

CHEM 2501 (0.50) for Term (Winter) 2025

Introduction to Inorganic and Bioinorganic Chemistry

Course Instructor: Kieran Lawford

How to address me: Kieran

Gender Pronouns: (he/him/his)

Email: kieranlawford@cunet.carleton.ca or
kieranlawford@cmail.carleton.ca

Student Hours: By appointment or TBD

Office Location: Room 414, Steacie Building

Class Location: Room 238, Tory Building

Class Times: Tue Thu, 16:35 - 17:55

Prerequisites: CHEM 1001/1002 or equivalent

Preclusions: CHEM 3506

Department/Unit: Chemistry

Course TAs:

Victoria Pham-Tran (she/her/hers)

(victoriaphamtran@cmail.carleton.ca)

Topics Covered and Learning Outcomes

Course Description

The basic concepts of inorganic chemistry, including the origins of elemental properties, simple theories of bonding, intermolecular forces, main group and transition metal chemistry, coordination chemistry. Inorganic ions in biochemistry, including ion transport and storage, oxygen carriers and hydrolases, redox proteins.

Topics to be Covered

Detailed list of topics to be covered.

1. Atomic Orbitals

- Historical Context of the Atom
- Wavefunctions
- Atomic orbitals
- Quantum Numbers

2. Periodic Trends

- The periodic table, electronic configurations
- Elemental properties of electron affinity, ionization energy, atomic radius
- Inert pair effect
- Hard and soft atoms and polarizability
- Calculations of effective nuclear charge

3. Bonding models:

- Lewis Dot Structure analysis
- Valence Shell Electron Pair Repulsion theory

- Valence Bond theory
- 4. Molecular Orbital Theory
 - Bonding and Antibonding Orbitals
 - Symmetry
 - π overlap
 - Secondary mixing
 - Photoelectron Spectroscopy
- 5. Groups 1 and 2
 - Hydrogen, Alkali Metals, and Alkali Earth Metals
 - Reactivity and Uses
 - Passivation
- 6. Coordination Chemistry
 - Ligands
 - Lewis Basicity and Acidity
 - Octet Rule
 - Cis/ Trans Isomers
 - Nomenclature
 - Denticity
- 7. Bio-inorganic Chemistry
 - Metals in Biology
 - Amino Acids as Ligands
 - Iron in the Body
 - CO and Oxygen binding
- 8. Metals and Other Crystals
 - Unit Cells
 - Holes
 - Fullerenes
 - Binary Examples

Important dates and deadlines can be found here:

<https://carleton.ca/registrar/registration/dates/academic-dates/>, including class suspension for fall, winter breaks, and statutory holidays.

Assessments

Grade Breakdown

COMPONENT	GRADE VALUE	DATE
ASSIGNMENTS	40%	End of each week (more details to follow)
MIDTERM	30%	Tentatively February 13, 2025
FINAL EXAM	30%	TBD

Late and Missed Work Policies

Late Work

Penalty of 10% for every day that the assessment is not handed in, up to 4 days, then a zero is given.

Missed Work

Missed work is given a zero, unless a valid reason/excuse is given. For example, a family or health emergency. This form is used for short-term missed work [academic considerations form](#).

Long-term missed work may still be accepted if a valid excuse/reason is given. See the following form: [longer-term accommodation](#).

Learning Material(s) and Other Course/Lab-Related Resources

Learning Material	Options for Purchasing (e.g. <i>Bookstore, Used, etc.</i>)	Approximate Cost
“Inorganic Chemistry” (5th e.d.) by Miessler, Fischer, and Tarr	Bookstore, Amazon, used, etc...	\$174.75 to \$232.75 (this is an optional textbook)
Supplied journal articles from peer-reviewed sources	n/a	n/a

Students are not required to purchase textbooks or other learning materials for this course.

Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>).

Statement on Chat GPT/Generative AI usage

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy.

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

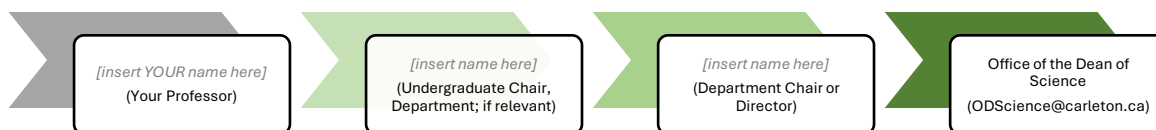
Mental Health and Wellness:

As a student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. For more information, please consult <https://wellness.carleton.ca/>.

Student Concerns

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):

Note: You can also bring your concerns to Ombuds services.



Assistance for Students

Writing and Learning Support: <https://carleton.ca/csas/support/>

Peer Assisted Study Sessions (PASS): <https://carleton.ca/csas/pass/>

Math Tutorial Centre: <https://carleton.ca/math/math-tutorial-centre/>

Science Student Success Centre: <https://sssc.carleton.ca/>