia.uvigo.es/es/docencia/horarios			
General description	According to its academical denomination this course deals with two animal phyla, phylum Arthropoda with joint appendages and phylum Chordata with an axial skeleton (notochorda), segmented muscles, pharyngeal slits, endostyle or thyroid gland and postanal tail.			

Training and Learning Results

Code	
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).
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
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.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know the origin and evolution of animals: the body plans, the position of the distinct groups along the evolutionary tree and the rules of the zoological nomenclature.	A3 A4	B6	C2	D3
To know the biodiversity and the organisms' abilities to adapt to their environment: species identification (use of dichotomous keys) and analysis of animal behaviour	A3 A4	B1	C1 C2 C6 C7	D3
To know and compare the anatomy and physiology of the different animal groups: morphological adaptations, strategies of capture and food foraging, developmental biology and biological cycles	A3 A4	B6	C2 C6 C9	D3

To apply the acquired knowledge in zoology to manipulate and analyse specimens and samples of biological origin, with the aim of cataloging, evaluating, designing and interpreting biological models; to elaborate management measures for species control and for the design of adequate plans that could ensure their conservation and the restoration of their habitats.	A3 A4	B1 B6	C1 C7 C9	D3 D4 D5
To apply knowledge and techniques in those areas specialised in producing and exploiting resources of animal origin; awareness of animal welfare and ethical commitment when studying and using animals	A3 A4	B6	C1 C7 C9	D3 D4 D5
To understand the social projection of zoology and its impact in the professional world, as well as to know how to disseminate contents (orally and written) in academic and scientific fields and in any other forum of dissemination.	A3 A4	B6	C9	D3 D4 D5

Contents

Topic	
Presentation: General organisation of the course	Organisation of the course. Introduction and justification of the phylogenetic scheme adopted.
I. Panarthropoda	Phylogenetic considerations of Panarthropoda Phylum Tardigrada. External and internal morphology. Phylum Onychophora. External and internal morphology.
II. Phylum Arthropoda	General characteristics Subphylum Chelicerata Subphylum Miriapoda Subphylum Crustacea Subphylum Hexapoda
III. Phylum Chordata	Exclusive characteristics Subphylum Cephalochordata Subphylum Urochordata Subphylum Vertebrata
IV. Phylum Chordata: Craniata	Subphylum Vertebrata (Vertebrates except Tetrapods) Class Mixini Class Petromizontidae Class Chondrichthyes Class Actinopterygii Class Sarcopterygii
IV. Phylum Chordata: Craniata	Subphylum Vertebrata (Tetrapod Vertebrates) Class Amphibia Class non Avian Reptiles Class Aves Class Mammals
Laboratory Exercises	I. Morphological study of Arthropods I. II. Morphological study of Arthropods II. III. Morphological study of Vertebrates I. IV. Morphological study of Vertebrates II. V. Morphological study of Vertebrates III. VI. Field trip. Observation in situ of different groups of arthropods and chordates.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	42	70
Laboratory practical	15	30	45
Case studies	0	16	16
Seminars	3	0	3
Objective questions exam	1	7	8
Objective questions exam	1	7	8

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

Methodologies

	Description
Lecturing	Theoretical contents related by the professor in the classroom. "Teaching starts in the classroom and ends in the books".
Laboratory practical	The practical exercises are complementary to the lectures and will provide a hands-on training to the diversity of arthropod invertebrates and chordates as well as their anatomy and how to identify them

Case studies	Resolution of problem-solving assignments and questionnaires using the online learning platform. They are intended to evaluate the transversal competences acquired by students (i.e. synthesis, critical thinking, creativity) included in the syllabus
Seminars	They can be used to solve any problems that could arise during the course. They will include complementary activities addressing some of the theoretical-practical aspects. Tasks aiming at acquiring academic English skills will be implemented.

Personalized assistance

Methodologies	Description
Lecturing	Group tutorials do not allow a personalized follow-up but they are a good mechanism to consult any doubts and enable the teacher to share the students' difficulties. In a system in which the burden of learning falls on the student, close follow-up is essential if learning and study are to be continuous and progressive. Therefore, individual tutorials (Monday, Tuesday and Wednesday 09:30-11:30) will also be used to monitor the development of the subject and resolution of any questions that may arise. Student tutorials could also be done virtually (email, videoconference) by mutual agreement between the lecturer and the student.
Laboratory practical	Tutorials (Monday, Tuesday and Wednesday 09:30-11:30) will be used to solve any questions that may arise.
Seminars	Tutorials (Monday and Tuesday 09:00-12:00) will be used to solve any questions that may arise.
Case studies	Tutorials (Monday, Tuesday and Wednesday 09:30-11:30) will be used to solve any questions that may arise.

