UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Chemistry and Propaedeutic Biochemistry I

2122-1-H4102D001-H4102D001M

Aims

The Chemistry and Propedeutic Biochemistry is intended to provide fundamentals of general and bio-organic chemistry. The structure of this course meets the requirements of medical sciences and aims to offer a knowledge useful in chemistry-related disciplines, such as biology and biochemistry.

Furthermore, the course aims to provide complementary skills which can be called upon for subsequent modules, including;

• Independent study skills

• Group presentation skills

•Introduction to literature searching and interpretation of scientific journals

Contents

In the first part of the course the principles of chemical kinetics and chemical equilibrium, redox reactions and related energy will be presented within the general frame of thermodynamics and electrochemistry, and finally the water self-ionization and the properties of acid/base and buffer solutions will be illustrated.

In the second part, the reactivity of the main classes of organic compounds, including isomerism and the stereo

chemical concepts related to organic molecules containing asymmetric carbon atoms of the course will describe. The properties of the mains class of macromolecules of biological interest (proteins, lipids, carbohydrates and nucleic acids) will be illustrated. Basic knowledge of proteomics and of Imaging by MS focused on clinical applications will be provided.

Detailed program

General Chemistry. Chemical reactions and equilibrium; redox reactions; kinetics and energy: state quantities H and G and spontaneity of a reaction. Acids, bases and buffer solutions: strong and week acid/base; Henderson-Hasselback equation; pH of a buffer solution. Principles of electrochemistry: energy related to redox reactions

Bio-organic chemistry. Classification of organic compounds: Definition of functional groups; structure, nomenclature and chemico-physical properties of organic compounds: Alkanes and halogen compounds: Reactivity and the nucleophilic substitution. Alcohols, thioalcohols and amines: Chemical properties and reactivity . Alkenes and aromatic hydrocarbons: The double bond and its reactivity. Carbonyl compounds: Chemical reactions of aldehydes and ketones. Carboxylic acids: Acidity and reactivity of carboxylic acids; carboxylic acid derivatives: ester, thioester, amides, anhydrides

Main classes of molecules of biological interest. Lipids: Structure and reactivity. Carbohydrates: Structure, stereochemistry and reactivity of monosaccharides/disaccharides; the mechanism of ring closure of a non-cyclic carbohydrate; polysaccharides. Nucleosides, nucleotides and nucleic acids: Structure and properties of nucleoside and nucleotides. Amino acids and proteins: Classification and nomenclature of amino acids; the amide bond and its chemical properties; Structure of proteins.

Prerequisites

Basic mathematical knowledges

Basic chemistry knowledges

Basic Biology and chemistry knowledge

Basic knowledge of analytical science

Teaching form

Formal lectures accompanied by supportive tutorials

Group activities (presentations in MAX. 6 people focusing on a given article/topic). This is done in order to hone ability to perform literature research and interpretation at the earliest stage possible as well as promote teamwork

(!) It is foreseen that lessons will take place in attendance, subject to any ministerial changes following the COVID pandemic situation

Textbook and teaching resource

Reading list

Inorganic Chemistry, 3rd or 4th Edition, Shriver and Atkins

A guidebook to mechanism in organic chemistry, 6th Edition, Sykes

Biochemistry, Berg et al, 5th Edition

Additional resources

http://www.chemguide.co.uk/

Semester

1st semester

Assessment method

Format: Written

Length: One hour

Number of sections: Two –

Part A (50%) – Multiple choice questions. 25 in total (1 mark each)

Part B (50%) – Longer length questions. 5 in total (5 marks each)

Total: 50 marks (30 marks required to pass)

(!) During the emergency period related to COVID-19, any oral exams will be undertaken online. They will be carried out using the WebEx platform and, on the e-learning page of the course, there will be a public link which will allow possible virtual spectators to access the examination.

Office hours

On appointment