


KAPITAŁ LUDZKI
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez
 Unię Europejską w ramach
 Europejskiego Funduszu
 Społecznego

UNIA EUROPEJSKA
 EUROPEJSKI
 FUNDUSZ SPOŁECZNY


Course title		ECTS code	
Bioinorganic chemistry		13.3.1161	
Name of unit administrating study			
null			
Studies			
faculty	field of study	type	drugiego stopnia
Wydział Chemii	Chemia	form	stacjonarne
		specjalty	chemia biomedyczna
		specialization	wszystkie
Teaching staff			
prof. dr hab. Mariusz Makowski; dr inż. Małgorzata Gawrońska; dr Sandra Ramotowska; prof. UG, dr hab. Agnieszka Chylewska; dr hab. Aleksandra Dąbrowska, profesor uczelni			
Forms of classes, the realization and number of hours		ECTS credits	
Forms of classes		2	
Laboratory classes, Lecture		classes 45 h	
The realization of activities		Tutorial classes 2 h	
classroom instruction		Student's own work 3 h	
Number of hours		TOTAL: 50 h - 2 ECTS	
Lecture: 15 hours, Laboratory classes: 30 hours			
The academic cycle			
2023/2024 winter semester			
Type of course		Language of instruction	
obligatory		polish	
Teaching methods		Form and method of assessment and basic criteria for evaluation or examination requirements	
<ul style="list-style-type: none"> - conducting experiments - group work - multimedia-based lecture 		Final evaluation	
		<ul style="list-style-type: none"> - Graded credit - Examination 	
		Assessment methods	
		<ul style="list-style-type: none"> - written exam with open questions - assignment work – completing a specific practical assignment - graded course credit based on individual grades obtained during the semester 	
		The basic criteria for evaluation	
		<ul style="list-style-type: none"> • positive assessment of the written exam consisting of 12-20 open questions covering the issues listed in the program content (lecture) • positive assessment of admission to part of experiments and passing reports 	
Method of verifying required learning outcomes			
Required courses and introductory requirements			
A. Formal requirements			
none			
B. Prerequisites			
basic knowledge of inorganic and coordination chemistry			

Aims of education

- making students familiar with the interdisciplinary problems of chemical, biological and medical sciences
- introduction of basic and specialized biochemistry information (in particular, information about the role that bioelements play in living organisms, i.e. iron, copper, zinc, cobalt, manganese, nickel, chromium)
- the proposed laboratory focuses on performing laboratory measurements using precise scientific equipment at the disposal of the Department of Bioinorganic Chemistry (potentiometry, spectroscopy: IR, UV-Vis, pH meter); the laboratory classes mainly concern the subject of complexes, and methods of their identification, enabling to facilitate the understanding of processes occurring in organisms; subject matter of the laboratory also uses metal ion complexes towards their identification (ions) of natural origin with essential biological (life) significance

Course contents

Bioinorganic chemistry - explanation of the term, foundations; Review by the most important groups of compounds (sugars, lipids, proteins and amino acids, vitamins - coenzymes, DNA / RNA) necessary for life; Biological demand for metals and inorganic compounds; The functions of metal ions in proteolysis.

Test methods for bioinorganic compounds. Redox reactions with electron transfer in biological systems. Oxygen transfer and transport processes in cells. Circulation of nitrogen at the molecular level. Physiology of metals. Medicinal chemistry of inorganic compounds. Environmental chemistry of bioinorganic compounds.

Laboratory classes:

Extraction of Ca²⁺ from the plant material

Complexes of Zn(II) and Co(II) ions as models of zinc fingers

Synthetic complexes of Cu(I/II) as oxygen binding systems (hemocyanin model)

Natural ionophores as Na and K cations transporters through membranes

Determination of the activity of invertase from yeast in the presence of bivalent metal ions: Mg, Zn i Cd

Cobalamine (B12 vitaminy) as selective biosensor

DNA extraction and fragmentation from banana with the use of manganese salene complex

Bibliography of literature**A. Literature required for the finals (passing the exam):****A.2. for the own work:**

L. Stephen, B. Jeremy – Podstawy chemii bionieorganicznej

R. M. Roat-Malone – Bioinorganic Chemistry: A Short Course

E. Ochiai – Bioinorganic Chemistry: a survey

B. Supplementary literature

Bioinorganic Chemistry and Applications – scientific papers recommended by a lecturer

Literature for the lab classes:

R. Jastrząb, M. T. Kaczmarek, M. Nowak, I. Pospieszna-Markiewicz, M. Skrobańska, M. Zabiszak, "Ćwiczenia laboratoryjne z Chemii Bionieorganicznej", UAM Poznań 2015.

R.M. Roat-Malone, „Chemia bionieorganiczna”, Wydawnictwo Naukowe PWN, Warszawa 2010.

A. Bartyzel, M. Makarska-Białokoz, „Chemia bionieorganiczna w ćwiczeniach laboratoryjnych. Podręcznik dla studentów chemii środków bioaktywnych i kosmetyków”, Wydawnictwo UMCS, Lublin 2010.

R. Łyszczek, A. Bartyzel, Z. Rzączyńska, „Chemia koordynacyjna w ćwiczeniach laboratoryjnych”, Wydawnictwo UMCS, 2006.

N. Metzler-Nolte, U. Schatzschneider, "Bioinorganic Chemistry: A Practical Course" Walter de Gruyter GmbH & Co. KG 2009.

The learning outcomes (for the field of study and specialization)

K_W01: uses knowledge of spectroscopic methods of chemical compound analysis;

K_W05: operates with extended knowledge in the field of specialization studied;

K_K01: knows the limits of his own knowledge, understands the need for further education and can inspire other people

Knowledge

Knows and understands the laws, concepts and phenomena on the border of three fields: chemistry, biology and physics

Skills**Social competence**

Understands the need for further education. can precisely formulate questions to deepen one's understanding of a given topic or to find missing elements of reasoning; understands and appreciates the importance of intellectual honesty in own and other people's actions; is ethical; understands the need for popular presentation of selected issues in chemistry to non-specialists; can independently search for information in literature, including foreign language (K_K01).

to do so;	
Contact	
mariusz.makowski@ug.edu.pl	