Assessment

	Description	Qualification	Training and Learning Results				
Laboratory practical	Attendance is compulsory and the students' active participation will also be positively considered. These sessions will be evaluated based on a written examination of the practical contents at the end of each practical session.	20	A3 A4	B1 B6	C2 C7		
Case studies	There will be three problem-solving assignments altogether, which will consist of the resolution of theoretical and/or practical aspects related to each of the thematic units. Each one of them allows the teacher to evaluate the student's efforts during the course. They will be available on the online learning platform for at least a week (exact dates will be agreed upon by the students and the teacher). Each of these activities will be evaluated on a scale from 1 to 10 and at the end of the course finally averaged to obtain the final score	10	A3 A4	B1 B6	C1 D3 D5		
Seminars	Attendance and active participation in the debates during these sessions are mandatory. The seminars will be evaluated by the resolution of a case study. The content and the quality of the report will also be considered.	10	A3 A4	B1 B6	C1 C9 D3 D4 D5		
Objective questions exam	The first assessment will take place during the teaching period (30%). The student will have to answer several questions related to the phylum Arthropoda. It will cover the material provided during the lectures and aims at evaluating the extent of knowledge acquisition. The format of this exam will be short-answer questions, filling gaps with a few words or drawing a diagram to explain a particular structure or physiological function of a particular animal.	30	A3 A4	B1 B6	C1 C2 C6 C7 C9 D3 D4 D5		
Objective questions exam	The second assessment (30%) will take place on the official date established by the Faculty. The student will have to answer several questions related to the phylum Chordata. It will cover the material provided during the lectures and aims at evaluating the extent of knowledge acquisition. The format of this exam will be short-answer questions, filling gaps with a few words or drawing a diagram to explain a particular structure or physiological function of a particular animal.	30	A3 A4	B1 B6	C1 C2 C6 C7 C9 D3 D4 D5		

Other comments on the Evaluation

The dates for the written exams of the theoretical aspects of the course will coincide with the official dates stated in the assessment schedule of the Faculty (May and July attempts), which can be found on the faculty website:
<http://bioloxia.uvigo.es/en/teaching/exams>

The written exams of the practical aspects of the subject will be done at the end of each of the practical classes. The scores obtained during the continuous evaluation (seminars, laboratory exercises, on-line activities) will be maintained for the second and extra attempts scheduled for the current academic year.

The final grade will be obtained as the sum of the different evaluation components (after calculating the percentages assigned), as long as each part of the total evaluation (theory, lab sessions, seminars and assignments) had been passed with a minimum value of 5.0. In the case of students not achieving the mark of 5 in either of these components, the score obtained in the failed component will become the numeric final grade.

In addition, the teacher may propose extra (voluntary) activities for those students willing to increase the average grade obtained. They will be announced throughout the semester and therefore, it is the student's obligation to stay informed throughout this period.

Students will also have the choice to take a final exam of 100% of the subject contents (instead of the continuous evaluation procedure) as long as they have attended all the laboratory sessions. There will be a period to select this modality, which will be established by the faculty.

A student will receive a grade of "not presented" (NP) when he/she has not attended the final written exam that will be held in the two official calls (first and second call) and if he/she does not perform any of the other activities included in the continuous evaluation procedure (i.e., seminars, laboratory exercises, on-line assignments).

If a student fails some elements of the course, he/she may still be able to progress to the next year by repeating all those elements of the continuous evaluation procedure that were not passed first time. However, students need to consult with the professors if only failed elements will be re-taken/deferred and upon which conditions.

Cheating and plagiarism in any of the different activities of the evaluation could result in failing the activity and/or the entire course.

Sources of information

Basic Bibliography

Hickman CP, Roberts LS, Larson A, l'Anson H and Eisenhour DJ, **Integrated Principles of Zoology**, 16, McGraw-Hill, 2014

Brusca RC, Moore W and Shuster SM, **Invertebrates**, 3, Sinauer, 2016

Kardong KV, **Vertebrates. Comparative Anatomy, Function, Evolution**, 7, McGraw-Hill, 2015

Complementary Bibliography

Recommendations
