



## IDENTIFYING DATA

### Biology: Biology

|                     |  |                 |      |            |
|---------------------|--|-----------------|------|------------|
| Subject             | Biology: Biology   |                 |      |            |
| Code                | V11G201V01101  |                 |      |            |
| Study programme     | Grado en Química   |                 |      |            |
| Descriptors         | ECTS Credits   | Choose          | Year | Quadmester |
|                     | 6  | Basic education | 1st  | 1st        |
| Teaching language   | Spanish  |                 |      |            |
| Department          |  |                 |      |            |
| Coordinator         | Arenas Busto, Miguel   |                 |      |            |
| Lecturers           | Arenas Busto, Miguel   |                 |      |            |
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| Web                 | <a href="http://cme.webs.uvigo.es">http://cme.webs.uvigo.es</a>  |                 |      |            |
| General description | The matter of Biology has like aim the preparation of the studens to comprise and explain better the living beings, as they are constituted and as they work, as they study , as they contrast the hypotheses and the experimental facts to elaborate the biological theories. |                 |      |            |

## Training and Learning Results

|      |  |
|------|--|
| Code |  |
| A2   | Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study |
| B1   | Ability for auronous learning  |
| B3   | Ability to manage information  |
| C20  | Know the structure and reactivity of the main classes of biomolecules and the chemistry of important biological processes  |
| D1   | Ability to solve problems  |

## Expected results from this subject

| Expected results from this subject   | Training and Learning Results |          |     |    |
|--|-------------------------------|----------|-----|----|
| Understand the cell as a fundamental unit in the organisms.  | A2                            | B1<br>B3 | C20 | D1 |
| Describe the cellular structure in prokaryotes and eukaryotes.   | A2                            | B1<br>B3 | C20 | D1 |
| Differentiate the properties, organisation and function of the distinct cellular organelles.                       | A2                            | B1<br>B3 | C20 | D1 |
| Associate the cellular structures with the metabolism.   | A2                            | B1<br>B3 | C20 | D1 |
| Identify and relate the metabolic routes of the distinct organic molecules.  | A2                            | B1<br>B3 | C20 | D1 |
| Recognise the structure and function of the hereditary material and interpret the principles of the central dogma. | A2                            | B1<br>B3 | C20 | D1 |
| Discuss the processes of mutation and their implications for the evolution of organisms.                           | A2                            | B1<br>B3 | C20 | D1 |
| Understand the methods of recombinant DNA.   | A2                            | B1<br>B3 | C20 | D1 |
| Understand the importance of the immune system.  | A2                            | B1<br>B3 | C20 | D1 |

## Contents

|       |
|-------|
| Topic |
|-------|

|  |  |
|--|--|
| 1. The cell.   | Size, form and cellular function.<br>Cell classification.<br>Cell Theory.<br>Prokaryotic cell and eukaryotic cell.   |
| 2. Biomembranes and systems of cellular transport.             | Cell membrane: functions, biochemical composition, physico-chemical properties.<br>Synthesis of the cellular membrane.<br>System of transport through the biological membranes: pumps, protein transporters and channels.  |
| 3. The core and the chromosomes. The cellular organelles.      | Cell nucleus: structure, composition and functions.<br>Structure and functions of the nucleolus.<br>Structures and functions of chromatin and chromosomes.<br>Structure, composition and functions of: matrix extracellular, cytoskeleton and centrioles, endoplasmic reticulum, apparatus of Golgi, endosomes and lysosomes, mitochondria, peroxisomes and chloroplasts.  |
| 4. Cellular division and cellular cycle.                       | Definition and characteristics of mitosis.<br>Differences between somatic and germinal cells.<br>Phases of the cellular cycle.<br>Biological meaning of mitosis.<br>Concept of the apoptosis, cellular proliferation and cancer.<br>Concept and differences between asexual and sexual reproduction.<br>Definition and characteristic of meiosis.<br>Phases of meiosis.<br>Origin of the genetic variability of the meiosis.<br>Differences between mitosis and meiosis. |
| 5. General design of the metabolism: catabolism and anabolism. | Concept of: enzyme, energetic metabolism, metabolic route, catabolism, anabolism.<br>The equivalent of ATP.<br>Extraction of the chemical energy of the organic compounds: glucides, lipids and proteins.  |
| 6. Photosynthesis.   | Nature of the light.<br>Photosynthetic pigments.<br>Stages of the photosynthesis: luminous phase and dark phase (cycle of Calvin).<br>The problem of the photorespiration: plants C4 and plants CAM.   |
| 7. DNA, structure and function.                                | Composition, structure of the DNA.<br>Function of the DNA.<br>Replication of the DNA.<br>Initiation the techniques of the recombinant DNA.   |
| 8. RNA and the expression of the genetic message.              | Composition and structure of the RNA.<br>mRNA, tRNA and rRNA.<br>Other types cellular RNAs and its functions.<br>Review of the concepts of transcription and translation.<br>Language of the genetic information.  |
| 9. Mutation and evolution.                                     | Genetic mutations: concept and types. Molecular consequences of the genetic mutations.<br>Structural chromosomal mutations.<br>Numerical chromosomal mutations.<br>Origin and consequences of the mutations.<br>Relation of the mutations and cancer.<br>Evolutionary theories.<br>Arguments in favour of evolution.   |
| 10. The immune system.   | Concept of immune system.<br>Components of the immune system.<br>Mechanism of the innate defence of the immune system.<br>Antibodies and interferon.<br>Types of immune response.<br>Alterations of the immune system.<br>Importance of the vaccines.  |

