

CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

NEW COURSE PROPOSAL

PROGRAM: MULTIPLE PROGRAMS/ CHEMISTRY

1. **Catalog Description of the Course.** [Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of \_\_\_ units); time distribution (Lecture \_\_\_ hours, laboratory \_\_\_ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]

**CHEM 465. BIOINORGANIC CHEMISTRY (4)**

Three hours lecture and three hours laboratory per week.

Prerequisite: CHEM 305 (or concurrent enrollment), CHEM 314 with a grade of C or better or consent of instructor

This course will examine the inorganic chemistry of biological systems including the role of metals such as zinc, iron, copper, manganese, and molybdenum in protein/ enzyme function. The course will discuss principles of coordination chemistry, protein and DNA functional groups and their metal-binding ability, and the role of metal ions in the reaction mechanisms of metalloenzymes.

2. **Mode of Instruction.**

	Units	Hours per Unit	Benchmark Enrollment
Lecture	3	1	36
Seminar			
Laboratory	1	3	18
Activity			

3. **Justification and Learning Objectives for the Course.** (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) [Use as much space as necessary]

This course is an elective to be taken by chemistry majors. Bioinorganic chemistry builds on the student's background in chemical biology by exploring in-depth the metallochemistry critical to many aspects of biomolecular function. Students completing this course will be particularly well suited for graduate studies in biochemistry, biophysics and biomaterials engineering.

Students who successfully complete this course will be able to:

- Explain the general state of the field of bioinorganic chemistry.
- Describe the elements of metal coordination chemistry as applied to biomolecular structure and function.
- Describe how molecular shape, electronic structure, thermodynamics, kinetics, and intermolecular interactions affect the structure, properties, and reactions of bioinorganic systems.
- Explain the role of metals in electron transfer and redox catalysis.
- Integrate their knowledge of bioinorganic chemistry with their broader knowledge of chemistry and biology.
- Interpret, discuss, and evaluate a primary literature article

4. **Is this a General Education Course**  
If Yes, indicate GE category:

YES

NO

**5. Course Content in Outline Form.** [Be as brief as possible, but use as much space as necessary]

*Introduction*

Protein structure  
Enzyme mechanisms  
Electron transfer

*Coordination chemistry in bioinorganic reactions*

Thermodynamics: acid/base concepts, chelation,  $pK_a$ , geometries  
Kinetics: ligand exchange, reactions mechanisms

*Ligand-field theory*

Principles and systems

*Biological ligands*

Proteins  
Nucleic acids  
Coenzymes

*Metal uptake, and storage and in biology*

Membranes  
Concentration gradients  
Solubilization of ions  
Storage of ions

*Structural role of metals in biology*

*Transport and storage of metals in biology*

Oxygen transport and storage

*Catalytic roles of metal ions in biology*

Electron carriers  
Electron transport and respiration

*Key examples in bioinorganic reactions*

Activation of dioxygen: iron  
Photosynthesis: magnesium and manganese  
Superoxide dismutases: copper and nickel  
Carbonic anhydrase: zinc

*Pharmaceutical Chemistry of Metals*

**6. References.** [Provide 3 - 5 references on which this course is based and/or support it.]

Bertini, I.; Gray, H.B.; Lippard, S.J.; Valentine, J.S. *Bioinorganic Chemistry*, Springer-Verlag, 1994  
Lippard, S.J.; Berg, J.M.; *Principles of Bioinorganic Chemistry*, Wiley, 1994  
Roat-Malone, R.M. *Bioinorganic Chemistry: A Short Course*, Wiley, 2002

**7. List Faculty Qualified to Teach This Course.**

Dr. Philip D. Hampton

**8. Frequency.**

a. Projected semesters to be offered: Fall \_\_\_ Spring X Summer \_\_\_

**9. New Resources Required.**

None.

**10. Consultation.**

Attach consultation sheet from all program areas, Library, and others (if necessary)

**11.** If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

Phil Hampton  
Proposer of Course

12-16-03  
Date