

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	6.0
Course	1
Period	First semester
Subject Type	Basic Education
Module	---

1.Basic info**1.1.Recommendations to take this course****1.2.Activities and key dates for the course****2.Initiation****2.1.Learning outcomes that define the subject****2.2.Introduction****3.Context and competences****3.1.Goals****3.2.Context and meaning of the subject in the degree****3.3.Competences****3.4.Importance of learning outcomes****4.Evaluation****5.Activities and resources****5.1.General methodological presentation****5.2.Learning activities****5.3.Program****Part I Introduction.**

1. The origin and evolution of cells. Chemical evolution. RNA world.The first cell. The evolution of metabolism. Present

27204 - Biology

day prokaryotes. Eukaryotic cells. The origin of eukaryotes. The development of multicellular organisms. Classification of living organisms. The virus.

Part II Composition of the cells.

2. Chemical Components of Cells. Chemical bounds. Carbon compounds. Water. Weak interactions in aqueous systems. Biomolecules.

3. Proteins. Amino acids. Peptide bonds. Peptides and proteins. The structure of proteins: primary structure. Protein secondary structure. Protein tertiary and quaternary structures. Protein function.

4. Enzymes. The catalytic activity of enzymes. Mechanisms of enzymatic catalysis. Coenzymes. Regulation of enzyme activity.

5. Carbohydrates. Monosaccharides and Disaccharides. Polysaccharides: structure and function. Glycoconjugates: Proteoglycans, glycoproteins and glycolipids.

6. Lipids. Fatty acids. Triacylglycerols. Structural lipids in membranes: Glycerophospholipids, Sphingolipids. Cholesterol: vitamin D and steroid hormones. Dolichols. Eicosanoids.

7. Nucleic Acids. Nucleotides. Other functions of nucleotides. Nucleic acids structure and function. DNA: the double helix. RNA: types. Ribozymes.

Part III Cell Structure and Function

8. Prokaryotes. Prokaryotic cell structure: Cell wall, cell membrane, nucleoid, ribosomes, flagellum. Morphology. Reproduction. DNA transfer. Environment. Evolution and classification: Archea and Bacteria. Biofilms.

9. Eukaryotic cell. Cell membranes. Cytoplasm. Membrane lipids. Membrane proteins. Cell membrane structure: the phospholipid bilayer. The glycocalix. Transport across membranes: Passive diffusion and carrier proteins. Ion channels. Active transport driven by ATP hydrolysis. Active transport driven by ion gradients. Endocytosis.

10. The endoplasmic reticulum, the Golgi apparatus and lysosomes. Protein sorting and transport. The endoplasmic reticulum and protein secretion. Targeting proteins to the endoplasmic reticulum. Insertion of proteins into the ER membrane. The smooth ER and lipid synthesis. Export of proteins and lipids from the ER. Organization of Golgi. Protein glycosylation within the Golgi. Lipid and polysaccharide metabolism in the Golgi. Protein sorting and export from the Golgi. Vesicular transport. Cargo selection, coat proteins and vesicle budding. Vesicle fusion. Lysosomal acid hydrolases. Endocytosis and lysosome formation. Phagocytosis and autophagy.

11. The cytoskeleton and cell movement. Structure and organization of actin filaments. Actin, Myosin and Cell movement. Microtubules. Microtubule motors and movement. Intermediate filaments.

12. Mitochondria and Chloroplast. Peroxisomes and Glyoxysomes. Organization and function of mitochondria. Mitochondrial genetic system. Protein import and assembly. The structure and function of chloroplast. The chloroplast genome. Other plastids. Structure and function of peroxisomes and glyoxysomes.

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13. Bioenergetics and Metabolism. Energy, Catalysis, and Biosynthesis. Free energy and ATP. The generation of ATP from glucose, lipids and amino acids. Krebs cycle. The electron transport chain. Chemiosmotic coupling. Photosynthesis. Cell Communication.

14. The nucleus. The structure of nuclear envelope. Nuclear lamina. The nuclear pore complex. Transport of proteins to and from the nucleus. Transport of RNAs. Chromatin. The nucleolus and rRNA processing.

Part IV The flow of genetic information

15. Molecular genetics. Chromosomes: centromeres and telomeres. Genomes. Asexual and sexual reproduction. Mendelian inheritance. Genes. Introns and exons. Genetic variation. Mutations. Repetitive DNA sequences. Gene duplication and pseudogenes.

16. From DNA to proteins. DNA replication. DNA repair. DNA transcription. RNA processing. Translation of mRNA. Genetic code. Control of gene expression.

17. The Cell Cycle and Apoptosis. The eukaryotic cell cycle. Regulators of the cell cycle progression. Mitosis. Meiosis. Cell death: necrosis and apoptosis. Programmed cell death.

5.4. Planning and scheduling

Lectures, practical sessions and examination dates will follow the scheduling fixed by the Science Faculty, which is published in its website (<https://ciencias.unizar.es/calendario-y-horarios>) and in the learning platform Moodle within the *Biología* course.

5.5. Bibliography and recommended resources

BB Becker, Wayne, M.. El mundo de la célula / Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin ; colaboración capítulos 9-12 Gregory Paul Bertoni ; traducción y revisión técnica, Íñigo Azcoitia Elías, Alberto Muñoz Céspedes ; equipo de traducción Íñigo Azcoitia Elías ... [et al.] . 6ª ed. Madrid [etc.] : Addison Wesley, D.L. 2006

BB Essential cell biology / Bruce Alberts ... [et al.] . 3rd ed. New York : Garland Science, cop. 2010