



IDENTIFYING DATA

Animal and plant histology and cytology I

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|---------------------|---|-----------|------|------------|
| Subject | Animal and plant histology and cytology I | | | |
| Code | V02G030V01303 | | | |
| Study programme | (*)Grao en Bioloxía | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Mandatory | 2nd | 1st |
| Teaching language | Spanish Galician English | | | |
| Department | | | | |
| Coordinator | Megías Pacheco, Manuel | | | |
| Lecturers | Álvarez Otero, Rosa María Megías Pacheco, Manuel Pombal Diego, Manuel Ángel | | | |
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| 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. | | | |

Competencies

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| 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. |
| C2 | Recognizing different levels of Living systems organization. Performing phylogenetic analysis and identifying evidence of evolution. |
| C3 | Identifying, analysing and characterizing biological samples, including those of human origin, and possible anomalies. |

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| C4 | Isolating, analysing and identifying biomolecules, viruses, cells, tissues and organs. |
| C21 | Processing and interpreting bioassays and biological diagnoses. |
| C25 | Gathering background information, develop experimental work and analysing data results |
| C28 | Teaching and sharing knowledge and resources related to Biology |
| 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 |
| 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 |
| D10 | Development of the critical thinking |
| D14 | Adquisition of abilities in the interpersonal relationships |

Learning outcomes

| Expected results from this subject | Training and Learning Results | | | |
|---|-------------------------------|------------------------|----------------|----------|
| To know the different levels of organization | B5 | C2 | D6 | |
| To know the structure and function of the eukaryotic cell | B5 | C4 | D1 D5 D8 | |
| To understand the biology of animal and plant development | B5 | C2 | D1 D10 | |
| To apply the knowledge of cytology and histology to isolate, identify, handle and analyze biological specimens and samples and to characterize their cellular and molecular constituents | A2 | B7 | C3 C4 | D6 D7 |
| To apply the knowledge and technology of Cytology and Histology in aspects related to production, exploitation, analysis and diagnoses of processes and biological resources | | B2 | C21 C25 | D7 |
| To obtain information, to develop experiments and to interpret results | A3 | B2 B7 B10 | C25 | D1 D7 |
| To understand the social projection of Cytology and Histology and its repercussion in the professional world, as well as to know how to use their contents for teaching and dissemination | A1 A4 | B3 B4 B11 B12 | C28 C33 | D14 |
| To know and to handle the concepts, terminology and scientific-technical instrumentation related to Cytology and Histology | | B4 | C31 C32 | |

Contents

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| 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 Intercellular junctions. |
| Origin of membranes and intracellular trafficking | Endoplasmatic reticulum and Golgi complex Vesicular trafficking. |
| Lysosomal system, peroxisomes and vacuoles | Cell digestion 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 membrane. Dynamic and structure of chromatin and chromosomes. The nucleolus. |
| DEVELOPMENTAL BIOLOGY (*) | |
| Cell cycle | Control of the cell cycle. |
| Cell division | Mitosis. Meiosis. Cell death: apoptosis and necrosis. |

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| 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 | 35 | 70 | 105 |
| Laboratory practical | 12 | 6 | 18 |
| Seminars | 3 | 12 | 15 |
| 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 | 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. Besides, a lab session will be dedicated to study the ultrastructure of the cell. |
| 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. |
| Laboratory practical | Individual support is offered during tutor hours. |
| Seminars | Some activities will be proposed for monitoring the evolution of each student. |

Assessment

| | Description | Qualification | Training and Learning Results | | | |
|--------------------------|--|---------------|-------------------------------|------------------------------|---|-----------------------------------|
| Lecturing | Theoric classes with presentations. Attendance is mandatory. | 0 | A1 A2 A3 A4 | B3 B5 B7 B10 B12 | C2 C32 C33 | D1 D5 D6 D7 D8 D10 |
| Laboratory practical | Laboratory practices exam included in the final exam. | 20 | A2 | B4 B5 B12 | C2 C3 C4 C21 C25 C31 C32 C33 | D1 D5 D6 D7 D8 D10 |
| Seminars | Evaluation of the work developed during the seminars | 10 | A1 A2 A4 | B2 B7 B11 | C28 | D1 D6 D7 D10 D14 |
| Objective questions exam | Exam evaluating the theoretic classes | 70 | | | | |

Other comments on the Evaluation

- Attendance to all lectures, lab sessions and seminars is required, unless properly justified.

- For passing the subject, it is necessary to pass 40% of both theoretical and practice part. Otherwise, the final mark will be the result of multiplying the total mark (theory + practice + seminars) by 0.5 points.
- In case the final evaluation of the subject doesn't achieve 5 points out of 10, but the student has approved some parts (theory, practice or seminars), that mark will be maintained till the second choice exam (July).
- Repeat students will have to make all the activities of the subject (seminars and practices).
- **Lectures.** The first thematic block (Cell Biology) will be evaluated with a maximum of 4 points in a midterm exam that will be established in the official calendar. This partial exam will be eliminatory and the students who don't pass it will have the chance to repeat it in the final exam. The second thematic block (Developmental Biology) will be evaluated with 3 points in the final exam, whose date is established by the Faculty. The maximum mark for the theoretical part will be 7 points.
- **Lab sessions.** Lab sessions will be evaluated in the final exam to a maximum of 2 points.
- **Seminars.** Attendance, together with the work carried out in class, will be evaluated with a maximum of 1 point.
- **Exam to improve the mark.** The students who have passed the final exam but want to improve their mark will have the chance to take this exam that will be established by the instructors.
- **Absent.** A student will be considered absent if he/she did not accomplish any activity of the course.
- **Final exam date.** Exam dates are available in the following web sites:

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

- **Schedules.** The schedules of the subjects are available in the next link:

<http://bioloxia.uvigo.es/en/teaching/schedules>

Sources of information

Basic Bibliography

Complementary 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

Browder, L.W.; Erickson, C.A.; Jeffery, W.R., **Developmental Biology.**, (3th ed.), Saunders., 1991

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

Gilbert, S.F., **Developmental Biology.**, (11th ed), Sinauer., 2016

Lodish, H., Matsudaira, P., Baltimore, D., Berk, A., Zipursky S.L.; Darnell, J., **Molecular Cell Biology.**, (8th ed), W.H. Freeman and Company., 2016

Megías, M.; Molist, P.; Pombal, M.A., **Atlas de histología vegetal y animal**,

Paniagua, R., Nistal, M., Sesma, P., Álvarez-Uría, M.; Fraile, B., **Citología e Histología Vegetal y Animal.**, (4th ed), McGraw Hill., 2007

Wilt, F.H.; Hake, S.C., **Principles of Developmental Biology.**, Norton & Company., 2004

Wolpert, L.; Smith, J.; Jessell, T.; Lawrence, P.; Robertson, E.; Meyerowitz, E., **Principles of Development.**, (5th ed), Oxford Univ Press., 2015

Recommendations

Subjects that are recommended to be taken simultaneously

Biochemistry I/V02G030V01301

Botany I: Algae and fungi/V02G030V01302

Microbiology I/V02G030V01304

Subjects that it is recommended to have taken before

Biology: Evolution/V02G030V01101

Biology: Basic laboratory techniques/V02G030V01203

Chemistry: Chemistry applied to biology/V02G030V01104
