Aim of course

The subject Medical Chemistry includes selected chapters from general, inorganic, physical and organic chemistry, chemistry of elements and important dental compounds, introduction to biochemistry and methodologically very important – analytical chemistry. Teaching is placed to the 1st semester of the study at Medical Faculty of UPJŠ. The knowledge of the structure and function of chemical compounds and substances, as well as of the fundamental dental materials, e.g. amalgams, porcelains, polymers, etc. is very important for the dentist, since use them daily during the praxis. The chapters from Medical Chemistry represent the basis for the next study of Dental Materials, Medical Biochemistry, Pathobiochemistry, Pathophysiology, Clinical Biochemistry, and others principal subjects of dental medicine study.

Education: lectures and practical exercises

Assessment: written tests and exam

Syllabus


Classification of chemical reactions. Chemical thermodynamics, thermodynamics terms, the heat of reaction, internal energy, enthalpy, Hess’s law, entropy, free energy, the direction of chemical reactions. Reaction kinetics, dependence of the reaction rate on the concentration, temperature and the presence of the catalyst. Molecularity and the order of chemical reactions. Chemical equilibrium, Guldberg-Waage law, equilibrium constant, Le Chatelier’s principle

Oxidation-reduction reactions, electrodes, electrode potential. The biological aspects of oxidation-reduction reactions. Macoergic bonds and compounds, energetically coupled reactions, the general features of the cell metabolism.

Biologically important carboxylic acids. Derivatives of carboxylic acids, their medically and biologically important homologues. Substitutional and functional derivatives of carboxylic acids. Derivatives of carbonic acid: e.g. carbamic acid, urea, guanidine, creatine, creatinine, barbituric acid. The important reactions of organic compounds in biochemistry. Organic
compounds containing phosphorus, organophosphates, structure, medical and toxicological importance.


Saccharides: structure, biological function, classification. The basic homological series of saccharides: the structural formulas of saccharides; optical isomerism: enantiomers, anomers, epimers; mutarotation. The reaction of saccharides: oxidation, reduction, dehydration, esterification and glycoside formation. Oligosaccharides: important disaccharides. Polysaccharides: homopolysaccharides (e.g. starch, glycogen, cellulose, dextran, inulin), heteropolysaccharides (proteoglycans, glycoproteins, GAG) – structure and importance.

Lipids: the structure, biological function, classification. Simple lipids: FA (essential fatty acids, eicosanoids – e.g. prostaglandins, prostacyclins), acylglycerols (TAG), ceramide. Complex lipids: phospholipids, sphingolipids, glycolipids, lipoproteins - structure, classification and importance. Isoprenoids and terpenes. Steroids - structure, classification and importance. Lipids as a part of biological membranes, their participation in the transfer of signal.

Nucleic acids (NA): composition, structure, classification, biological importance. The structure of purine and pyrimidine bases. Biochemically important nucleotides, nucleosides. Genetic code. Diagnostically importance of the bases derivates (e.g. 5-fluorodeoxyuridylate). Methods for isolation, detection and utilization of NA for diagnostic purpose.

Vitamins: classification, structure, chemical properties and biological importance. Terpenes, alkaloids and flavonoids: structure, properties, biological importance and medical application.


Proteins: structure, classification, characteristic properties and biomedical importance. Supramolecular structures. The properties of proteins in solution. Solubility of proteins,

The calculation in Medical Chemistry – e.g. concentration/dilution solutions, stoichiometric, pH, spectrophotometric calculations.