CHM 238Y 2021: INTRODUCTORY INORGANIC CHEMISTRY
COURSE SYLLABUS: FALL 2021, WINTER 2022

I CONTACTS

INSTRUCTORS (IN ORDER OF APPEARANCE)

Prof. Datong Song (DS)
d.song@utoronto.ca
Office: Davenport Labs, room 343, 80 Saint George St.
Student hours: 4:10-5 pm Mondays Sept., Oct., Jan., Feb.
By Zoom meeting ID 839 9507 4909

Research: https://www.chemistry.utoronto.ca/people/directories/all-faculty/datong-song

Prof. Robert H. Morris (Course Spokesperson, RHM)
robert.morris@utoronto.ca
Office: Davenport Labs, room 344, 80 Saint George St.
Student hours: 4:10-5 pm Mondays Nov., Dec.
By Zoom meeting ID 839 9507 4909

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

Prof. Geoffrey A. Ozin (GAO)
g.ozin@utoronto.ca
Office: Lash Miller Labs , room 326, 80 Saint George St.
Student hours: TBA Mar., Apr.
By Zoom meeting

Research: https://www.chemistry.utoronto.ca/people/directories/all-faculty/geoffrey-ozin

PRACTICAL LAB – CHM238Y1 PRA5101, 5102, 5201, 5202

Prof. John De Backere (JD)
john.debackere@utoronto.ca
Office: Lash Miller Labs, room 223, 80 Saint George St.
Student hour: TBD in the Winter Term

TUTOR – CHM238Y1 TUT0101, 0201, 9101, 9201TBA

Graduate student Garion Hicks (GH)
garion.hicks@mail.utoronto.ca

LAB DEMONSTRATORS –
TBA

STUDENT LEARNING OUTCOMES:
At the end of the course, successful students will be able to:
- show knowledge and understanding of trends in the periodic properties of the elements and simple compounds that they form and how these relate to the underlying quantum structure of multielectron atoms.
- identify the symmetry and point group of molecules and how these are used to describe the bonding of atoms in molecules.
- show knowledge of the basic theories of bonding and how they are applied to simple molecules.
- appreciate the structures and energetics of molecular, semiconducting, and ionic solids.
- identify from their atomic structure the types of acid and bases in water and in nonaqueous solvents, and the factors that determine the strength of acid-base adducts.
- describe the coordination chemistry of transition metal ions in terms of acid-base chemistry and know the common bases (ligands) used to solubilize metal ions.
- describe common uses of acids and bases in industry, in the home and in research.
- identify oxidants and reductants and the factors that determine their electrochemical potentials.
- calculate free energies from electrochemical potentials and interpret Latimer Diagrams.
- describe common uses of oxidants and reductants in industry, in the home and in research.
- display a general knowledge and understanding of the properties, fundamental reactions and uses of significant compounds of hydrogen and the elements from groups 1, 2, and 13-18.
- demonstrate understanding of basic concepts underpinning the chemical and physical properties of solids (without much physics and mathematics) and how to orchestrate their functionality towards enabling practical applications in the real world.

PREREQUISITE COURSES:
CHM151Y/(135H, 136H) with a minimum grade of 63%.
This course assumes you have a basic understanding of first year chemistry.

This course is a *prerequisite* for the following course(s): Intermediate Inorganic Chemistry (CHM338H), Introduction to Inorganic and Polymer Materials Chemistry (CHM325H), Organometallic Chemistry and Catalysis (CHM432H), Advanced Materials Chemistry (CHM434H), and Bioinorganic Chemistry (CHM437H).

READINGS:
Course notes from the QUERCUS website at https://q.utoronto.ca/courses/236107.

Required text: Inorganic Chemistry, 5th Edition, C. Housecroft, Pearson, New York (2018). Selected topics and questions from chapters 1-20; 28 (Materials) and 29 (Trace metals of life)

Book available at the University of Toronto Bookstore
E-book available at, for example: www.Vitalsource.com

Supplemental:
Reference text for the Materials section:
Moore and Smart,https://www.routledge.com/Solid-State-Chemistry-An-Introduction/Moore-Smart/p/book/9780367135720

III HOW THE COURSE IS ORGANIZED

This course is organized by:

- two classes each week (M and W at 3:10 pm ET) starting on September 13, 2021 (CHM238Y1 LEC0101) Zoom meeting for some classes ID 83995074909 – see below.
- one tutorial for each of two sections (see below)
- one practical in-person lab (CHM238Y1 PRA5101,5102,501,5202) every week in Winter 2022 term (*activities and dates to be announced*).

Quizzes will be conducted on-line at the course website.

