UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Scienze Propedeutiche

1819-1-H4601D069

Aims

CHEMISTRY AND PROPAEDEUTICS BIOCHEMISTRY

The student should be able to:

• indicate the factors which affect the kinetics of chemical reactions and define their role;define the activation energy in chemical reactions and explain the significance of chemical equilibrium

• define the concept and properties of enzyme, coenzyme and substrate in relation to the catalytic processes

• explain the principles of thermodynamics, define the concepts of work, kinetic and potential energy, and their relationship;describe the elements of electrochemical necessary to the study of bioenergetics

• define the concept of acid, basic, salt and amphoteric electrolyte
• define the concept of pH and its significance in relation to biological processes, describe the properties of the buffer systems, measure the pH of a solution

• identify the structural and chemical properties of the major classes of organic compounds

• define the biological significance and interest of the "isomerism" in organic compounds

• identify the characteristics of alcohols, phenols, thiols, ethers and thioethers

• indicate the characteristics of aldehydes and ketones, carboxylic acids and their derivatives, polyfunctional compounds

• describe the mechanism of addition reactions, substitution and oxidation-reduction applied to biological reactions

• describe the chemical characteristics of organic compounds of biological interest: lipids, carbohydrates, amines

and nitrogen compounds, proteins and nucleotides

• describe the composition and structure of nucleic acids and explain the composition and structure of proteins

MEDICAL PHYSICS

The student should know:

• The fundamental concepts of mechanics with particular reference to the balance of the limbs of the human body
• The fundamental concepts of thermodynamics with particular reference to chemical reactions

• The basic concepts of fluid dynamics with particular reference to the hydraulic circuit of the blood

• The basic concepts of electrodynamics with particular reference to the current transport in nerve endings

• The basic concepts of radiation physics with particular emphasis on biomedical applications

PSYCHOLOGY

The student should know:

• the main cognitive functions (attention, perception, memory, learning)

• emotion regulation strategies and their neuro physiological basis

• interpersonal motivational systems

• to recognize interpersonal dynamics, with reference to doctor-patient interactions

MEDICAL STATISTICS I

Students should be able to:

- explain the basic concepts of statistics: variables and data, statistical units and population

- describe and use the main indices of location and variability

- apply the principles related to the process of data collection and to the use of data-bases

- build appropriate tabular and graphical representations of data

- explain the process of measurement in biology and medicine

- discuss the different types of error as related to any measurement process and the use of the index of precision and accuracy

- evaluate the relationship between two quantitative variables:the Pearson correlation coefficient and the simple linear regression model.

Contents

The course aims to provide students with the essential theoretical knowledge derived from basic science and tools necessary for future study of the degree course in Dentistry.

Detailed program

CHEMISTRY AND PROPAEDEUTICS BIOCHEMISTRY

- Chemical equilibrium: condition of chemical equilibrium, equilibrium constants and factors that influence the equilibrium

- Chemical kinetics; rates of reactions, energy of activation and the effect of temperature on reaction rate.

- Catalysis: how to change the speed of chemical reactions; enzymatic catalysts and their activity and specificity

- Elements of electrochemistry: redox potential and spontaneity of redox reactions

- Elements of thermodynamics: state of a system, thermodynamic state functions and variables, thermodynamic processes, interpretation of the spontaneity of chemical reactions through the state functions (entropy, enthalpy, free energy); Spontaneity of equilibrium reactions

- Acid-base equilibria: definitions of acid and base, strength of acids and bases in water; approximate calculation of pH, acidity and basicity of salt solutions

- Buffers and their buffer capacity, blood buffer systems

- General properties of organic compounds: chemical andphysical properties
- Structural isomerismand stereoisomerism, geometric isomers and optical isomers

- Structure ofcoordination compounds and theirbiological importance

- Structure and reactivity of organic compounds:hydrocarbons, alcohols, Thioalcohols; Amine, Carbonyl compounds Carboxylic acids and carboxylicacid derivatives, polyfunctional compounds

- Compounds ofbiological interest: Lipids, Carbohydrates,Amino Acids, Nucleotides

- Biological Polymers: Polysaccharides,Peptides and Proteins, Nucleic Acids

MEDICALPHYSICS

- Mechanics: Moment of a force and statics of the rigid body.
- Equilibrium of a rigid body, with examples related to the equilibrium of the human body.

