
Medical chemistry

1. General structure of atoms. Chemical elements of the living organisms, their atomic orbitals and electron configurations.
2. Primary chemical bonds and secondary interactions. Covalent bonds in organic compounds.
3. Physical and chemical properties of water (intermolecular forces, self-ionization, etc.).
4. Solutions. Their components, and types of concentration.
5. Solubility of solid, liquid or gaseous solutes. Precipitation and the solubility product.
6. Acid-base reactions. Definition of pH, the pH scale. Examples for strong and weak acids or bases.
7. Chemical equilibria, Le Chatelier's principle, acid-base buffer solutions.
8. Redox reactions. Changes in the oxidation number and transfer of electrons. Voltaic cells.
9. Standard reduction potentials. The effect of temperature, pressure and concentrations on the reduction potential.
10. Redox reactions and Lewis acid-base reactions of iron and its different ions. The biological roles of heme.
11. Heat of the chemical reactions. Exothermic and endothermic reactions. The conservation of energy.
12. Changes in entropy and in free enthalpy. Driving force of natural processes. Entropy and the state of matter.
13. The rate of a chemical reaction, and its dependence on temperature. The activation energy and catalysis.
14. Carbon-carbon covalent bonds in organic chemistry. Saturated and unsaturated hydrocarbons, aromatic compounds.
15. Alcohols and phenols. Their reactions and physical properties.
16. Oxidized derivatives of alcohols. Biologically important aldehydes, ketones and carboxylic acids.
17. Amines and imines. Their types and most important chemical reactions.
18. Condensed bonds in organic compounds (ether, ester, amide, anhydride, Schiff base). Special roles of phosphate-esters in biology.
19. Sulfur atoms in bioorganic molecules (thiols, thioesters, disulfides).
20. Structure and biological functions of steroids (i.e., cholesterol and its derivatives).
21. Monosaccharides and disaccharides: definition, classification, most important representatives.
22. Proteinogenic amino acids: classification, examples, peptide bond.
23. Nucleotides and nucleic acids: building blocks, purines and pyrimidines, polymer structure, base pairing.