Chemistry 3840: Inorganic Chemistry II
Winter 2026

Professor: Dr. P. G. Hayes
Office: SA8448
E-mail: p.hayes@uleth.ca
URL: http://people.uleth.ca/~p.hayes/
Phone: (403) 329-2313
Office Hours: 13:30 – 15:30 Wednesdays (or by appointment)

Class URL: https://people.uleth.ca/~p.hayes/Chem%203840%20Web%20Page%202025/index%20-%20Chem%203840.htm

Email: Due to the complex nature of the subject, it is not possible to properly answer questions about course material via email. Thus, all such inquiries should be made in person. Only emails of an administrative nature (*e.g.* exam absence, appointment set-up, *etc.*) will receive responses. Grades will not be given out by email.

Credit Hours: 3.0

Pre-requisites: Chemistry 3830

Course Subject: Chemistry of the elements with an emphasis on transition metals and their inorganic and organometallic compounds. Laboratory experiments illustrate the lecture topics with an emphasis on chemical synthesis and characterization.

Lectures: MW at 12:00–13:15 in D631

Labs: Thursdays, 15:00–18:45 in SA8406. The laboratory portion of the course is compulsory and commences January 15th with an introduction and check-in. The details of laboratory policies and operation will be addressed at that time. **Both the lab and lecture portions of the course must be passed independently** (*i.e.* A good lab mark cannot raise a failing lecture grade (or vice-versa). The laboratory manual contains information pertinent to the laboratory which you must read. It will be distributed via e-mail (.pdf format). It is imperative reading – it contains information pertinent to the laboratory which you must read and respond to. It is a requirement that all students wear a lab coat, safety glasses (contact lenses beneath safety glasses are not acceptable), adequate footwear (sandals are not permitted) and have fully covered legs (shorts and skirts and not permitted). A deposit of $15.00 is required in order to obtain a locker key. Please pay at the cashier's office and bring the token to the laboratory. Lab books and coats can be purchased at the University Book Store. Please ensure that these details are dealt with prior to the beginning of your first lab period. Refer to the lab manual for complete details on these and other topics relating to the laboratory component of Chemistry 3840.

Attendance Policy: Attending the laboratory component of this course is mandatory, and you will be assigned a grade of 0 for any lab missed without a valid reason. Please see your lab manual for the correct protocol to make up a lab that was missed due to illness, etc. It is strongly recommended that you attend the lectures as all material discussed in lectures is examinable, and not all course material is covered in the text. Students who do not attend class regularly and punctually tend to fail this course.

Classroom Etiquette: Classes begin promptly at 12:00 PM. Students must be in their seats and ready to begin at this time. Late arrivals interrupt the classroom flow and disrupt the learning of fellow students. Cell phones and other entertainment devices are not to be used and must be out of sight during class time without exception.

Artificial Intelligence: The use of generative artificial intelligence tools (genAI) or apps, including tools like ChatGPT and other AI writing or coding assistants, is strictly prohibited. This policy applies to all aspects of the course, including laboratory reports. Failure to comply will be considered academic misconduct and will result in an assigned grade of F in the course.

Special Needs Students: Please contact the Disabilities Resource Office to arrange for accommodations. Also, feel free to inform your instructor of your special needs in order for you to have a productive learning experience.

Exams:	Midterms:	Wednesday, February 11th (in class)
		Wednesday, March 25th (in class)
	Final:	TBA

Note: Failure to attend an exam without a valid reason (*e.g.* illness) will earn a grade of zero. Notify Professor Hayes **as soon as possible** if you are going to miss an exam. ***If any course component is missed for a valid reason, that portion of the course grade will be shifted to the final examination.***

IMPORTANT NOTE: Exams will cover all course material including demonstrations, practice problems, assignments, laboratory experiments and assigned readings up to the end of the preceding lecture, unless otherwise stated. They are **cumulative**, covering all material presented in lecture, assignments, *etc.* throughout the semester. Assignments and suggested problems are intended as partial preparation for exams. Failure to put forth effort is perilous.

Assignments:	#1	To be assigned: Wednesday, January 28th	Due: Wednesday, February 4th
	#2	To be assigned: Wednesday, March 11th	Due: Wednesday, March 18th
	#3	To be assigned: Wednesday, April 1st	Due: Wednesday, April 8th

Note: All assignments are due at the beginning of class. Late assignments will not be accepted (a grade of 0 will be given).

Recommended Textbook:

- M. Weller, J. Rourke, F. Armstrong, S. Lancaster, T. Overton *Inorganic Chemistry*, *8th Edition*, Oxford, 2025. ISBN: 978-0-19-8866916.

*Previous editions (5th, 6th and 7th editions are recommended) of the textbook may be used, but may lead to inconvenience due to material rearrangement.

