



## IDENTIFYING DATA

### Plant physiology I

Subject	Plant physiology I			
Code	V02G030V01503			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician			
Department	Plant Biology and Soil Sciences			
Coordinator	Sánchez Moreiras, Adela María			
Lecturers	Pedrol Bonjoch, María Nuria Reigosa Roger, Manuel Joaquín Sánchez Moreiras, Adela María			
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General description	(*) The aims of the **asignatura of Vegetal Physiology *I head to to achieve that the students obtain a current vision of the scientific knowledge developed in the field of the Vegetal Physiology. It pretends that the student obtain the theoretical basic knowledges-practical necessary to comprise the operation **fisiolóxico of the plants and like this purchase the foundations for his application in matters but specific.			

## Competencies

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Ability of reading and analyzing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the corresponding conclusions.
B3	Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area.
B4	Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context.
B5	Understanding of the levels of organization of living beings from a structural (molecular, cellular and organic) and functional point of view by observing their relations with the environment and other organisms, as well as their appearances in situations of environmental alteration.
B7	Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue.
B10	Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.
B11	Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).
B12	Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context.
C3	Identifying, analysing and characterizing biological samples, including those of human origin, and possible anomalies.
C5	Growing microorganisms, cells, tissues and organs.
C6	Assessing and interpreting metabolic activities.
C8	Assessing the functioning of physiological systems by the interpretation of parameters
C9	Analysing and interpreting the behaviour of living beings

C10	Analysing and assessing the adaptation of living beings to the environment.
C16	Growing, producing, transforming, improving biological resources as well as getting profits.
C17	Identifying and obtaining natural biological products
C18	Producing, transforming, controlling and preserving Agro-Food products.
C21	Processing and interpreting bioessays and biological diagnoses.
C24	Designing biological process models.
C25	Gathering background information, develop experimental work and analysing data results
C28	Teaching and sharing knowledge and resources related to Biology
C30	Controlling and counselling on every aspect related to Organisms Welfare.
C31	Knowing and handling technical and scientific apparatus.
C32	Knowing and handling basic or specific key concepts and terminology
C33	Understanding the social projection of Biology.
D1	Development of capacity of analysis and synthesis
D2	Acquisition of the organization and planning capacity for tasks and time
D3	Development of oral and writing communication abilities
D5	Use of computer resources related to the study field
D6	Research and interpreting of information from different sources
D7	Resolution of issues and decision making in an effective way
D8	Development of the ability of independent learning
D9	Ability to work in collaboration or creating groups with an interdisciplinary character
D10	Development of the critical thinking
D13	Sensitivity for environmental issues
D14	Acquisition of abilities in the interpersonal relationships
D15	Development of creativity, initiative and entrepreneurial spirit
D16	Acceptance of a quality commitment
D17	Development of the self-criticism ability
D18	Development of negotiating power

### Learning outcomes

Expected results from this subject	Training and Learning Results			
Obtain an integral vision of all the processes **fisiológicos of the plants, his behaviour and his adaptative *answers to the half	A1 A2 A3 A4	B3 B5 B10 B11 B12		
Apply knowledge of the vegetal physiology to isolate, identify, handle and analyse *espécímenes and samples of vegetal origin, as well as to characterise his cellular constituents and metabolic *activities	A1		C3 C6 C9 C10 C16 C17 C32 C33	
Apply knowledges and relative technology to the vegetal physiology in appearances related with the obtaining, exploitation, analysis and diagnostic of vegetal resources and products derived of these	A3		C17 C18 C28 C30 C33	D1 D2 D3 D5
Obtain information, develop experiments and interpret the results.	A3 B10 B12	C5 C8 C21 C24	D1 D5 D6 D7 D8 D9 D10 D13 D14 D15 D16 D17 D18	
Comprise the social projection of the vegetal physiology and his repercussion in the professional exercise, as well as know use his contents to give teaching and the divulging	A3 B4	C25 C28	D1 D6 D9	

Use knowledges of the matter to supervise and *asesorar on all the appearances related with the welfare of the vegetables	A3	C30	D13
Know and handle the concepts, terminology and scientific instrumentation-technical relative to the vegetal physiology	A1	B2 B7 B10 B11 B12	C32 C3 C18 C25 C31 D16