- Young's modulus and elasticity'.

- Thermodynamics: Thermology, thermodynamics, temperature and heat.

- Internal energy and enthalpy.

- 1 stand 2 nd law of thermodynamics.

- Entropy, free energy and thermodynamicpotentials.

- Fluid Mechanics: Properties of ideal and real liquids. Perfect gas.

- Stevin, Archimedes, Bernoulli, Poiseuille laws and their applications in biology and medicine.

- Hydraulic resistance, resistances in series and parallel.

- Viscosity, turbulence, Reynolds number, sedimentation.

- Blood hydrodynamic circuit.

- Surface tension, Laplace's law and biomedical applications.

- Electrodynamics: Interaction of electric charges: electric field and electrostatic potential.

- Electric current, Ohm's law, circuits in series andparallel

- Charging and discharging of the capacitor.

- Action potential and other applications relating to the transmission of nervous information.

- Physics of radiation: X-Rays

- Radioactive decays: alpha, beta, gammaand nuclear reactions.

- Radiation-matter interaction.

PSYCHOLOGY

- the main cognitive functions: perception, attention,learning and memory

- motivational systems: biological and interpersonal

- emotional regulation strategies

- the role of the autonomic nervous system in theregulation of emotions and interpersonal dynamics

- doctor-patient relationship: internalprocesses and interpersonal dynamics related to the helping relationships

MEDICAL STATISTICS I

-Statistical units, sample, population, variables and data

-Typesof variables

-Indicesof location and dispersion

-Methods for data collection, coding and checking

-Design of research data-bases

-Construction of tables and graphs

-Concept of random and systematic errors as related to any measurementprocess

- The indices of precision and accuracy

-The relation between two quantitative variables

-Correlationand simple linear regression

Prerequisites

In order to standardize the basic knowledge of the class, the School of Medicine organizes lectures and tutorials in physics and chemistry preliminary to the course

Teaching form

Lectures and tutorials

It is required 70% course attendance

Textbook and teaching resource

CHEMISTRY AND PROPAEDEUTICS BIOCHEMISTRY:

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

E. Santaniello, M.Alberghina, M. Coletta, S. Marini Principi di Chimica Generale e Organica Ed.PICCIN

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

MEDICAL PHYSICS

D. Scannicchio e L. Giroletti "Elementi di fisica biomedica" Edises

PSICHOLOGY

Educational handouts provided by the teacher

Motivi e significati dell'agire interpersonale, Liotti, G., Ardovini, C.; in Liotti, G., Monticelli, F. (2008), I sistemi motivazionali nel dialogo clinico,(pp.3-23), Milano: Raffaello Cortina Editore.

Costruzione e regolazione delle emozioni: teoria e ricerca del costruzionismo psicologico. Zorzi, F., Bani, M.; in Rezzonico, G., De Marco, I., (2013). Le emozioni nel lavoro del clinico: la prospettiva del costruttivista, (pp. 139-142), Torino:Bollati Boringhieri Editore.

Porges, S. W., (2014) La teoria polivagale. Fondamenti neurofisiologici delle emozioni, dell'attaccamento, della comunicazione e dell'autoregolazione, (capp. I, III), Giovanni Fioriti Editore.

Wilhelm, K., Tietze, T., (2016). Difficult doctor–patient interactions. Applying principles of attachment-based care. Medicine Today17(1-2):36-44.

MEDICALSTATISTICS I

Bland Martin, Statistica Medica, APOGEO, 2009

Bossi A., Cortinovis I., Statistica medica. Esercitazioni, Città Studi Edizione, 1996

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. Being an integrated course, the evaluation Will cover all three modules.

Therefore the student will have to answer:

CHEMISTRY AND PROPAEDEUTICS BIOCHEMISTRY

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

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

PHYSICS

5 Open Response Questions (with numerical exercises)

PSYCHOLOGY

10 Single-answer quiz with 4 answers, of which only one is correct

1 open response question

MEDICAL STATISTICS I

5 Open Response Questions (with numerical exercises)

6 Single-answer quiz with 4 answers, of which only one is correct

Through this written test, the expositive and synthesis skills will be evaluated.

Oral examination on the evaluation of the teachers(discussion of the written test) The oral test will serve to clarify critical issues emerged from the written test and to verify the communication skills of the student and will focus on the topics covered by the written test

Office hours