

Chemistry 510

Special Topics in Inorganic Chemistry

Professor J. Kovacs

Wed & Fri 9:00–10:20 am, Bagley 331A

Canvas Site: <https://canvas.uw.edu/courses/1633124>

Course Description:

This course will explore the interdisciplinary field of bioinorganic chemistry. Approximately half of all biological enzymes take advantage of the unique properties of transition metals to catalyze reactions critical to life. We will explore the metal ion (M^{+n}) properties important for catalytic activity, how Nature selects the correct M^{+n} for a given function, and how M^{+n} catalytic sites can be spectroscopically probed. Spectroscopic methods to be discussed include Mössbauer, EPR, XAS, EXAFS, and resonance Raman. The thermodynamics and kinetics of proton-coupled electron transfer (PCET) will be discussed in the context of H-atom transfer (HAT) and biological substrate oxidation. Dinitrogen activation and reduction, as well as photosynthetic H_2O oxidation will also be explored.

Instructor: Professor J. A. Kovacs
Office Hours: By appointment
e-mail: Kovacs@uw.edu

Required Text: Lecture Notes and Journal Articles

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Recommended Texts:

- "Physical Methods in Bioinorganic Chemistry", Lawrence Que, Jr., Ed.; University Science Books, 2000, ISBN 978-1-891389-68-9.
- "Electron Paramagnetic Resonance", Chechik, Carter, Murphy; Oxford University Press, ISBN 978-0-19-872760-6.
- "XAFS for Everyone", Calvin; CRC Press, ISBN 978-1-4398-7863-7.
- "Inorganic Electronic Structure and Spectroscopy", E. I. Solomon, and A. P. B. Lever, Eds.; Vols 1 and 2; Wiley-Interscience, 1999.

Workshop Videos:

- Penn State runs a regular workshop that covers spectroscopic methods used in bioinorganic chemistry. As a supplement to course lectures, you will be asked to watch selected videos, and answer questions about the videos as part of your homework set. <https://sites.psu.edu/bioinorganic/workshops/>
- Links to specific videos will be posted on the course website and on the Homework sets.

Grades:

Graded work in this course will consist of

- **seven homework sets**
- a 15-20 page **final paper**
- a 15-minute **final oral presentation**

| | <u>Points</u> |
|-------------------------|---------------|
| Problem Sets | 350 |
| Final Paper | 400 |
| Final Oral Presentation | <u>200</u> |
| Total | 950 |

Final Paper:

- A list of possible topics for your final papers with guidelines will be handed out during the 3rd week of classes.
- The **final paper** will be **due** on Wed **June 7**.
- A **topic** for your paper should be selected by Mon, **May 1**.
- A **brief paragraph**, which summarizes your knowledge-to-date on the topic chosen for your paper, will be due on Monday, **May 15**.

Oral presentations:

- **Oral presentations** are scheduled for **May 31** and **June 2**.
- Your final oral presentation should summarize the key points of your midterm paper.

Homework sets:

- For the **homework sets**, you will be asked to watch selected videos from the Penn State bioinorganic workshop, and answer questions about the videos as part of your homework set.
- Links to the video will be handed out, along with the homework questions, at least one week before the homework is due.

Reading assignments:

Weekly reading assignments will be announced on Wednesdays at the beginning of class. Journal articles will examine selected topics in more depth.

Important Deadlines and Events:

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|----------------|---------------------------------------|
| Mon, May 1 | Selected Topic for papers due |
| Mon, May 15 | Paragraph summarizing paper topic due |
| May 31, June 2 | Oral Presentations |
| Wed, June 7 | Final Paper due |