

CHM 1263-S 2021: BIOINORGANIC CHEMISTRY
COURSE SYLLABUS: Winter 2021

I CONTACTS

INSTRUCTOR



Prof. Robert H. Morris

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Office: Davenport Labs, room 344, 80 Saint George St.

Online student hours: 4-5 pm ET Mondays Jan.-Apr.

Research: <https://www.chemistry.utoronto.ca/people/directories/all-faculty/robert-morris>

II COURSE OVERVIEW

COURSE DESCRIPTION:

Essential elements, harmful elements, naturally occurring ligands, chelating ligands, ligands used in chelate therapy, functions of metals, principles of bioinorganic coordination chemistry, template effect, spontaneous self-assembly, properties of biological molecules, transport of metal ions, control and utilization of metal-ion concentrations, DNA binding, enzymes exploiting acid catalysis, developing artificial hydrolytic metalloenzymes, zinc fingers, electron transfer and energy sources for life, iron-sulfur proteins, Mossbauer spectroscopy, hydrogenases, nitrogenase, atom and group transfer chemistry, redox enzymes, biomineralization, metals in medicine, radiopharmaceuticals

STUDENT LEARNING OUTCOMES:

At the end of the course, successful students will be able to:

1. Recognize how the fundamental principles of inorganic chemistry apply to bioinorganic systems.
2. Appreciate how Nature acquires and places trace elements for use in life processes.
3. Understand the application of specialized methods used to study bioinorganic molecules.
4. Discuss the chemistry and biology of specific bioinorganic systems and model metal complexes.

PREREQUISITE COURSES:

Transition metal chemistry course.

Exclusions: Previous bioinorganic chemistry course

Strongly Recommended: Biochemistry, advanced inorganic chemistry

READINGS:

Course notes from the QUERCUS website at [CHM1263H S LEC0101 20211:Bio-inorganic Chemistry \(utoronto.ca\)](https://www.chemistry.utoronto.ca/CHM1263H%20LEC0101%2020211/Bio-inorganic%20Chemistry)

Textbook: Biological Inorganic Chemistry , 2nd ed., Robert R. Crichton, 2012 (available on-line through the UoT library:

<http://go.utlib.ca/cat/8390276>). Note that the Microsoft Edge browser may not work – install and use the Firefox or Chrome browser. Safari should work.

III HOW THE COURSE IS ORGANIZED

This course is organized by:

- two classes each week (Tues. and Thurs. at 4:00 pm ET) starting on January 14, 2020 (CHM1263S1 LEC0101) *on-line only using Bb Collaborate at* [CHM1263H S LEC0101 20211:Bio-inorganic Chemistry \(utoronto.ca\)](http://CHM1263H%20LEC010120211%3ABio-inorganic%20Chemistry%20utoronto.ca)

In a fully online course there is no in-person scheduled classroom time. Over the course of each week, you are expected to watch and take notes on the classes uploaded, read the relevant sections in the textbook and make note of questions to ask the instructor and answer the assigned questions. You must answer at the course website the quiz questions and the midterm tests as instructed according to the due dates. Recordings of the classes will be available to view asynchronously. It is recommended that you have a computer with a microphone and camera in order to participate in online activities. The list of topics in the Course Schedule below is subject to change due to unforeseen circumstances

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

WINTER DATES	WEEK	TOPICS
Jan. 12-28	1,2,3	Introduction, essential elements, biocoordination chemistry, metal ion transport
Feb. 2 Feb. 2 – Feb. 11	4,5	Quiz 1 due on Feb. 2 O ₂ transport, non-redox proteins, electron carriers
Feb. 15-19		Winter reading week
Feb. 23 Feb. 23,25	6	Midterm Assignment due Feb. 23 Iron sulfur proteins, cytochromes.
Mar. 2 Mar. 2, 4	7	Quiz 2 due on Mar. 2 Copper blue proteins
Mar. 9-18 Mar. 16	8,9	Nitrogenase, respiration Abstract of presentation due Mar 16
Mar. 23-Apr 1 Mar. 30	10,11	Photosynthesis, metals in medicine. Quiz 3 due on Mar. 30
Apr. 5, 7 Apr. 5-9	12	Student presentations (final assignment) Virtual poster session (final assignment)
Apr. 9		Classes end

IV EVALUATION/GRADING SCHEME

QUIZZES (three in total, best two) worth 10% each*

MIDTERM ASSIGNMENT (due Feb. 25) worth 25%*

PRESENTATION ABSTRACT (due Mar. 16) worth 5%

STUDENT PRESENTATION FINAL ASSIGNMENT (virtual poster session) due Apr. 5-9 worth 45%

STUDENT PARTICIPATION worth 5%

*Quizzes and assignment are all open book but should be completed without conferring with others.

