MEDICAL UNIVERSITY OF PLOVDIV
FACULTY OF PHARMACY
DEPARTMENT OF CHEMICAL SCIENCES

BIOINORGANIC CHEMISTRY

LECTURES – THESES

II – semester

LECTURE № 1 – 2 hours
INTRODUCTION TO BIOINORGANIC CHEMISTRY

1. Object, subject and tasks of Bioinorganic chemistry
2. Basic concepts in Bioinorganic chemistry – bioelements, bioligands, xenobiotics

LECTURE № 2 – 2 hours
INTRODUCTION TO BIOINORGANIC CHEMISTRY

1. Occurrence, use and biological role of the bioelements
2. Fundamental knowledge about the coordination chemistry of metal atoms

LECTURE № 3 – 2 hours
BIOELEMENTS CLASSIFICATION

1. Classification according to the chemical nature of the bioelement
2. Classification according to the function they perform in living organisms
3. Classification according to the location of bioelements in multicellular organisms
4. Classification according to their quantity in living organisms

LECTURE № 4 – 2 hours
MACRONUTRIENTS IN THE BIOSPHERE (part I)

1. s-Elements – occurrence, atomic structure, chemical bonds, properties, biological role
2. Hydrogen

LECTURE № 5 – 2 hours
MACRONUTRIENTS IN THE BIOSPHERE (part II)

1. Alkali and alkaline earth metals – potassium, sodium, magnesium, calcium
2. Homeostasis of redox metal ions
3. p-Elements – occurrence, atomic structure, chemical bonds, properties, biological role
4. Carbon

LECTURE № 6 – 2 hours
MACRONUTRIENTS IN THE BIOSPHERE (part II)

1. p-Elements – occurrence, atomic structure, chemical bonds, properties, biological role
2. Nitrogen and phosphorus

3. Oxygen and sulfur
4. Fluorine and chlorine

LECTURE № 7 – 2 hours
BIOGEOCHEMICAL CYCLE

1. Water – distribution in nature, properties, biological role, hydrological cycle
2. CO_2 – carbon dioxide cycle; biological role
3. Biogeochemical cycle

III – semester

LECTURE № 8 – 2 hours
MICRONUTRIENTS IN THE BIOSPHERE

1. d-Elements – vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, Molybdenum – atomic structure, chemical bonds, biological role
2. Metalloproteins
3. Metalloenzymes

LECTURE № 9 – 2 hour
TOXIC CHEMICAL ELEMENTS

1. Toxicity of arsenic, antimony and selenium
2. Toxicity of lead, cadmium, thallium, mercury, aluminum, beryllium and chromium

LECTURE № 10 – 2 hours
IMBALANCE OF BIOELEMENTS IN HUMAN BODY

1. General information and classification
2. Drug treatments for deficiency and excess of bioelements
3. Nutritional additives for the regulation of mineral exchange
4. Antioxidants

LECTURE № 11 – 2 hours
CHEMOTHERAPY INVOLVING INORGANIC CHEMICAL COMPOUNDS

1. Platinum complexes in cancer therapy
2. New anticancer drugs based on transition metal complexes (ruthenium, gold, titanium, gallium, palladium, osmium, rhodium and iridium)
3. Further inorganic compounds in chemotherapy – therapy of Rheumatoid arthritis, Diabetes, Psychopharmacologic drugs, Ulcers
4. Metal complexes for treatment of parasites, bacteria and viruses
5. Metal complexes for detecting diseases

LECTURE № 12 - 2 hours
NANOMEDICINE AND NANOPHARMACEUTICALS (I part)

1. Introduction
2. Reception, circulation and elimination / retention of nanoparticles
3. Types of nanoparticles – silver, gold, carbon nanotubes, superparamagnetic nanoparticles of iron oxide

LECTURE № 13 - 2 hours
NANOMEDICINE AND NANOPHARMACEUTICALS (II part)

1. Biodistribution of nanoparticles in the human body
2. Nanotechnologies for treatment
3. Nanotechnologies for diagnostics
4. Cytotoxicity of nanoparticles

LECTURE № 14 – 2 hours
CHELATION THERAPY

1. Mechanism of chelation therapy
2. Chelating agents – EDTA, thiol antidotes and sodium thiosulphate
3. Iron chelation therapy

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