



Teachers' guide – summary sheet

Initial Identification details:

Title:	Degree in Biotechnology (Plan 2009)		
Faculty/School:	Bio-Health Sciences		
Course subject:	Fundamentals of Biochemistry		
Type (3):	Obligatory	Credits ECTS:	6
Year / Semester (4):	1st Year-2nd Semester	Code (1):	2015
Subject (2):	Bio-chemistry		
Module (2):	Bio-chemistry and molecular biology		
Language (5):	Spanish		
Total Number of hours undertaken by pupil (6):	150		

Brief description of the course (7):

Fundamentals of Biochemistry – the subject taught in the first degree course in Biotechnology includes the study of molecular units, such as carbohydrates, lipids, amino-acids and nitrogen bases, which are the constituents of the macro-molecules; and the study of the relationship between structure and function of macro-molecules originated, especially those with greater interest in the field of biotechnology, such as proteins with enzymatic function.

With the teaching of the course Fundamentals of Biochemistry students are provided with the knowledge necessary to understand a basic level of molecular structures, their biological functions and possible biotechnological applications. It will therefore be one of the core subjects as all biotechnologists should know and understand so that they can develop their work optimally.

Prior Knowledge (8):

The student studying the subject Fundamentals of Biochemistry will get the maximum use of the subject if you have the knowledge level of 2^o in the Spanish High School for the subjects of chemistry and biology.

General objective (9)

- Know the different biological macromolecules.
- Understand the structure-function of macromolecules.
- Understand the physical and chemical characteristics of biomolecules.
- Learn the basics of enzymology

Skills / Abilities:

General (10):

- Promote the restlessness for knowledge as a tool inculcate in the process of personal and professional growth of students.
- Develop the ability to search, assimilation, analysis, synthesis and summary of the information.
- To acquire the ability to think analytically, synthetically, reflectively, critically, theoretically and practically.
- Understand the principles and fundamental laws of physics, mathematics, chemistry and biology as the mental basis of the biotechnologist.

Specific (10):

- Recognize the structural and functional characteristics of macromolecules from a solid background in biochemistry.
- Organize and plan work properly in the laboratory.
- Know how to design and implement adequately an experimental protocol from the knowledge of different subjects.
- Identify and define instruments and laboratory materials.
- Be able to describe, quantify, analyze and critically evaluate the results of experimental work in the laboratory.
- To develop habits of rigorous thought.
- Ability to communicate orally and in writing the acquired knowledge.
- Be able to self-evaluate the foreground.
- Ability to work effectively and coordinate as a team.

Brief index to subjects (12):

Item 1. Introduction to Biochemistry. Characteristics of living things. Chemical composition. Bio-molecules: Properties. Principles of biochemistry. Review of major functional groups of organic chemistry. Stereoisomerism.

Item 2. Water, pH and ionic equilibria. Structure and properties of water. Weak interactions in aqueous systems. Hydrogen bonds. Hydrophobic junctions. Water as a weak electrolyte. PH. Buffer and buffer solutions. Henserson-Hasselbach equation. Buffer systems of blood and the cell cytosol.

Item 3. Amino acids. Structure and properties of amino acids. Classifications of amino acids as side chains. Stereoisomerism of amino acids. Nonstandard amino acids. Post-translational modifications of amino acids. Acid-base properties and valuation curves.

Item 4. Proteins: biological functions and primary structure. Peptide bond. Peptides and proteins. Diversity of biological functions. Levels of structural organization of proteins. Separation and purification of proteins. Primary structure. Information from the amino acid sequence. Homologous proteins. Protein sequencing. Protein analysis methods.

Item 5. Secondary structure, tertiary and quaternary structure of proteins. Weak forces that stabilize the three dimensional structure. Geometry of the peptide bond. Secondary structure: alpha helix, beta sheets and beta turns. Fibrous proteins: alpha-keratin, collagen. Globular proteins. Super-secondary structures. Tertiary structure. Denaturation and folding. Molecular chaperones. Quaternary structure. Hemoglobin: structure and function. Immunoglobulins.

Item 6. Enzymes. Classification. Principles of enzymatic catalysis. Activation energy. Reaction rate and reaction equilibrium. Acid-base catalysis, covalent, metal ion. Enzyme kinetics: Michaelis-Menten equation. Enzyme inhibition. Mechanisms of regulation of enzyme activity.

