UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Chemistry and Propaedeutics Biochemistry

2223-1-H4101D252-H4101D002M

Aims

The student must achieve the knowledge on: Atomic structure, Chemical bonds, Solutions. Chemical reactions and catalysis. Energy aspects of chemical reactions.Acids and basis and buffer solutions. Organic compounds and functional groups: structural properties of organic molecules and chemical reactivity. The compounds of life: carbohydrates, amino acids, nucleotides, lipids. Proteins. Polysaccharides. Nucleic acids.

Contents

The primary goal of the course is to provide the tools for the understanding of the complex reactions that represent the molecular basis of life and to give to the student the basis to identify the cause-effect relations of the most important chemical processes for the curriculum and the work of a physician. This knowledge will form the primary basis for a rationale approach to the knowledge of medical sciences.

Detailed program

ATOMS AND ATOMIC STRUCTURE -Isotopes, electronic configuration Periodic Table of the elements -Nuclear Chemistry, Radioactivity and nuclear reactions - Chemical Bond: Ionic and Covalent Bond. Hydrogen bond and weak interactions - Chemical Reactions and Equations: Balance and Principle of Mass Conservation. Stoichiometry, Concentration and Molarity

BALANCE REACTIONS - Chemical equilibrium - Position of equilibrium, equilibrium constant and factors influencing it - The kinetics of chemical reactions - Speed of reaction and factors influencing it CATALYSIS OF CHEMICAL TRANSFORMATIONS - catalysts: how they modify the speed of chemical reactions - Enzyme catalysts and their activity and specificity

ENERGY ASPECTS OF CHEMICAL REACTIONS - Elements of electrochemistry: potential redox and spontaneity of redox reactions - Thermodynamic elements: state of a system, status functions and thermodynamic variables, thermodynamic transformations. - Thermodynamic elements: interpretation of the spontaneity of chemical reactions through the functions of state (entropy, enthalpy, free energy) -Spontaneity of equilibrium reactions.

ACIDS AND BASES - Acid-base balances: acid and base definitions, strength of acids and bases in water; approximate pH calculation - Acidity and basicity of salt solutions. Solution buffer and their buffering power - Blood buffer systems.

INTRODUCTION TO ANALYTICAL CHEMISTRY
CLASSIFICATION, GENERAL PROPERTIES OF ORGANIC COMPOUNDS FINALIZED TO THE INTERPRETATION OF BIOCHEMICAL PROCESSES - Physico-chemical properties - Structural isomerism and stereoisomerism - Optical isomers and geometric isomers - Structure of coordination compounds and their biological importance

STRUCTURE, NOMENCLATURE AND REACTIVITY OF ORGANIC COMPOUNDS - Hydrocarbons, alcohols, thioalcohols and analogues; Amines, Carbonyl compounds Carboxylic acids and carboxylic acid derivatives, Polyfunctional compounds

COMPOUNDS OF RELEVANT BIOLOGICAL INTEREST - Lipids, Carbohydrates, Amino Acids, Nucleotides

BIOLOGICAL POLYMERS Polysaccharides, Peptides and Proteins, Nucleic Acids

Prerequisites

None

Teaching form

Lectures, exercises, laboratories

It is required 70% course attendance

Lesson in attendance, subject to any ministerial changes following the COVID pandemic situation

Textbook and teaching resource

F.A. Bettelheim, W.H. Brown, M.K. Campbell, S.O. Farrell Chimica e Propedeutica Biochimica EdiSES

A. Fiecchi, M. Galli Kienle, A. Scala Chimica e Propedeutica Biochimica Ed. Edi Ermes.

E. Santaniello, M. Alberghina, M. Coletta, S. Marini Chimica propedeutica alle scienze bio-mediche Ed. PICCIN

Semester

First semester

Assessment method

No ongoing tests

The evaluation will consist of a written test that will be used to ascertain the level of knowledge and ability to understand the topics covered during the course and to be able to solve problems.

For these modules the student will have to answer:

3 Open Response Questions (also with numerical exercises) concerning the topics of general chemistry, organic chemistry and biological compounds respectively

19 Single-answer quiz with 5 answers, of which only one is correct

The examination procedure may change following ministerial provisions related to the pandemic emergency

Office hours

By appointment (e-mail) at Building U28, I floor

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING