DESCRIPTION OF THE COURSE OF STUDY

Course code	531.6.CHEM.2.B/C.CKiB	
Name of the course in	Polish	***Chemia koordynacyjna i bionieorganiczna***
	English	***Coordination and bioinorganic chemistry***

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	Chemistry
1.2. Mode of study	Full-time
1.3. Level of study	2nd degree
1.4. Profile of study*	General academic
1.5. Person/s preparing the course description	dr hab. Joanna Masternak prof. UJK
1.6. Contact	joanna.masternak@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	English
2.2. Prerequisites*	Inorganic chemistry, Fundamentals of spectroscopy, Basics of crystallography

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		Lectures - 30 hrs, laboratory classes - 45 hrs
3.2. Place of classes		Courses in the teaching rooms of UJK
3.3. Form of assessment		Lecture – exam, laboratory classes - credit with grade
3.4. Teaching methods		Informative and problem-based lecture, laboratory practical method
3.5. Bibliography	**Required reading**	1. C. E. Housecroft, A. G. Sharpe, Inorganic chemistry, Pearson, 4th edition, 2012 2. I. Bertini, H. B. Gray, S. J. Lippard, J. Selverstone Valentine, Bio-inorganic chemistry, University Science Books, California, 1994 3. E. Alessio, Bioinorganic medicinal chemistry,Wiley, 2011
	Further reading	1. K. Nakamoto, Infrared and Raman Spectra of Inorganic and Coordination Compounds: Part A: Theory and Applications in Inorganic Chemistry, Sixth Edition, Wiley 2009 2. Articles from research databases: Elsevier, Springer etc.

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives *(including form of classes)*

Lecture:

C1. Extending the knowledge of modern coordination chemistry.

C2. To approach the role of metals in biological systems. To become familiar with the structure of selected metallo-biomolecules.

Laboratory:

C1. To learn in a practical way the methods of analysis and the visualisation of the structure of selected coordination compounds.

C2. Familiarisation with selected research methods used in the analysis of the biological activity of a selected compound.

4.2. Detailed syllabus *(including form of classes)*

Lectures

Comparison of modern theories describing coordination bonding (TPK, TPL). Examples of organometallic complexes (complexes with pi-donor and pi-acceptor ligands). Clusters (properties and applications). Role of selected essential and toxic metals in biological systems. Use of coordination compounds of selected metals in medicine. Examples of biocoordination structures: Haemo/myoglobin system (oxygen transport), other iron-sulphur proteins (siderophores); calcium-dependent molecules (calmodulin); role of copper in living organisms (hemocyanin, copper enzymes (SOD) and copper blue proteins); Functions of manganese (CAT); cobalt in coenzyme B_{12}, zinc enzymes and proteins (carbonate dehydratase, alcohol dehydrogenase, zinc regulatory proteins); nickel-containing enzymes (urease, carbon monoxide dehydrogenase). Metal transport and storage in living organisms. Selected physicochemical methods for the study of coordination and bioinorganic chemistry. Perspectives of bioinorganic chemistry.

Laboratory classes

I. Students will work in teams of two. They will carry out an individual project in which they will use

(a) Literature from available databases (Science Direct, Ebesco, Wiley) to develop the synthesis and analysis of a metal complex with a selected bioligand.

b) Determine the structure and composition of the obtained compound by elemental analysis, FTIR, UV-Vis spectroscopy, magnetic moment measurements.
c) X-ray studies on single crystals to understand the molecular and crystalline structure of the model complexes (visualisation of structures by means of DIAMOND and/or Mercury software).
And according to the coordinating compound obtained and the predicted properties:
II. Determination of the lipophilic properties of the studied complexes - shake-flask method.
III. UV-Vis and/or CD studies to determine the likely interaction pattern of the studied complex with DNA.
IV. Determine the binding strength of the studied complex with BSA - UV-Vis and/or CD studies.
V. Use spectroscopic methods to investigate the potential antioxidant properties (with selected radical) of selected transition metal complexes.

4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of **KNOWLEDGE:**		
W01	Has advanced knowledge of coordination bond theory.	CHEM2A_W01
W02	Understand how selected bioelements affect life processes and can characterise selected bionie-organic systems.	CHEM2A_W01
W03	Be familiar with the research methods that are used in coordination and bio-inorganic chemistry.	CHEM2A_W01
within the scope of **ABILITIES:**		
U01	Be able to relate the type of metal ion to the structure and function of selected metallo-biomolecules.	CHEM2A_U05
U02	Be able to characterise model coordination systems using the research methods learnt	CHEM2A_U05
within the scope of **SOCIAL COMPETENCE:**		
K01	Be aware of the importance of the acquired knowledge of the subject and its popularisation in society.	CHEM2A_K01

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	Method of assessment (+/-)																					
	Exam written			Test			Project			Effort in class			Self-study			Group work			Others*		
	Form of classes			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*			*Form of classes*		
	L	*C*	...	*L*	*C*	...	*L*	*C*	...	*L*	*C*	...	*L*	*C*	...	*L*	*C*	...	*L*	*C*	...
W01	+																		+		
W02	+																		+		
W03	+																		+		
U01	+							+											+		
U02								+									+		+		
K01								+													

**** two intermediate colloquia, which entitle the student to be excused from the examination if they obtain more than 70% of all possible points;***

4.5. Criteria of assessment of the intended learning outcomes

Form of classes	Grade	Criterion of assessment
lecture (L)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points
Laboratory classes (C)	**3**	obtaining 50-60% of the total number of points in the project
	3,5	obtaining 61-70% of the total number of points in the project
	4	obtaining 71-80% of the total score for the project
	4,5	obtaining 81-90% of the total score of the project
	5	obtaining 91-100% of the total score of the project

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	Student's workload	
	Full-time studies	Extramural studies
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/	***75***	
Participation in lectures	30	
Participation in laboratories	45	
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***75***	
Preparation for the lecture	20	
Preparation for the laboratories	15	
Preparation for the exam/colloquium	20	
Gathering materials for the project/Internet query	20	
TOTAL NUMBER OF HOURS	**150**	
ECTS credits for the course of study	**6**	

delete as appropriate

Accepted for execution *(date and legible signatures of the teachers running the course in the given academic year)*

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