

CHEM 4735/8735 Bioinorganic Chemistry
Spring 2017

TTh at 11:15 am-1 pm in Smith 111

Professor Lawrence Que (Smith 343; 5-0389; larryque@umn.edu)

Bioinorganic chemistry is a subject at the interface between biochemistry and inorganic chemistry. Thus it requires one to become familiar with the terminologies of both fields. Students in the course should do so by reading appropriate chapters in a basic biochemistry text (to learn about amino acid nomenclature, basic protein and nucleic acid structure, and enzyme kinetics) and in an advanced undergraduate inorganic chemistry text (to learn about electron counting, oxidation and spin states, and trends across the first transition metal series). Strongly recommended text: Bertini, Gray, Stiefel, and Valentine (eds.),

Biological Inorganic Chemistry, Structure and Reactivity, 2007 (**BGSV**) (Walter reserve)

Books on bioinorganic chemistry that may be helpful include:

Lippard and Berg, *Principles of Bioinorganic Chemistry* (Walter reserve)

Cowan, *Inorganic Biochemistry, An Introduction*, 2nd ed. (Walter reserve)

Kaim and Schwederski, *Bioinorganic Chemistry. Inorganic Elements in the Chemistry of Life*, 2nd ed. (Walter reserve)

Que (ed.), *Physical Methods in Bioinorganic Chemistry* (Walter reserve)

Other useful resources are:

May 1994 issue of Chemical Reviews devoted to oxygen chemistry

Nov 1996 issue of Chemical Reviews devoted to bioinorganic enzymology

Feb 2004 issue of Chemical Reviews on bioinorganic modeling chemistry

Comprehensive Coordination Chemistry II Vol 8 (**CCC2-8**)

Grades will be based on:

- 5 2-page assigned essays to be submitted prior to planned classroom discussions of designated topics (as indicated by bolded dates in the syllabus) (75 pts)
and participation in classroom discussion (50 pts)
- two 2-hr exams on March 21 and May 4 (100 pts each)
- a 30-min oral presentation on May 11 1030 am-1230 pm (75 pts for grad students only)

Course material and schedule

1/17 Intro: Recurring motifs in bioinorganic chemistry	BGSV X.1-3; CCC2-8.2-4; Science 1997 , 277, 653-659 (FeS); JBIC 2000 , 5, 2-15 (FeS); JBIC 2000 , 5, 16-19 (CuS); JBIC 2000 , 5, 551-559 (CuS)
1/19,24 Introduction to EPR, Mossbauer, resonance Raman, and XAS spectroscopies	Que, Chapter 2,3,6,9
1/26, 1/31 electron transfer proteins: hemes, FeS clusters, cupredoxins	BGSV X.1-3; CCC2-8.2-4; Science 1997 , 277, 653-659 (FeS); JBIC 2000 , 5, 2-15 (FeS); JBIC 2000 , 5, 16-19 (CuS); JBIC 2000 , 5, 551-559 (CuS)
2/2, 2/7 (0.5) Superoxide processing (Cu/Zn, Fe, Mn, Ni)	BGSV XI.1&2; CCC2-8.19, CR104, 840-845,
2/7,9 O ₂ binding to Mb/Hb (0.5) and hemerythrin (1)	BGSV XI.4 and XI.4.4.3; CCC2-8, 244-255; CR94, 715-726; JBIC 1997 , 2, 544-552; ACIE 2001 , 40, 2782-2807
2/14,16 O ₂ binding and activation at CuCu and heme-Cu active sites	BGSV XI.3 and XI.5; CCC2-8.10-12; L&B Chap 11
2/21,23 O ₂ activation at heme: peroxidases and cytochrome P450	BGSV XI.6-8; CR96, 2841-2887; CR104, 1077-1133; JBIC DOI:10.1007/s00775-016-1430-3
2/28 3/2 O ₂ activation at mono Fe and Cu active sites	CR104, 1013-1045; CR104, 1047-1076; JBIC 2017 , 22, xxx; CR104, 939-986; CCC2-8.16
3/7,9 Metalloradical enzymes	
3/14,16 Spring break 3/21 Test#1	
3/23 Fe ₂ and FeMn ribonucleotide reductases	BGSV XIII
3/28,30 H ₂ metabolism	BGSV XII.1
4/4 no class ACS meeting	
4/6,11,13 N ₂ fixation	BGSV XII.3
4/18 C ₁ metabolism	BGSV XII.2
4/20,25 Water oxidation	BGSV X.4
4/27, 5/2	No class
5/4 Test#2	
5/11 presentations 1030 am	

Chem 8735 Oral Presentation
Spring 2017

The last requirement for the course is an oral presentation in the first week of May. The presentation should be about 30 min long (20-25 slides) so that there will be sufficient time for discussion with the class. The presentation should contain both biological and inorganic aspects of the subject, although the ratio of the two is up to your discretion.

Since this exercise is meant to demonstrate your ability to collect information, digest it, and present it to the class clearly, you should plan to meet with me before your presentation date to discuss your Power Point presentation. On the day before the discussion, e-mail me a pdf file of your presentation (2 slides per sheet .ppt style) to make a handout for the class. This handout should also include at least one or two articles you would highly recommend as resource materials for your talk.