Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Bioinorganic chemistry
Course code	44730
Scientific sector	CHIM/03
Degree	Master in Food Sciences for Innovation and Authenticity
Semester	1st
Year	II
Academic year	2021/22
Credits	2
Modular	No

Total lecturing hours	20
Total exercise hours	-
Attendance	
Prerequisites	Inorganic and organic chemistry
Course page	

Specific educational objectives	The course gives a general overview of scientific contents on complexes of transition metals, metalloproteins and their interaction and catalytic activity with metabolites. The aim is to understand and rationalize relevant biochemical processes involving metals in the cell. Chemistry of transition metals and coordination compounds, mono and polydentate ligands with C, N, O, P, S heteroatoms, aquo complexes, water exchange rate, complexes with EDTA, 18 electron rule, geometry of the complexes. Interaction of metals with small and organic molecules (eg. CO, carboxylic acids, phenols, amines), redox reactions and catalytic activity of metal complexes, catalytic cycles. Metals in biological systems. Bonding properties of biological molecules (porphyrins, peptides, sulfur ligands). Transport, storage and control of iron. Metalloproteins and metalloenzymes: structure, oxygen transport mechanisms (hemoglobin, hemerythrin, hemocyanin), electron transfer mechanism (iron-sulfur proteins, copper blue proteins, cytochrome c). Enzymatic reactions with Zn (carbonic anhydrase, carboxypeptidase, alcohol dehydrogenase) and metals with different oxidation states, namely Fe, Cu and Co, involving oxygen, peroxides and radical reactions (cytochrome P-450, monooxygenase, dioxygenase, catalase, peroxide dismutase, vitamin B_{12}), mediated by the NAD^+ / NADH system. Anticancer Pt and Ru compounds: structure and their mechanism.

Lecturer	Walter Baratta

Learning outcomes	The course aims to provide the students the knowledge of the properties of transition metal compounds. Particular attention will be focused on the thermodynamic and kinetic aspects of chemical reactions involving complexes of transition metals. Furthermore, the role of metals within metalloproteins and metalloenzymes in biochemical processes will be presented with the aim to better understand the involved mechanism.

Assessment	Oral exam with review questions to test knowledge and some application skills
Assessment language	
Evaluation criteria and criteria for awarding marks	Final mark, taking into account the clarity of answers, ability to summarize, evaluate and establish relationships between topics

Required readings	Chemistry of Metalloproteins, Problems and Solutions in Bioinorganic Chemistry, J. J. Stephanos. A. W. Addison, John Wiley & Sons, Inc. 2014.
Supplementary readings	Principles of Bioinorganic Chemistry, S. J. Lippard, J. M. Berg, University Science Books, Mill Valley, CA, 1994