

***MEDICAL UNIVERSITY OF PLOVDIV***  
***FACULTY OF PHARMACY***  
***DEPARTMENT OF CHEMICAL SCIENCES***

**BIOINORGANIC CHEMISTRY**  
**SYLLABUS**

1. Introduction to Bioinorganic chemistry. Object, subject and tasks of Bioinorganic chemistry. Basic concepts in Bioinorganic chemistry.
2. Fundamental knowledge about the biocoordination chemistry of metal atoms. Occurrence, use and biological role of the bioelements.
3. Bioelements classifications according to: the chemical nature of the bioelement; the function they perform in living organisms; the location of bioelements in multicellular organisms; their quantity in living organisms.
4. s-Elements – occurrence, atomic structure, chemical bonds, properties, biological role. Hydrogen.
5. Alkali and alkaline earth metals – potassium, sodium, magnesium, calcium. Homeostasis of redox metal ions.
6. p-Elements – occurrence, atomic structure, chemical bonds, properties, biological role. Carbon. Nitrogen and phosphorus. Oxygen and sulfur. Fluorine and chlorine.
7. Biogeochemical cycle. Water – distribution in nature, properties, biological role, hydrological cycle.
8. CO<sub>2</sub> – carbon dioxide cycle, biological role.
9. Nutrient cycling.
10. Micronutrients in the Biosphere. d-Elements – vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, molybdenum; atomic structure, chemical bonds, biological role.
11. Metalloproteins. Metalloenzymes.
12. Toxicity of arsenic, antimony and selenium.
13. Toxicity of lead, cadmium, thallium, mercury, aluminum, beryllium and chromium.
14. Imbalance of bioelements in human body. General information and classification. Drug treatments for deficiency and excess of bioelements.
15. Platinum complexes in cancer therapy.
16. New anticancer drugs based on transition metal complexes (ruthenium, gold, titanium, gallium, palladium, osmium, rhodium and iridium).
17. Further inorganic compounds in chemotherapy – therapy of Rheumatoid arthritis, Diabetes, Psychopharmacologic drugs, Ulcers.
18. Metal complexes for treatment of parasites, bacteria and viruses.
19. Metal complexes for detecting diseases.
20. Nanomedicine and nanopharmaceuticals. Introduction. Reception, circulation and elimination/retention of nanoparticles.

21. Types of nanoparticles – silver, gold, carbon nanotubes, superparamagnetic nanoparticles of iron oxide.
22. Biodistribution of nanoparticles in the human body. Nanotechnologies for treatment. Nanotechnologies for diagnostics. Cytotoxicity of nanoparticles.
23. Chelation therapy. Mechanism of chelation therapy. Chelating agents – EDTA, thiol antidotes and sodium thiosulphate. Iron chelation therapy.

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