



IDENTIFYING DATA

Plant physiology I

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|---------------------|---|-----------|------|------------|
| 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 | Adquisition of abilities in the interpersonal relationships |
| D15 | Development of creativity, initiative and entrepreneurial spirit |
| D16 | Acceptance of a quality commitment |
| D17 | Development of the self-criticism ability |
| D18 | Development of negotiating power |

Learning outcomes

| Expected results from this subject | Training and Learning Results | | | |
|---|-------------------------------|-----|-----|-----|
| Obtain an integral vision of all the processes **fisiológicos of the plants, his behaviour and his adaptative *answers to the half | A1 | B3 | | |
| | A2 | B5 | | |
| | A3 | B10 | | |
| | A4 | 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 | D1 |
| | | | C18 | D2 |
| | | | C28 | D3 |
| | | | C30 | D5 |
| | | | C33 | |
| Obtain information, develop experiments and interpret the results. | A3 | B10 | C5 | D1 |
| | | B12 | C8 | D5 |
| | | | C21 | D6 |
| | | | C24 | 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 | D1 |
| | | | C28 | D6 |
| | | | | D9 |

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|---|-----|-----|-----|
| 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 | B2 | C32 | D17 |
| | B7 | C3 | D16 |
| | B10 | C18 | |
| | B11 | C25 | |
| | B12 | C31 | |

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"> - Water relative a of the plant cell. Water potential. Plasmolise. Turgidity. - 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. - Movement of the water through the plant. Mechanism of ascending transport. - Transpiration. Stomas. Opening mechanism and closing. Water Balance. - Absorption of ions by the plants. The elements in the soil. Absorption by the root. Movement of ions in the plant. - Translocation of solutes. Characterisation of the transport. Hypothesis of the flow of pressure. |
| Photosynthesis | <ul style="list-style-type: none"> - Photosynthesis. General equation. Magnitude of the photosynthesis. - Chloroplasts. Structure. Photosynthetic pigments. Ultrastruture of the thylakoid system. - Capture of the light energy. Structure of the Photosystems: centres of reaction and complex LHC. - Transduction of the energy. Transport of electrons. - Photophosphorylation. Quimioosmotic Hypothesis. ATP-sintase. Synthesis of ATP. - Photosynthetic fixation of the CO₂. Cycle of Calvin. Stoichiometry of the cycle. Regulation. - Photorespiration. Biochemical mechanism. Intracellular location. Biological meaning. - Plants C-4. Structure of the leaf. Biochemistry of the route C-4. Types of C-4 plants. - Crassulacean Acid Metabolism (CAM). Biochemistry of the fixation of CO₂. Regulation. - Photosynthetic productivity. Concept of point of compensation. Factors that affect to the photosynthesis: light, CO₂, water. - Utilisation of the Carbon fixed. Synthesis of starch and sucrose. Exchange of substances between the chloroplast and the cytoplasm. |
| Secondary metabolism | <ul style="list-style-type: none"> - Characteristic of the secondary metabolism - Flavonoids - Terpenoids - Nitrogen compounds |
| Practices of laboratory | <ol style="list-style-type: none"> 1. Determination of the Water potential of a plant tissue 2. Physiology of the stomas. Observation of the stomas and assessment of the stomatal opening and closing. 3. Extraction, separation and quantification of photosynthetic pigments of plants 4. Crassulacean acid metabolism 5. Effect of the temperature on the oxidative respiration 6. Writing of the manual of practices |

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

| | |
|----------------------|---|
| 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 | |

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>

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

Recommendations

Subjects that continue the syllabus

Plant physiology II/V02G030V01603

Vegetable production/V02G030V01909

Subjects that it is recommended to have taken before

Biochemistry I/V02G030V01301