Additional Useful References:

- A. F. Hollemann, E. Wiberg, *Inorganic Chemistry*, Academic Press, San Diego, 2001. ISBN: 0123526515, [QD 151.3 W5313 2001].
- G. L. Miessler, D. A. Tarr, *Inorganic Chemistry*, *3rd Ed.*, Prentice Hall, Upper Saddle River, NJ, 2004. ISBN: 0130354716, [QD 151.3 M54 2004].
- J. E. Huheey, E. A. Keiter, R. L. Keiter, *Inorganic Chemistry: Principles of Structure and Reactivity*, *4th Ed.*, HarperCollins, New York, 1993. ISBN: 006042995X, [QD 151.2 H84 1984].
- F. A. Cotton, G. Wilkinson, P. L. Gauss, *Basic Inorganic Chemistry*, *3rd Ed.*, Wiley, New York, 1995. ISBN: 0471505323, [QD 151.2 C691 1995].
- F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann, *Advanced Inorganic Chemistry*, *6th Ed.*, Wiley, New York, 1999. ISBN: 0471199575, [QD 151.2 H84 1984].
- C. E. Housecroft, A. G. Sharpe, *Inorganic Chemistry*, *2nd Ed*., Pearson Education, Harlow, 2004. ISBN: 0130399132, [QD 151.2 H68 2005].
- N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements, 2nd Ed.*, Butterworth-Heinemann, Burlington, 2002. ISBN: 0750633654, [QD 466 G74 1997].

Additional Useful Materials:

- It is highly recommended that students obtain a molecular model kit. These kits are permitted for all assignments and exams. Model kits can be purchased from the Chemistry and Biochemistry Undergraduate Society (Contact Dr. Patenaude in E782 – $30.00). In addition, the University Book Store sells a more expensive, alternate model kit (~$80.00).

Evaluation Mechanisms:

- Laboratory (25%). Note: ***All experiments must be performed (and submitted before the end of the course) in order to pass the laboratory component, and hence, the entire course***. A grade of 50% constitutes a pass in the laboratory component.
- Assignments (10%)
- 2 Midterms (25%; First Midterm: 10%, Second Midterm: 15%)
- 1 Final exam (40%)

Conversion of Overall Percentage Grade to Letter Grade

The normal overall percentage grade to letter grade conversion will take place according to the following table:

A+	91.00% – 100%
A	85.00% – 90.99%
A–	80.00% – 84.99%
B+	76.67% – 79.99%
B	73.34% – 76.66%
B–	70.00% – 73.33%
C+	66.67% – 69.99%
C	63.34% – 66.66%
C–	60.00% – 63.33%
D+	57.00% – 59.99%
D	50.00% – 56.99%
F	0% – 49.99%

However, it should be noted that Prof. Hayes reserves the right to adjust the conversion table when there are multiple students who have overall percentage grades close to one another (*i.e.* when overall percentage grades for students are within 0.33% of each other) and those grades span the intended percentage to letter grade cut-off.

For example, if the following overall percentage grades were obtained:

80.97%	78.62%
80.25%	78.45%
80.13%	78.11%
79.89%	
79.75%	

the overall percentage to letter grade conversion for the bottom end of A– might be lowered from 80.00% to 79.75%.

Similarly, if the following overall percentage grades were obtained:

71.59%	70.32%
71.28%	70.19%
71.00%	70.01%
	69.73%
	69.55%
	69.42%
	69.16%
	68.91%
	68.65%

the overall percentage to letter grade conversion for the bottom end of B– might be raised to 71.00%.

The purpose of maintaining such flexibility in overall percentage grade to letter grade conversion is to provide the professor with an ability to accommodate for “natural breaks” in overall percentage grade distributions that correspond to a meaningful difference in course performance. In the event that the actual overall percentage grade to letter grade conversion deviates from the provided table, that deviation will be limited to a maximum of +/– 3.00%.

Academic Conduct: All students in the course are subject to the student discipline policy for academic and non-academic offenses in accordance with the University Calendar. Please take time to make yourself familiar with the University Academic Offence Policy.

If caught cheating on any component of Chemistry 3840 you be assigned a grade of F for the course. A letter describing the offense will be placed in your student file. Two such letters is grounds for expulsion from the university.

STUDENTS WHO CHEAT, CHEAT THEIR FELLOW STUDENTS BY DEVALUING THEIR HARD WORK, EARNED GRADES AND DEGREE. If you see someone cheating during an exam, inform the proctor in the following way: 1) Write a message on your exam paper indicating what is happening and where. 2) Raise your hand and the proctor will come over -- point out your note. The proctor will take it from there. It is often pointless to report cheating after the event.

What is plagiarism? Plagiarism is defined as the taking of someone's thoughts, writings or inventions and using them as one's own. This includes work created with the assistance of generative AI.

When writing a paper **or lab report** on a given topic, you must read up on the topic, get the necessary information and then present it IN YOUR OWN WORDS. If you use a sequence of text verbatim (*i.e.* exactly) from someone else's work, THAT IS A QUOTE and must be cited (to give proper credit to the author). If you use an idea or data from someone else's work, then that work must be cited specifically as a reference, and/or in your paper's bibliography. Beware of information that is found on the web -- it is rarely primary source information and is generally not acceptable (*e.g.* Wikipedia)

IF, IN THE COURSE OF WRITING A REPORT, YOU EXECUTE A CUT AND PASTE FROM A WEBSITE OR OTHER SOURCE (without a citation) YOU HAVE COMMITTED PLAGIARISM.