MARK BREAKDOWN

Quizzes: $2 \times 10\% = 20\%$ of final grade

Midterm assignment: 25% of final grade

Presentation abstract: 5% of final grade

Presentation final assignment: 45% of final grade

Student participation: 5%

Total: 100%

Note: if an unexpected technical issue occurs with a university system (e.g., Quercus services, network outage) that affects availability or functionality, it may be necessary to revise the timing or weighting of the assessments.

V COURSE POLICIES

- We will respond to email within 24 h on weekdays.
 - All members of CHM1263 agree to fulfill the University's statement regarding a positive learning environment: *"The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities."*
 - This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session. Course videos and materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor. For questions about recording and use of videos in which you appear please contact your instructor.
 - Deadlines for assignment submissions are given in section III above. 10 % will be deducted daily for late assignments, quizzes and tests.
 - All assignments will be submitted at the QUERCUS website.
 - If you believe that an error has been made in the marking of your work please contact Professor Morris.
 - If you miss classes, assignments or tests for medical reasons please inform Professor Morris immediately by email.
 - No extensions or make-up work will be considered.
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VI TECHNOLOGY REQUIREMENTS

Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: <https://www.vicprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/>

Advice for students more broadly regarding online learning is available here: <https://onlinelearning.utoronto.ca/getting-ready-for-online/>

This course requires the use of computers, and of course sometimes things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, broken printers, lost or corrupted files, incompatible file formats, and similar mishaps are common issues when using technology, and are not acceptable grounds for a deadline extension.

VII INSTITUTIONAL POLICIES AND SUPPORT

ACADEMIC INTEGRITY

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In assignments and laboratory reports:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <https://www.academicintegrity.utoronto.ca/>).

Use of Turnitin

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

COPYRIGHT

If a student wishes to copy or reproduce lecture presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available here:

<https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/>

ACCESSIBILITY NEEDS

Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact [Accessibility Services](https://studentlife.utoronto.ca/departments/accessibility-services/) (<https://studentlife.utoronto.ca/departments/accessibility-services/>) as soon as possible.

ADDITIONAL SERVICES and SUPPORT

The following are some important links to help you with academic and/or technical service and support

- General student services and resources at [Student Life](https://studentlife.utoronto.ca/) (<https://studentlife.utoronto.ca/>)
- Full library service through [University of Toronto Libraries](https://onesearch.library.utoronto.ca/) (<https://onesearch.library.utoronto.ca/>)
- Resources on conducting online research through [University Libraries Research](https://onesearch.library.utoronto.ca/research) (<https://onesearch.library.utoronto.ca/research>)
- Resources on academic support from the [Academic Success Centre](https://studentlife.utoronto.ca/departments/academic-success/) (<https://studentlife.utoronto.ca/departments/academic-success/>)
- Learner support at the [Writing Centre](https://writing.utoronto.ca/) (<https://writing.utoronto.ca/>)
- Information for [Technical Support/Quercus Support](https://q.utoronto.ca/courses/46670/) (<https://q.utoronto.ca/courses/46670/>)
- **Recognized Study Groups (RSG)** at <https://sidneysmithcommons.artsci.utoronto.ca/recognized-study-groups/> are voluntary, peer-led study groups of 3 – 6 students enrolled in the same course. They're available for all A&S courses and are now fully online. In addition to supporting students' study habits and academic success, RSGs also encourage student participants to be socially connected with their peers. Last year, over 2,000 A&S students participated in RSGs for courses spanning all streams and class sizes.
- **Meet to Complete** <https://sidneysmithcommons.artsci.utoronto.ca/meet-to-complete/> are online drop-in study sessions held exclusively for A&S undergrads. Offered multiple times per business day and led by trained A&S student-staff, these study sessions help students to stay motivated and productive by offering daily goal-setting and the opportunity to study alongside their A&S peers.