## Contents

Topic	
Physiology of the plant cell	Introduction to Plant Physiology. The plant cells: organelles, membranes and cellular wall. Mechanism of extension of the cellular wall.
Water relations and transport	<ul style="list-style-type: none"> <li>- Water relative a of the plant cell. Water potential. Plasmolise. Turgidity.</li> <li>- Absorption of water by the plants. The water in the soil. Absorption of the water by the roots. Movement of the water through the root.</li> <li>- Movement of the water through the plant. Mechanism of ascending transport.</li> <li>- Transpiration. Stomas. Opening mechanism and closing. Water Balance.</li> <li>- Absorption of ions by the plants. The elements in the soil. Absorption by the root. Movement of ions in the plant.</li> <li>- Translocation of solutes. Characterisation of the transport. Hypothesis of the flow of pressure.</li> </ul>
Photosynthesis	<ul style="list-style-type: none"> <li>- Photosynthesis. General equation. Magnitude of the photosynthesis.</li> <li>- Chloroplasts. Structure. Photosynthetic pigments. Ultrastruture of the thylakoid system.</li> <li>- Capture of the light energy. Structure of the Photosystems: centres of reaction and complex LHC.</li> <li>- Transduction of the energy. Transport of electrons.</li> <li>- Photophosphorylation. Quimioosmotic Hypothesis. ATP-sintase. Synthesis of ATP.</li> <li>- Photosynthetic fixation of the CO<sub>2</sub>. Cycle of Calvin. Stoichiometry of the cycle. Regulation.</li> <li>- Photorespiration. Biochemical mechanism. Intracellular location. Biological meaning.</li> <li>- Plants C-4. Structure of the leaf. Biochemistry of the route C-4. Types of C-4 plants.</li> <li>- Crassulacean Acid Metabolism (CAM). Biochemistry of the fixation of CO<sub>2</sub>. Regulation.</li> <li>- Photosynthetic productivity. Concept of point of compensation. Factors that affect to the photosynthesis: light, CO<sub>2</sub>, water.</li> <li>- Utilisation of the Carbon fixed. Synthesis of starch and sucrose. Exchange of substances between the chloroplast and the cytoplasm.</li> </ul>
Secondary metabolism	<ul style="list-style-type: none"> <li>- Characteristic of the secondary metabolism</li> <li>- Flavonoids</li> <li>- Terpenoids</li> <li>- Nitrogen compounds</li> </ul>
Practices of laboratory	<ol style="list-style-type: none"> <li>1. Determination of the Water potential of a plant tissue</li> <li>2. Physiology of the stomas. Observation of the stomas and assessment of the stomatal opening and closing.</li> <li>3. Extraction, separation and quantification of photosynthetic pigments of plants</li> <li>4. Crassulacean acid metabolism</li> <li>5. Effect of the temperature on the oxidative respiration</li> <li>6. Writing of the manual of practices</li> </ol>

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	30	60
Group tutoring	3	36	39
Case studies	0	4	4
Laboratory practices	15	30	45
Essay 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
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Lecturing	The master lessons of the educational programming are organised in lessons of 50 min of length. They devote to explain and develop the concepts and basic methodologies in Plant Physiology. They have to be completed with autonomous work of the student by means of books of text, complementary readings, pages web of reference. They will arouse also study of cases that the student will have to resolve by his/her account delivering in the date established.
Group tutoring	The tutoring of 6-8 students allow to supervise the group in the realisation of a bibliographic work in which it prevail the organisation of the work of the group and that end in the writing of a text of no more than 30 pages and no less than 10 that it will be evaluated, as well as in a presentation of 15 minutes that also will form part of the evaluation of this section.
Case studies	Each 10-15 days will arouse a case in class that the student will have to resolve of individual way with the help of educational material specialised.
Laboratory practices	The practices of laboratory are aroused with the aim to complement the master sessions, familiarise the student with the protocols of laboratory in Plant Physiology and realise concrete experiments that the student will have to value delivering a manual of practices

### Personalized attention

Methodologies	Description
Group tutoring	Besides the regular tutoring, the group tutoring will allow to work much more with the student in the study of cases, in the development of the memory of practices and in the presentation of works
Laboratory practices	They will be interactive and will allow to establish actions customized of reinforcement. During the realization of the practices of laboratory the professors will give attention customized to the students for the correct understanding of the experimental objectives and of the methodology used. The student owes to learn to work in team. Once finalized the practical, the group of students will be supervised in their work by a professor. It contemplates also the resolution of doubts and problems through the platform TEMA or with the tutoring.
Case studies	The student owes to learn to work of autonomous form realizing autonomous activities that are indicated in the master sessions and studying the subjects proposed. Also they owe to learn to work in team under the supervision of the professors, will realize a work with public presentation. These works will have supervision in group tutoring, and will be able to form part of individual tutoring.
Tests	Description
Essay questions exam	The students will be able to resolve doubts of the subject during them time of individual tutoring.

### Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Exhibition of the contents	0				
Group tutoring	Preparation of bibliographic works and 15 min presentation of the main results.	10	A1 A2 A3 A4			
Case studies	Solution and analysis of suppositions	5	A1 A2 A3 A4	B12	C9 C10 C28 C33	D5 D6 D8 D9 D10 D13 D14 D15 D16 D17 D18
Laboratory practices	Evaluation of the capacity of criticism in function of the development of the experimental design	25	A1 A2 A3	B3 B4 B7	C3 C5 C6 C10 C16 C17 C18 C21 C24 C25 C30 C31	D2 D3 D5 D6 D7 D8 D9 D13 D14 D15 D16 D17

Essay questions exam	Where will value the knowledges purchased in the sessions	60	A1	B3	C3	D1
	*magistrales		A2	B4	C5	D3
			A3	B5	C6	D7
			A4	B7	C10	
				B10	C21	
				B11	C24	
					C25	
					C31	

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### Other comments on the Evaluation

The students must reach a qualification of 4/10 in every part (exam, laboratory practices and seminars) to be evaluated. There is also the possibility of doing a unique final exam with theoretical and practical questions.

The type of exam can be discussed with the teachers of the matter.

All the parts with positive evaluation in june will be saved until july.

### Class timetable:

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

### Exam's dates

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

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### Sources of information

#### Basic Bibliography

Azcón-Bieto, J.; Talón, M., **Fundamentos de Fisiología Vegetal**, 2008

Taiz, L.; Zeiger, E., **Fisiología Vegetal**, 2006

Buchanan, B.B.; Gruissem, W.; Jones, R.L., **Biochemistry and Molecular Biology of Plants.**, 2000

Salisbury, F.B.; Ross, R., **Fisiología de las Plantas.**, 2000

#### Complementary Bibliography

Díaz de la Guardia, M., **Fisiología de las plantas.**, 2004

Pineda, M., **Resúmenes de Fisiología Vegetal.**, 2004

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### Recommendations

#### Subjects that continue the syllabus

Plant physiology II/V02G030V01603

Vegetable production/V02G030V01909

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#### Subjects that it is recommended to have taken before

Biochemistry I/V02G030V01301