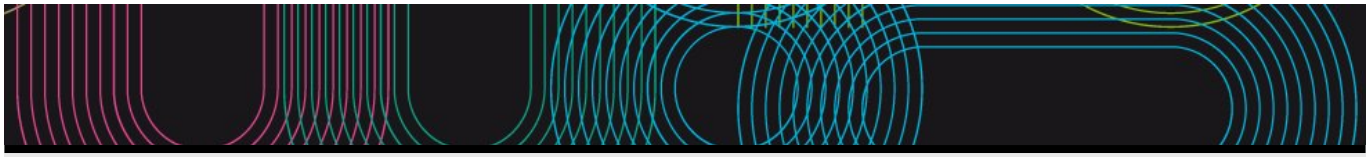

IDENTIFYING DATA				
Bioquemistry and cellular biology				
Subject	Bioquemistry and cellular biology			
Code	V12G420V01301			
Study programme	Grado en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Pombal Diego, Manuel Ángel Gil Martín, Emilio			
Lecturers	Gil Martín, Emilio Miguel Villegas, Encarnación de Pombal Diego, Manuel Ángel Suárez Alonso, María del Pilar			
E-mail	pombal@uvigo.es egil@uvigo.es			
Web				
General description	Conceptual subject on the principles of cellular and molecular organization of living organisms. The understanding of the dynamics of biological processes, based on the knowledge of the chemical composition and cellular structure of biological systems is the strategic objective.			

Training and Learning Results
Code

Expected results from this subject	
Expected results from this subject	Training and Learning Results

Contents	
Topic	
1. Chemical composition of biological systems.	Macrobiogenic, microbiogenic and trace elments. The molecular logic of life. Structure of biological macromolecules.
2. Structural biochemistry of proteins.	Aminoacids: structure and properties. Peptide bond features. Three-dimensional structure of proteins: protein folding. Protein denaturation.
3. Principles of biocatalysis and regulation of enzyme activity.	Enzymes as biological catalysts. Enzyme structure and functional principles. How enzymes work. Substrate specificity: the active site. Classification of enzymes and nomenclature. Enzyme kinetics: the Michaelis-Menten equation and calculation of kinetic parameters.
4. Structural biochemistry of carbohydrates, lipids and nucleic acids. Biological relevance.	Structural units: structure and chemical properties. Macromolecular structure of carbohydrates, lipids and nucleic acids. Biological relevance.
5. Cell membrane and extracellular matrix.	Structure, composition and functions. Membrane transport. Cell junctions.

6. Organelles and intracellular traffic.	Endoplasmic reticulum and Golgi apparatus. Vesicular trafficking. Cell digestion: peroxisomes and lysosomes. Mitochondria: structure and function. Cytoplasmic inclusions.
7. Cytoskeleton and cell movement.	Actin filaments, microtubules and intermediate filaments.
8. Nucleus, cell cycle, apoptosis.	Nuclear envelope. Chromatin and chromosomes: structure and dynamics. Nucleolus. Cell cycle regulation. Cell death: apoptosis and necrosis.
Practice 1. Assay of enzyme activity.	Obtention of an active fraction of beta-D-galactosidase. Measurement of beta-D-galactosidase activity.
Practice 2. Quantification of total protein content in biological samples.	Seroalbumin standard calibration curve by the Lowry method. Determination of protein concentration in beta-D-galactosidase extract.
Practice 3. Kinetic characterization of enzyme activity.	Substrate saturation curve for beta-D-galactosidase. Determining Km and Vmax.
Practice 4. Thermal stability and optimum pH.	Determining the optimum pH of beta-D-galactosidase activity. Thermal inactivation of beta-D-galactosidase.
Practice 5. Cell types and extracellular matrix.	Observation of cell types and extracellular matrices at light microscopy.
Practice 6. Cell organelles I.	Observation of cell organelles at light microscopy.
Practice 7. Cell organelles II.	Identification of cell organelles in electron microscopy images.
Practice 8. Cell cycle.	Observation and quantification of mitotic phases in animal tissues.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	16	16	32
Lecturing	34	68	102
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
Laboratory practical	They include activities carried out in the laboratory involving the application to experimental contexts of theorical knowledge and technical guidelines discussed in the lectures. Practices, in addition to experimental work, include individual or group tasks aimed at promoting the acquisition of general, specific and transversal skills of the subject.
Lecturing	Teacher dissertations on concepts and practical guidelines required for the acquisition of general, specific and transversal skills of the subject. Lectures will be dynamical and open to debate with the students.

Personalized assistance

Methodologies	**Description**
Lecturing	Lectures are participatory and include questions and issues to be solved. They also allow monitoring the learning progress. Questions and doubts resolution may also be solved during individual tutorials.
Laboratory practical	Teachers will provide individual attention to each student during laboratory practices, as much support as they need for the correct understanding of experimental objectives, required methodology or technical procedures to be performed. Each student will be supervised by the teacher and will receive specific instructions according to the results achieved.
Tests	**Description**
Objective questions exam	Teachers will solve doubts during examination.
Objective questions exam	

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	Laboratory practices exam.	20	
Objective questions exam	Final theoretical exam of the biochemistry module with multiple choice and short answer questions.	40	

Objective questions exam	Final theoretical exam of the cell biology module with multiple choice and short answer questions.	40

Other comments on the Evaluation

Attendance to theoretical classes and laboratory practices is mandatory, except for documented reasons.

The subject will be passed by obtaining 5.0 or more out 10 as final mark, achieved as follows:

- Attendance at laboratory practices and completion of the practical exam (20 %).

- Completion of two exams consisting of test and short answer questions. Each exam will correspond to 40 % of the final grade. The first exam will be on a date agreed with the students and the second on the date scheduled by the School (first edition). There will only be a second chance exam, which will include questions related to all the contents of the subject.

A numerical rating system from 0 to 10 will be used,according to the regulations contained in RD 1125/2003, BOE of September 18.

To pass the subject, the student must pass 40 % in all exams. Otherwise, the final mark will be the result of multiplying theory + practices by 0.5.

In the case that final mark of the subject does not reach 5.0, but the theoretical or practical part is passed, that score will be maintained for the second exam opportunity (July).

Repeating students from previous academic courses must carried out all theoretical and practical activities, of which they will be evaluated.

*Ethical commitment: students are expected to exhibit adequate ethics. In the case of detecting unethical behaviors (copying, plagiarism, use of unauthorized electronic devices, etc.), the student will not pass the subject. In this case, the overall score for the current academic year will be 0.0.

Sources of information

Basic Bibliography

Alberts, B.; Johnson, A.; Lewis, J.; Raff, M.; Roberts, K.; Walter, P., **Molecular Biology of the Cell**, 6th ed, Garland Science, 2015

Becker, W.M.M., Kleinsmith, L.J.; Hardin, J., **The World of the Cell**, 8th ed, Benjamin-Cummings Publish. Comp., 2012

Berg, J.M.; Tymoczko, J.L.; Gatto, G.J.; Stryer, L., **Biochemistry**, 9th ed, WH Freeman Publishers, 2019

Cooper, G. M.; Hausmann, R.E., **The Cell: a Molecular Approach**, 7th ed, ASM Press, 2016

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

Complementary Bibliography

Megías, M.; Molist, P.; Pombal, M.A, **Atlas de histología vegetal y animal**, https://mmegias.webs.uvigo.es/,

Recommendations

Subjects that continue the syllabus

General physiology/V12G420V01402

Subjects that it is recommended to have taken before

Chemistry: chemistry/V12G420V01205

Other comments

In general, in order to register for this subject it is necessary to have completed or be enrolled in all the subjects of the previous course.