UCLouvain

lbbmc2101

2022

Structural and functional biochemistry

4.00 credits	36.0 h + 6.0 h	Q1

Teacher(s)	Desguin Benoît (compensates Soumillion Patrice) ;Morsomme Pierre ;Soumillion Patrice ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	The course will be divided into two parts:1. Structural biochemistry:- patterns and forms in protein structures (observation, manipulation, description, classification)- principles of protein folding - domains and assemblies (modular nature of proteins, multi-protein complexes)- bioinformatics in structural biology- interactions between biomolecules (methods and characterization)2. Enzymology- principles of enzyme catalysis (Michaelis Menten, steady state kinetics, reaction schemes)- the basics of chemical catalysis by proteins (catalysis by amino acids lateral chains, active site complementarity, entropic catalysis, transition state stabilisation)- control of enzyme activity (inhibition, activation, cooperativity, allosterism, environmental effects)
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 The objective of the course is to acquire the fundamental principles that allow describing and understanding the properties of proteins and nucleic acids, going from structural biology to chemistry (catalysis, interactions). It will give a vision of the general characteristics of proteins and nucleic acids architecture that lead to the very great variety of structures, functions and interactions observed in nature. The student will also understand the chemical nature of molecular interactions and the mechanisms of chemical catalysis that underlie the functions of proteins. Regarding structural biochemistry, the student will acquire the knowledge of the concepts and tools that are necessary for manipulating, observing and describing the three-dimensional structures of biomolecules. The student will learn how to use the variety of informatic resources related to structural biology and available on the web (databanks, prediction algorithms, visualization softwares). He will also learn how to identify, characterize and describe interactions between biomolecules.The formalism of enzymatic kinetics will be initially reminded. With the help of case studies, the student will learn how to identify the different catalytic strategies used by enzymes and the underlying principles of chemical catalysis. These notions will finally allow him/her to better understand the different molecular mechanisms of enzymatic regulation and inhibition.
Evaluation methods	The course is divided into three modules. Each module will be evaluated during the course of the quadrimester in the form of a dispensatory test. A written exam will be organized in session for students who have not passed the tests during the quadrimester.
Teaching methods	Ex cathedra lectures
Content	About 36 hours will be dedicated to lectures with the help of PowerPoint slides. 6 hours will be organized in computer room for exercises or guided tours of various websites. The course is composed of three main chapters: Chapter 1. Amino acids side chains: - hydrophobicity/hydrophilicity - electrostatic and acido-basic properties - nucleophilicity - redox properties. Structural biochemistry: - biomolecule structures and interactions: non covalent driving forces and quantitative aspects - thermodynamical and chemical stability of proteins - protein folding : from molecular mechanisms to conformational diseases - observation, manipulation, visualisation, description and classification of three-dimensional structures (in computer room) Chapter 2: structural biology of membrane proteins Chapter 3. Enzymology - principles of enzyme catalysis (Michaelis Menten, steady state kinetics, reaction schemes) - the basics of chemical catalysis by proteins (catalysis by amino acids lateral chains, active site complementarity, entropic catalysis, transition state stabilisation) - cofactors and coenzymes chemistries - control of enzyme activity (inhibition, activation, cooperativity, allosterism, environmental effects) - numerical simulation of enzymatic catalysis (in computer room)
Inline resources	All documents are available via Moodle
Other infos	Precursory courses: Basics in biochemistry (e.g. Elements of biochemistry CHM1271)
Faculty or entity in charge	BIOL

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biochemistry and Molecular and Cell Biology	BBMC2M	4		
Master [60] in Biology	BIOL2M1	4		
Master [120] in Chemistry	CHIM2M	4		
Master [120] in Chemistry and Bioindustries	BIRC2M	4		
Master [60] in Chemistry	CHIM2M1	3		