Item 7. Lipids. Biological functions. Storage lipids, fatty acids, triacylglycerols. Structural lipids: glycerophospholipids, sphingolipids, sterols. Lipids with specific biological activities: eicosanoids, fat-soluble vitamins.

Item 8. Carbohydrates. Biological functions. Monosaccharides: nomenclature and stereoisomerism. Pentoses and hexoses. Disaccharides. Carbohydrate binding. Reserve polysaccharides: glycogen and starch. Structural polysaccharides, proteoglycans. Glycoproteins and glycolipids.

Item 9. Nucleotides and nucleic acids. Structure and nomenclature of nucleotides. Properties of nucleotide bases. Structure of nucleic acids. The double helix. Types of structures. Chemistry of nucleic acids. Denaturation and renaturation. Hybridization. Types of genetic material in living organisms. Supercoiled DNA.

Item 10. Eukaryotic genome structure. Eukaryotic chromosome: DNA rates. Satellite DNA, moderately repetitive DNA, genes and gene multicopy monoprnt. Monocopia gene structure. Mitochondrial DNA. Lab practicals.

Teaching Activities (13) (Approximate % as a function of total credits, considering solely those activities where the student's presence is required and that these represent between 30% and 40%)

Theory classes:	65%
Practical Classes:	31%
Workshops/Labs/Presentations:	4%
Others:	0%
Total:	100%

Evaluation system:

Examinations:	60%
Assistance and participation:	0%
Course work:	20%
Others:	20%
Total:	100%

Specifics of evaluation (14):

- Written exam (60%) comprising:
Test questions with multiple response option
Short questions to develop answers

Practical cases

- Preparation and submission of papers: 10%
- Preparation and presentation of exercises: 10%
- Implementation of practical work in the laboratory: 20%

Basic bibliography (15):

- Berg J, Tymoczko J, Stryer L. (2001). *Biochemistry*. Ed. W.H. Freeman.
- Teijón Rivera JM. (2001). *Bioquímica estructural: conceptos y tests*. Ed. Tebar.
- Mathews CK., Van Holde KE., Ahern KG. (2002). *Biochemistry*. Ed. Addison Wesley.
- Metzler DE. (2003). *Biochemistry. The chemical reactions of living cells*. Ed. Academic Press.
- Voet D., Voet JG. (2004). *Biochemistry*. Ed. John Wiley and Sons, Ltd.
- Baynes JW., Dominiczak MH. (2006). *Bioquímica Médica*. Elsevier Mosby.
- Murray RK., Granner DK., Mayes PA., Rodwell VW. (2000). *Harper's Biochemistry* (25th ed.) Ed. McGraw-Hill.
- Nelson DL., Cox MM. (2001). *Lehninger: Principios de Bioquímica* (3ª ed.). Ed. Omega.
- Devlin TM. (2006). *Textbook of Biochemistry with clinical correlations*. (6th ed.) Ed. Wiley-Liss, John Wileyand Sons, Ltd.

- (1) Code of the course
- (2) Description as per the Verified Memorandum
- (3) May be either: Basic Teaching, Obligatory, Optional, External Practices, or Final Degree Work.
- (4) May be either: First Year - 1st semester and (or) 2nd semester; Second Year - 3rd semester and (or) 4th semester; Third Year - 5th semester and (or) 6th semester; Fourth Year – 7th semester and (or) 8th semester.
- (5) The language in which the course will be taught
- (6) The total number of hours that the student will dedicate to the course. Being approximately twenty-five hours for each ECTS, accounting for all activities.
- (7) Between three and five phrases that summarize the description of the course.
- (8) Corresponds to those recommendations to aid taking the course. A brief recommendation is written. If they are not required, one specifies “those corresponding to the degree”.
- (9) Set out the general objective of the course, writing a sole objective.
- (10) The skills as set out in the Verified Memorandum along with the abbreviations corresponding to each of them
- (11) One can add various other skills that are not in the Verified Memorandum and which the teacher deems relevant
- (12) The main thematic blocks of the course
- (13) In this case neither tutorials nor evaluations are included. Only those activities where the student is present.
- (14) Explain the process of evaluation that has been set out previously in percentages with three brief phrases
- (15) Three to ten references should be detailed.