It is important to point out that there is a difference between working out answers to an assignment or a lab report with a friend and plagiarism. If, after conferring with others, what you write down is based on your own understanding of the material and **is in your own words**, then that is acceptable. If, however, you look at a friend's answer to a question, and then simply write (essentially) the same thing on your assignment (a mental cut and paste), then you have committed plagiarism (even if a few words, structures, etc. were changed). Similarly, **IF TWO OR MORE STUDENTS TURN IN IDENTICAL REPORTS/ASSIGNMENTS, THAT IS PLAGIARISM.** Accordingly, you must take care when you share work that you have completed with other students. If they take your material and plagiarize it, you are all subject to disciplinary action. If you have completed a course and loaned marked material from it to someone who is currently taking it, you will be called upon to explain your actions if this material is plagiarized. This also applies to taking marked course material and making it generally available as in a website.

PLAGIARISM IS CHEATING and is subject to discipline as described in the university policy. If you are unclear about any aspect of the student discipline policy for academic offences, refer to https://uleth.sharepoint.com/sites/Policy/Policies/Forms/AllItems.aspx?id=%2Fsites%2FPolicy%2FPolicies%2FStudent%5FCode%20of%5FConduct%5FGFC%20Approved%5FJuly%5F1%5F2025%2Epdf&parent=%2Fsites%2FPolicy%2FPolicies&p=true&ga=1

Calculator Policy:

- While calculations are not the primary focus of Inorganic Chemistry, you may still need a simple calculator. You will be informed prior to each exam whether or not you should bring your calculator. You are not allowed to store/download text to your calculator – graphing calculators are not permitted. Any calculators found to be in violation of this policy during a test will be confiscated along with the test paper; this is cheating and will be dealt with as such. **CALCULATORS WITH WIRELESS COMMUNICATION CAPABILITIES ARE STRICTLY FORBIDDEN.**

Course Contents (may be subject to change):

1.	Boron chemistry	Chapter 14
2.	Structure of simple solids	Chapter 4
3.	Coordination complexes	Chapter 7, 20
4.	Crystal field (CF) theory	Chapter 20
5.	Molecular orbital (MO) theory for transition metal complexes (ligand field theory)	Chapter 20
6.	CF and MO theory to explain magnetism, UV-Visible spectra and emission spectra	Chapter 20
7.	Introduction to organometallic chemistry • Properties and types of ligands (*e.g.* CO, N_2, phosphines, acyclic and cyclic π ligands, hydrides, dihydrogen)	Chapter 22, 24
8.	Reactivity: kinetics and activation parameters	Chapter 22
9.	Reaction mechanisms: substitution reactions	Chapter 23
10.	Reaction mechanisms: oxidative addition, reductive elimination, σ-bond metathesis	Chapter 23
11.	Reaction mechanisms: 1,1-insertions, 1,2-insertions	Chapter 23
12.	Special topics (time permitting; *e.g.* industrial homogeneous catalysis: olefin polymerization, Pd catalysis, *etc.*)	Chapter 24, 31

Winter 2026 Chemistry 3840 Schedule

Monday	Wednesday†	Thursday	Lab
Jan. 5	Jan. 7 **First Day of Classes**	Jan. 8	**No Lab period**
Jan. 12 **Last class before add/drop deadline (Jan. 13)**	Jan. 14	Jan. 15	**Lab Introduction & Check-in**
Jan. 19	Jan. 21	Jan. 22	**Multinuclear NMR Spectroscopy**
Jan. 26	Jan. 28	Jan. 29	**Multinuclear NMR Spectroscopy**
Feb. 2	Feb. 4 **Assignment #1 Due**	Feb. 5	**Lab 1a**
Feb. 9	Feb. 11 **Midterm Exam #1**	Feb. 12 **Lab #1 Outline Due**	**Lab 1b**

Feb. 16 – Feb. 20 **Reading Week – No Labs or Classes**			
Feb. 23	Feb. 25	Fe. 26 **Lab #1 Report Due**	**Lab 2a**
Mar. 2	Mar. 4	Mar. 5 **Lab #2 Outline Due**	**Lab 2b**
Mar. 9	Mar. 11	Mar. 12 **Lab #2 Report Due**	**Lab 3a**
Mar. 16	Mar. 18 **Assignment #2 Due**	Mar 19 **Lab #3 Outline Due**	**Lab 3b**
Mar. 23	Mar. 25 **Midterm Exam #2**	Mar 26 **Lab #3 Report Due**	**Lab 4a**
Mar. 30	Apr. 1	Apr. 2 **Lab #4 Outline Due**	**Lab 4b**
Apr. 6 **No Classes**	Apr. 8 **Assignment #3 Due**	Apr. 9 **Lab #4 Report Due**	**Lab Check-out**
Apr. 13 **Last Day of Classes**	Apr. 15	Apr. 17	**No Lab period**