## Planning

|                      | Class hours | Hours outside the classroom | Total hours |
|----------------------|-------------|-----------------------------|-------------|
| Lecturing            | 26          | 60                          | 86          |
| Problem solving      | 10          | 30                          | 40          |
| Mentored work        | 3           | 11                          | 14          |
| Essay questions exam | 1           | 4                           | 5           |

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

| Methodologies   |  |
|-----------------|--|
|                 | Description  |
| Lecturing       | In these classes, the professor will clearly explain and develop the concepts and basic foundations of the contents to facilitate understanding.<br>The contents for each topic will be provided on the online platform with sufficient time so that the students can consult them.<br>It is recommended that the student works on this material, also consulting the bibliography recommended.  |
| Problem solving | These classes include the following appearances.<br>a) Each student will perform exercises to understand the topics. These exercises will be considered for the evaluation.<br>b) Explanations of doubts about the previously explained concepts in Lecture classes.<br>c) The students separately or in groups will make illustrative pictures of the subjects analyzed in the Lecture classes to have an overview of the contents, which will facilitate the understanding and interrelationships.<br>d) In this section, we will work on some concepts that by experience are more difficult to understand and require greater didactic support.<br>e) If necessary these classes will also be used to present works. |
| Mentored work   | Performance (research of information, preparation, and presentation) of a work with an oral presentation in groups.<br>It will be related to the fields of biotechnology, cellular biology, molecular biology, genetics, and immunology and will be proposed by the professor. The professor could contribute part of the necessary information for this execution. The work will be considered for the evaluation.  |

### Personalized assistance

| Methodologies   | Description   |
|-----------------|---|
| Mentored work   | For the activity of oral presentation of a work. Discussion and solving of questions, exercises and problems related with the activity. Each student will ask the professor the explanations that estimate timely to comprise better the activity and develop successfully the tasks that were proposed. These queries will be attended in schedule of personalized sessions. |
| Problem solving | Discussion and solving of questions, exercises and problems related with the subject. Each student will ask the professor the explanations that estimate timely to comprise better the subject and develop successfully the tasks that were proposed. These queries will be attended in schedule of personalized sessions.  |

### Assessment

|                      | Description  | Qualification | Training and Learning Results |    |     |    |
|----------------------|--|---------------|-------------------------------|----|-----|----|
| Problem solving      | Resolution by the students of a series of problems and/or exercises as academic follow-up of the student (skills CB1, CG1, CG3, CE20 y CT1).   | 15            | A2                            | B1 | C20 | D1 |
| Mentored work        | The student performs an activity of oral presentation of a work.<br>The evaluation considers the structuring and organization of the contents, the complexity of the work, the presentation of results and the sources consulted (skills CB1, CG1, CG3, CE20 y CT1). These works will be presented in the seminar sessions. Further information in "Other comments on the Evaluation". | 10            | A2                            | B1 | C20 | B3 |
| Essay questions exam | Mid-course exam (partial) on the contents explained in the lectures and seminars. It will consist mainly of short answer questions, although it could include some long answer questions (skills CB1, CG1, CG3, CE20 y CT1).   | 35            | A2                            | B1 | C20 | D1 |
| Essay questions exam | Final exam on the contents explained in the lectures and seminars. It will consist mainly of short answer questions, although it could include some long answer questions (skills CB1, CG1, CG3, CE20 y CT1).  | 40            | A2                            | B1 | C20 | D1 |

### Other comments on the Evaluation

The student who perform the final evaluation exam will be considered as presented.

The final mark of the subject will be given by the weighted average of the evaluation in the cited sections. Thus, to pass the subject, the weighted average must be equal or higher than 5.0.

In the second call, the evaluation will be obtained by any of the following two options (selecting that one better for the student):

1. The score reached by the student during the course in the supervised works and seminars is conserved (25% of the final

mark). None of them are recoverable. An analogous exam will be done at the end of the semester (skills CB1, CG1, CG3, CE20 y CT1). This exam will provide the 75% of the final mark.

2. An analogous exam will be done at the end of the semester (skills CB1, CG1, CG3, CE20 y CT1). This exam will provide the 100% of the final mark.

### **Evaluation of the Mentored work**

The student (in a team) performs an activity of oral presentation of a work related with the subject (10% of the final mark). The mark will consider the activity, complexity, structuring and organization of the contents, and the sources consulted by the student (skills CB1, CG1, CG3, CE20 y CT1).

### **Evaluation of students of the Senior Programme**

Students from the Senior Programme will be evaluated as follows:

- Mandatory attendance of the 75% of theoretical classes and seminars.
- Preparation and oral presentation of an individual or group work related with the subject that will be used to obtain the evaluation mark (skills CB1, CG1, CG3, CE20 y CT1).

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### **Sources of information**

#### **Basic Bibliography**

John Kimball, <http://biology-pages.info/>,

Bruce Alberts, Dennis Bray, Karel Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Robert, **Introducción a la Biología Celular**, Tercera Edición, 2011,

Peter J Rusell, **iGenetics. A molecular approach**, Third Edition, 2010,

Leonardo Fainboin, Jorge Geffner, **Introducción a la Inmunología Humana**, Sexta Edición, 2011,

James D. Watson, **Biología Molecular del gen**, Séptima edición, 2016,

Christopher Mathews, K. E. van Holde, **Bioquímica**, Segunda edición,

#### **Complementary Bibliography**

Helmut Plattner, Joachim Hentschal, **Biología Celular**, Cuarta Edición, 2014,

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### **Recommendations**

#### **Subjects that are recommended to be taken simultaneously**

Physics: Physics I/V11G201V01102

Mathematics: Mathematics I/V11G201V01103

Chemistry: Chemistry I/V11G201V01104

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### **Other comments**

It is recommended to have studied the subject "Biology" of the 2º course of Bachillerato.