



FEDERAL UNIVERSITY OF CEARÁ
Provost Office of Research and Graduate Studies

COURSE PROGRAM

1. PROGRAM:	
Program	GRADUATE PROGRAM IN CHEMISTRY
2. COMPONENT TYPE:	
Activity ()	Course (X) Module ()
3. LEVEL:	
Master's Degree () Doctorate ()	
4. COMPONENT IDENTIFICATION:	
Name:	FUNDAMENTS OF BIOINORGANIC
Code:	CEP9522
Hours:	128
Credits:	8
Optional course:	Yes (X) No ()
Compulsory course:	Yes () No (X)
Area:	Inorganic Chemistry
5. PROFESSOR:	
Eduardo Henrique Silva de Sousa Luiz Gonzaga de França Lopes	
6. ABSTRACT:	
Introduction to the fundamentals of biochemistry for bioinorganics, fundamentals of coordination chemistry, molecular reasons for selecting metals in biology, techniques applied to bioinorganics (spectroscopies, electrochemistry, molecular biology, bioinformatics), iron metalloproteins, natural bioorganometallic, sodium biological chemistry, potassium, calcium and magnesium, metallopharmaceuticals and inorganic materials applied in biology and medicine. The course will be divided as follows: 64 hours of presential activity, 64 hours of experimental activities, discussions of scientific articles, seminar presentations and no-presential activities.	
7. COURSE PROGRAM:	
<ol style="list-style-type: none"> 1. Introduction to the Fundamentals of Biochemistry (amino acids, peptides and proteins, cofactors, DNA transcription and translation, RNA) 2. Coordination Chemistry and Molecular Reasons in the Selection of Metals in Biology 3. Spectroscopic and Electrochemical Techniques Used in Bioinorganics and Bioinformatics 4. Fundamentals of Molecular Biology and Strategies for Expression and Purification of Metalloproteins 5. Iron Metalloproteins <ol style="list-style-type: none"> 5.1. Hemoproteins (their role in biomolecule transport, catalysis and molecular signaling, a. Hemoglobin, myoglobin, nitrophorin; b. Cytochrome c, cytochrome P450; c. Soluble guanylate cyclase, FixL and CoxA; neuroglobin, cytoglobin) 5.2. Nonhemic proteins (their role in transporting biomolecules transferrin, ferritin and siderophores; iron-sulfur clusters as an oxygen sensor (hydroxyproline oxidase, HIF-alpha) and gene expression regulator (IRP1 and IRP 2 iron homeostasis; iron demethylation; bases in gene control), ribonucleotide reductase and other monooxygenases) 	

6. Natural Bioorganometallics (copper systems (ethylene signaling and pi-stacking systems), cobalt (vitamin B12), nickel, arsenic, mercury)
7. Sodium, Potassium, Calcium and Magnesium in Biology (role of “hard” elements and their electrical, structural, and molecular signaling)
8. Metallopharmaceuticals (History and advances; cancer therapy, cis-platinum and its post-platinum generations; gold therapeutic application and perspectives; NO and CO therapy strategies; chelate therapy and neurological diseases; modern strategies applied in the development of metallopharmaceuticals (complementarity , redox potential, pH, light and enzymatic selection; magnetic resonance imaging).
9. Inorganic Materials in Medicine and as Tools Applied to Biology (examples in the detection of proteins, DNA, measurement of molecular events such as phosphorylation, sensors for metal studies in biology (zinc, nitric oxide, manganese), biomolecule marking and cell imaging)

8. EVALUATION PROCESS:

Tests, seminars

Frequency equal to or greater than 75%

9. BIBLIOGRAPHY:

Basic

1. James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Inorganic Chemistry, Principles of Structure and Reactivity, 4th Ed., 1993 by Harper Collins College Publishers
2. G. L. Miessler, P. J. Fischer, D. A. Tarr, Inorganic Chemistry. 5th Ed., 2014, by Pearson.
3. David L. Nelson e Michael M. Cox, Princípios de Bioquímica de Lehninger, 6a Ed., 2014 , Artmed
4. Dieter Rehder, Bioinorganic Chemistry, Oxford, 2014
5. Eiichiro Ochiai, Bioinorganic Chemistry - a survey, Academic Press, 2008
6. Ivano Bertini, Harry B. Gray, Edward I. Stiefel, Joan Selverstone Valentine, Biological Inorganic Chemistry - Structure and Reactivity, University Science Book, 2007

Complementary

1. da Silva, J. J. R. F., Williams, R. J. P., The Biological Chemistry of the Elements – The Inorganic Chemistry of Life, Oxford Press, 2001
2. Robert Crichton, Biological Inorganic Chemistry: An Introduction, Elsevier, 2008
3. Wolfgang Kaim, Brigitte Schwederski, Axel Klein, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life – an introduction and guide, 2a. Ed, Wiley, 2013
4. Structural insights into protein–metal ion partnerships, Current Opinion in Structural Biology 2004, 14:1–10
5. Application of Metal Coordination Chemistry To Explore and Manipulate Cell Biology 2009, 109, 4921
6. Ibers, J. A, Holm, R. H., Modeling Coordination Sites in Metallobiomolecules, Science 1980, 209, 223
7. Outros Artigos científicos.