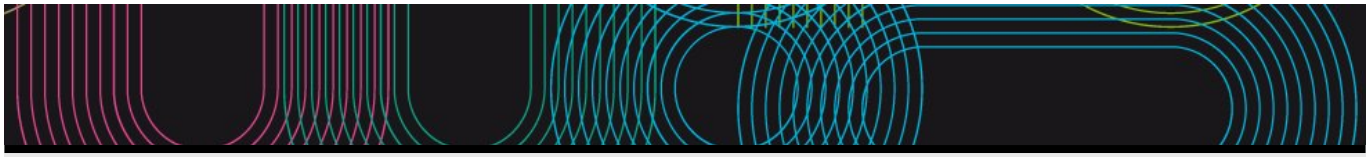

IDENTIFYING DATA				
Molecular Basis of Adaptation to the Marine Environment				
Subject	Molecular Basis of Adaptation to the Marine Environment			
Code	V02M098V01107			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	San Juan Serrano, María Fuencisla			
Lecturers	García Martín, Óscar San Juan Serrano, María Fuencisla			
E-mail	fsanjuan@uvigo.es			
Web				
General description	Molecular mechanisms underlying the phenomenon of adaptation. Integration of the biochemistry compared.			

Competencies	
Code	
A1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
A2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
A5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
B2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
B5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
B6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad
C2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
C3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros
C13	Divulgación de conocimientos de la biología y el medio marinos: programas de formación y docencia; planificación y dirección de acuarios, museos, centros de interpretación ambiental, parques naturales y espacios naturales protegidos
C14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
D1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
D2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
D3	Desarrollo de las capacidades de trabajo en equipo, enriquecidas por la pluridisciplinariedad
D4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
D7	Desarrollo de habilidades para la divulgación de ideas en contextos tanto académicos como no especializados

Learning outcomes

Expected results from this subject	Training and Learning Results
Knowledge of basic mechanisms and adaptive strategies at molecular level	A1 A2 A3 B2 B6 C2 C3 C13 D1 D2 D4
Integration ability to understand the molecular basis of adaptive phenomena from the perspective of comparative biochemistry.	A2 A3 B6 C2 D1 D2
Ability to evaluate and interpret the effects of environmental changes from marine environment on organisms and their interactions.	A2 A3 B2 C2 C3 C14 D1 D2
Ability to obtain information, analyse it critically and apply it to the interpretation and sustainability of marine environments.	A2 A3 A5 B2 B6 C13 C14 D1 D2 D4
Ability to develop individual and / or team works, and to expose them and discuss them in public.	A3 A4 A5 B2 B5 B6 C13 D1 D2 D3 D4 D7

Contents	
Topic	
Biochemical adaptation: basic mechanisms and strategies.	Biochemical adaptation. Basic mechanisms of the biochemical adaptation. The time of the biochemical adaptation.
Design of cellular metabolism.	Points of metabolic adaptation in glycolysis. Origin and phylogenetic distribution of the urea cycle. Adaptations of mitochondrial energy metabolism.
Adaptation of enzymes to metabolic functions.	Mechanisms of enzymatic regulation. The enzymes like protective elements.
Adaptation to the limited oxygen availability.	Anaerobic metabolism of marine invertebrates. Anaerobic metabolism of marine vertebrates. Adaptation to hypoxia.
Adaptation to salinity.	Osmoregulation in aquatic organisms. Response regulation to osmotic shock.
Adaptation to temperature.	Compensatory mechanisms from poikilotherm organisms to temperature changes. Acclimatization mechanisms to temperature. Adaptation to ice.

Adaptation to pressure.	Effects of the hydrostatic pressure on the biological systems. Mechanisms of perception and compensation to the changes of pressure.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	20	40	60
Seminars	4	10	14
Multiple choice tests	1	0	1

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

Methodologies

	Description
Master Session	In master sessions the teacher will give the fundamental concepts so that the student understands and can prepare the subject contents.
Seminars	In seminars, students will work aspects or bibliographic data related with subject, and will elaborate coments and oral and/or written presentations.

Personalized attention

Methodologies	Description
Master Session	The doubts resolution and necessary orientation in the personal work of the student will be attended through voluntary tutorships.
Seminars	The doubts resolution and necessary orientation in the personal work of the student will be attended through voluntary tutorships.

Assessment

	Description	Qualification	Training and Learning Results			
Master Session	The acquired theoretical knowledge will be assessed through a final test exam.	70	A1 A2 A3 A5		C2 C3	D1 D2
Seminars	In the work from seminars, the ability to relate the acquired knowledges and concepts, the correct use of specific terminology and the criticism and synthesis ability will be assessed.	30	A1 A2 A3 A4 A5	B2 B5 B6	C13 C14	D1 D2 D3 D4 D7

Other comments on the Evaluation

The realization of seminars and / or bibliographic work is compulsory for passing the subject.

The final test exam is compulsory for passing the subject. The score in the themes given by each professor should be 3 in order to be take into account in the exam total score . The mean score of the exam will have to be of 3,5 (35% of the assessment of subject) for to sum the score of the seminars assessment.

Sources of information

Atkinson D.E., **Cellular Energy Metabolism and its Regulation**, 1977,

Di Prisco, G., **Life under extreme conditions**, 1991,

Ewart K.V., **Fish antifreeze proteins. Molecular aspects of fish and marine biology**, 2002,

Hochachka, P.W. and Somero G.N., **Strategies of Biochemical adaptation**, 1973,

Hochachka, P.W. and Mommsen T.P., **Metabolic Biochemistry**, 1995,

Hochachka P.W and Somero G.N., **Biochemical Adaptation**, 2002,

Le Gal, Y., **Biochimie Marine**, 1988,

Lucas A., **Bioenergetics of Aquatic Animals**, 1997,

Mathews-Van Holde, **Bioquímica**, 4ª Ed. 2013,

Nelson D.L and Cox M.M., **Lehninger. Principios de Bioquímica**, 6ª Ed. 2014,

Salway J., **Metabolism at a glance**, 2004,

Urich, K., **Comparative Animal Biochemestry**, 1994,

Recommendations

Subjects that continue the syllabus

Physiology of Marine Organisms/V02M098V01106

Subjects that are recommended to be taken simultaneously

Marine Ecology/V02M098V01105
Physiology of Marine Organisms/V02M098V01106
Marine Zoology/V02M098V01103