

## SYLLABUS

### CHE 600 (section M003) Bioinorganic Chemistry (3 credits) Fall 2017

Time: 9:30 am – 10:25 am Monday, Wednesday, and Friday.

Location: Life Science Building 126

Prof. Olga Makhlynets

Office: 2-016A CST, Phone: 315-443-1979, e-mail: [ovmakhly@syr.edu](mailto:ovmakhly@syr.edu)

Office hours: Wednesday and Friday 10:30 am – 11:30 am and by appointment

#### Textbook

Stephen J. Lippard, Jeremy M. Berg: **Principles of Bioinorganic Chemistry**. University Science Books, 1994.

Communication of important course announcements and distribution of some handouts will be done through *Blackboard*.

#### Summary

This course will present an inorganic chemist's view on the role of metal ions in biological systems. Bioinorganic chemistry is a rapidly developing area of research and is by no means a mature subject. It is impossible to cover all aspects of bioinorganic chemistry in a one-semester course. The topics of the course are designed to communicate general directions of bioinorganic research and provide foundation to understand the role of metals in biology. Discussions of *recent* papers relevant to the course will be held through the course. Students are encouraged to suggest papers of their choosing. You will also have a chance to influence the content of the course through Student Presentations. You are welcome to suggest topics for Case Studies. Some background in inorganic chemistry and biochemistry is assumed; critical concepts will be reviewed at the beginning of the class.

#### Grading

Graded homework – 20%, midterm exam – 25%, research paper and presentation – 25%, final exam – 25%, participation in class discussion – 5%.

There will be two types of assignment in this course: problem sets and reading assignments based on primary publications.

Midterm will cover the basic material.

Final exam will ask for your creativity: you may be asked for example to propose the mechanism of action of newly found metalloenzyme, or to design a model for its active site, or to interpret the results of metal-binding studies.

#### Regrades and Missed Exams

Only written regrade requests will be accepted. Regrade requests will be only entertained if submitted within 48 hours after the exams have been returned. Briefly state your reason(s) for requesting the regrade. The regrade request will be considered carefully but the entire exam will be regraded

regardless of whether additional points are awarded on the request. Only examinations that were **written in ink** will be accepted for regrades.

If an exam is missed, the default mechanism is a score of **0** for that exam. In some extraordinary cases (including but not limited to medical emergency, etc.) alternative arrangements can be made. An oral or written (as the circumstance may warrant, and at my discretion) make-up exam will be administered.

### **Problem Set Policy and Structure**

Problems sets have to be handed in at the beginning of lecture on the day they are due. The answer key will be given out at the end of class. **NO LATE PROBLEM SET WILL BE ACCEPTED** without medical or dean's excuse. You can turn them in earlier in my mailbox in the Chemistry Department Office.

The problem sets are to be unique work of the individual turning in the problem set. This **DOES NOT** preclude working with other people on the problem set. The problems will be difficult and working on them with others is an important study technique. However, each person's work should not be a carbon copy of the work of their studying partner(s).

The problem sets are integral in your understanding of the material. There is a direct correlation between exam scores and problem set scores.

### **Academic Integrity**

The Syracuse University Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the Policy and know that it is their responsibility to learn about general academic expectations with regard to proper citation of sources in written work. The policy also governs the integrity of work submitted in exams and assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. Serious sanctions can result from academic dishonesty of any sort.

### **Religious Holidays observation**

Students will have update access to the notification form through MySlice beginning the first day of classes. It will be available through the end of the second week of class. Students must notify the instructor by the end of the second week of classes when they will be observing their religious holiday(s) to make the appropriate arrangements.

### **Students with Disabilities**

Students who are in need of disability-related academic accommodations must register with the Office of Disability Services (ODS), 804 University Avenue, Room 309, 315-443-4498. Students with authorized disability-related accommodations should provide a current Accommodation Authorization Letter from ODS to the instructor and review those accommodations with the instructor. Accommodations, such as exam administration, are not provided retroactively; therefore, planning for accommodations as early as possible is necessary.

**CHE 600 Bioinorganic Chemistry**  
**Tentative Schedule**

Monday, August 28	Overview of bioinorganic chemistry.
Wednesday, August 30	Basic principles of coordination chemistry.
Friday, September 1 <sup>st</sup>	Basic principles of coordination chemistry.
Wednesday, September 6	Proteins as ligands for metals.
Friday, September 8	Nucleic acids and other metal-binding biomolecules.
Monday, September 11	Physical methods in bioinorganic chemistry (EPR, NMR).
Wednesday, September 13	Physical methods in bioinorganic chemistry (Mössbauer, CD).
Friday, September 15	Physical methods in bioinorganic chemistry (IR, UV-vis, Raman).
Monday, September 18	Biological role of iron.
Wednesday, September 20	Biological role of copper.
Friday, September 22	Biological role of manganese.
Monday, September 25	Biological role of nickel and cobalt.
Wednesday, September 27	Metal uptake and transport.
Friday, September 29	Control of metal concentration in the cell.
Monday, October 2	Self-assembly of metal clusters.
Wednesday, October 4	Calcium in cell signaling. <b>Paper topic due.</b>
Friday, October 6	Zinc: Lewis acid and gene regulator.
Monday, October 9	Metal-ion binding to DNA.
Wednesday, October 11	Selection and insertion of metal ions into proteins.
Friday, October 13	Pre-exam review.
Monday, October 16	<b>Midterm exam</b>
Wednesday, October 18	Electron-transfer proteins.
Friday, October 20	Substrate binding and activation by metal ions.
Monday, October 23	Dioxygen transport (hemoglobin and hemocyanin).
Wednesday, October 25	Oxygen atom transfer reactions (heme).
Friday, October 27	Oxygen atom transfer reactions (non-heme).
Monday, October 30	Protective metalloenzymes.
Wednesday, November 1	Protein tuning of metal properties.
Friday, November 3	Magnesium-dependent enzymes.
Monday, November 6	Molybdenum, Tungsten, Vanadium and Chromium.
Wednesday, November 8	Nitrogenase.
Friday, November 10	Metal-ion concentration gradients.
Monday, November 13	Metals in brain and their role in neurodegenerative diseases.
Wednesday, November 15	Biomineralization (ferritin).
Friday, November 17	Metalloenzymes in the reduction reactions.
Monday, November 27	Metalloenzymes with radical intermediates.
Wednesday, November 29	Photosystem II.
Friday, December 1	Student presentations.
Monday, December 4	Student presentations.
Wednesday, December 6	Student presentations.
Friday, December 8	<b>Final exam</b>