The list of topics in the Course Schedule below is subject to change due to unforeseen circumstances

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

FALL DATES	WEEK	TOPICS (Instructors)
Sept. 13 Sept. 15, 20, 22 Sept. 23, 24	1,2	Introduction (RHM in person and by Zoom) The Periodic Table and atoms (DS by Zoom only) First tutorial (DH in person)
Sept. 27-Oct. 8 Sept. 27	3,4	Molecular symmetry (DS in person) **QUIZ 1 due on Sept. 27**
Oct 11		Thanksgiving holiday
Oct 13	5	Molecular symmetry (DS) Bonding in diatomic molecules (DS)
Oct. 18-22 Oct. 18	6	Bonding in polyatomic molecules (DS) **QUIZ 2 due on Oct 18**
Oct. 25 Oct. 27	7	**MIDTERM TEST 1, Oct 25** Bonding in polyatomic molecules (RHM)
Nov 1-5	8	Reactions: Acids and bases (RHM)
Nov. 8-12		Fall reading week
Nov. 15 Nov. 15-Nov. 26	9,10	**QUIZ 3 due on Nov. 15** Acids and bases and non-aqueous media (RHM) Coordination compounds (RHM)
Nov. 29-Dec. 3	11	Coordination compounds (RHM)
Dec. 6 Dec. 6-Dec. 8	12	**QUIZ 4 due on Dec. 6** Reactions: Oxidation and Reduction (RHM)
WINTER DATES	**WEEK**	**TOPICS (Instructors)**
Jan. 10-19	1,2	Introduction to crystal field and ligand field theories and magnetism (DS) **IN-PERSON Labs Begin** (JD)
Jan. 24 Jan. 24 – Feb. 2	3,4	**MIDTERM TEST 2 due on Jan. 24** Descriptive chemistry and periodicity (DS)
Feb. 7 – Feb. 18	5,6	Introduction to crystal structure, metallic and ionic solids (DS)
Feb. 21-25		Winter reading week
Feb. 28 Feb. 28, Mar. 2	7	**QUIZ 5 due on Feb. 28** Introduction to solid state materials chemistry (GAO)
Mar. 7-16 Mar. 14	8,9	Bonding and electronics of solids (GAO) **QUIZ 6 due on Mar 14**

Mar. 21-30	10,11	Defects and non-stoichiometry (GAO)
Apr. 4 Apr. 4, 6	12	**MIDTERM TEST 3 due on Apr. 4** Solid state ionics (GAO)
Apr. 8		Classes end
Apr 11-29		**Final Assignment TBA**

TUTORIALS CHM238Y1 TUT0101,0201,9101,9201):
For groups TUT 0101 and TUT 9101: tutorials will be held on certain Thursdays (see the Tutorial schedule below) at 1 pm.

For groups TUT0201 and TUT9201 : tutorials will be held on certain Fridays (see the Tutorial schedule below) at 2 pm

Tutorial objectives: Questions, including those from the text, intended to encourage active learning of the material, will be assigned after each section and then taken up, when requested, by the tutor at the tutorial. Questions from students that arise from the classes and reading material will also be answered by the tutor so that the whole group can learn. These questions can form the basis of examination questions. All students must attend and participate in their assigned tutorial sections.

Tutorial schedule

Tutorial Number	TUT 0101 + TUT 9101 Thursday 1:00-2:00	TUT 0201 + TUT 9201 Friday 2:00-3:00
1	Sept. 23	Sept. 24
2	Oct. 7	Oct. 8
3	Oct. 21	Oct. 22
4	Nov. 4	Nov. 5
5	Nov. 25	Nov. 26
6	Jan. 20	Jan. 21
7	Feb. 3	Feb. 4
8	Feb. 24	Feb. 25
9	Mar. 10	Mar. 11
10	Mar. 31	Apr. 1

LABORATORY OBJECTIVES (CHM238Y1 PRA5101,5102,501,5202):
Upon completing the experiments of this course, you will be able to:
i) safely synthesize and characterize a variety of inorganic compounds using standard laboratory techniques and spectroscopic methods;
ii) apply the fundamental principles learned in lecture to explain the properties and aspects of the inorganic systems investigated;
iii) work both independently and collaboratively to interpret data and clearly/concisely communicate results using proper scientific writing through lab reports;
iv) use the scientific literature to prepare for, understand, and evaluate experimental procedures and results.

See your Quercus CHM238Y1 PRAX0X webpage for more information.

IV EVALUATION/GRADING SCHEME

QUIZZES (six in total, best five) worth 3% each*
MIDTERM TESTS (on Oct. 25, Jan. 26 and Apr. 4) worth 10% each
LABORATORY worth 30%
FINAL ASSESSMENT worth 25%
*Quizzes are all open book but should be completed within one hour without conferring with others.

MARK BREAKDOWN
Quizzes: 5 x 3% = 15% of final grade
Midterm tests: 3 x 10 % = 30% of final grade
Laboratory: 30% of final grade
Final ASSESSMENT: 25% of final grade
Total: 100%

V COURSE POLICIES

- We will respond to email within 24 h on weekdays.
- All members of CHM238 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, may be recorded on video and may 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.

VI TECHNOLOGY REQUIREMENTS

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 plagiarism detection tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool 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 tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation 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/department/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/)
- Full library service through University of Toronto Libraries (https://onesearch.library.utoronto.ca/)
- Resources on conducting online research through University Libraries Research (https://onesearch.library.utoronto.ca/research)
- Resources on academic support from the Academic Success Centre (https://studentlife.utoronto.ca/department/academic-success/)
- Learner support at the Writing Centre (https://writing.utoronto.ca/)
- Information for Technical Support/Quercus Support (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.