

Chemistry 103: Bioinorganic Chemistry (Fall 2015)

Course Information

LECTURE SCHEDULE: Tuesday, Thursday 9:30-11:00 am in 120 Latimer Hall

INSTRUCTOR

Matthew B. Francis
724 Latimer Hall
mbfrancis@berkeley.edu (NOT francis@berkeley.edu!)
Office Hours: Thursday 4:00-5:30 pm in 724 Latimer

GRADUATE STUDENT INSTRUCTORS

Joel Finbloom (jaf@berkeley.edu)
Adam Childs (adam.childs@berkeley.edu)

TEXTBOOKS AND SOFTWARE

- There is no required textbook for this course. Instead, a series of articles will be distributed on the bSpace site.

ADDITIONAL RESOURCES

- Inorganic Chemistry
G. Miessler and D. Tarr (any edition will do)
- Biological Inorganic Chemistry
Ivano Bertini, Harry Gray, Edward Stiefel, and Joan Valentine
- Bioinorganic Chemistry—Inorganic Elements in the Chemistry of Life
Wolfgang Kaim, Brigitte Schwederski, Axel Klein, 2nd Ed.
- Lehninger Principles of Biochemistry, 6th Ed.
David Nelson and Michael Cox (any other edition is also OK)
- PyMol software from Schrödinger. This program is available for PCs, Macs, and Linux-based computers, and can be downloaded for free at <http://pymol.org/ep>. The username and password will be distributed in class. The software is not required, but it is helpful for viewing the structures covered in class.

COURSE WEBSITE

Go to <https://bcourses.berkeley.edu/> and find the “CHEM 103 F2015” page under “Sites”. This webpage will be used to distribute handouts, lecture notes, problem sets, study guides, etc. It will also be used to distribute the protein structure files that are used in class.

PROBLEM SETS: There will be about six problem sets for the course. They will be distributed approximately every two weeks.

IN-CLASS EXAMS: There will be two in-class exams for the course, scheduled for Oct. 6th and Nov. 12th.

FINAL EXAM: The final exam is scheduled for Dec. 15th, 3:00-6:00 pm.

GRADING

Problem Sets	20%
Midterm I	25%
Midterm II	25%
Final Exam	30%

For each student, grades will also be calculated by taking the worst midterm score as 10% and the final as 45%. The best overall score will be used.

CHEM 103 Fall 2015: LECTURE SCHEDULE (ALL DATES ARE APPROXIMATE)

Lecture	Date	Topic
1	Aug 27	Course Introduction and A Brief Overview of Bioinorganic Chemistry
2	Sept 1	Quantum Numbers and the Periodic Table
3	Sept 3	Electronic Structure of the First-Row d-Transition Metals
4	Sept 8	Survey of Basic Ligand Types
5	Sept 10	Coordination Geometries, Oxidation States and the "18 Electron Rule"
6	Sept 15	Biomolecules as Ligands for Metal Ions, with Examples in Signaling and Regulation
7	Sept 17	Color and Molecular Orbital Theory - I
8	Sept 22	Color and Molecular Orbital Theory - II
9	Sept 24	Magnetism and Crystal Field Theory
10	Sept 29	Ligand Spectrochemical Series
11	Oct 1	Mechanisms of Ligand Substitution
	<i>Oct 6</i>	<i>First In-Class Midterm</i>
12	Oct 8	Stability Constants and the Chelate Effect
13	Oct 13	Electrochemistry as Applied to the Study of Biomolecules
14	Oct 15	Chemical Properties and Biological Roles of Oxygen
15	Oct 20	Oxygen Transport in Biological Systems
16	Oct 22	Redox Cofactors
17	Oct 26	Oxidation of Organic Metabolites by Iron-Based Enzymes
18	Oct 29	Protection From Reactive Oxygen Species
19	Nov 3	Iron Uptake and Metal Ion Transport
20	Nov 5	Copper In Oxygen Transport and Biocatalysis
21	Nov 10	Pathways for Electron Transfer in Biological Systems
	<i>Nov 12</i>	<i>Second In-Class Midterm</i>
22	Nov 17	Metal Ions in Photosynthetic Systems I: Energy Capture and Electron Transport
23	Nov 19	Metal Ions in Photosynthetic Systems II: Oxygen Evolution and Carbon Fixation
24	Nov 24	Nitrogen Fixation and Metabolism
25	Dec 1	The Chemistry of Vitamin B ₁₂
26	Dec 3	Metal Ions in Medicine: Toxins, Tracers, and Treatments
	Dec 15	FINAL EXAM: 3-6 pm