

Chemistry 2210 – Introductory Inorganic Chemistry – Fall 2020

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Discussion Boards: Please use these to ask questions about course content, expectations, labs etc. (include Chem 2210 in the title of any e-mails sent to me, re: accommodations and personal matters)

Every effort will be made to respond to discussion board posts and e-mails within 24 hours, with the exceptions of evenings, weekends and holidays. For example, if you e-mail Dr. Kerton at 5.00 pm on a Friday – you will probably not receive a reply until some time on Monday.

URL: <http://online.mun.ca>

Course Subject: The purpose of this course is to give you a sound and deep understanding of the underlying principles (the foundations) of inorganic chemistry. We will cover a significant portion of Part 1 of the text (Inorganic Chemistry, 7th edition, by Weller, Overton, Rourke and Armstrong, 2018). Some material covered in these chapters is review of general chemistry and possibly even high school chemistry – Dr. Kerton will NOT re-teach everything, so please study and review from the textbook (and possibly your general chemistry textbook) outside of lectures/video content.

Some book sections will be omitted and some material concerning the chemistry of s- and p-block elements, and periodic trends will be taken from the second half of the text. Some d-block metal chemistry will also be touched on (e.g. their occurrence and isolation/extraction, coordination chemistry). Therefore, it is essential that you view the videos/lectures provided online and are an active participant in online discussions, assignments and labs. If you don't watch the videos and do the exercises provided, you won't know what is included in the course this year and what is omitted! So to do well in the quizzes, you need to follow along. This course has evolved over time and each year slightly different material is covered or explained in more/less detail.

Warning: This year there are significant changes in content compared to previous years.

Lectures: These are being provided asynchronously via uploaded video. Problem sets/Exercises (examples that would normally be worked on in class) will also be provided. Notes/powerpoint slides will be provided and students should annotate these with what Dr. Kerton says, demonstrates and also with relevant content from the text book.

Labs: David Stirling is in charge of the labs (dstirlin@mun.ca)

Student hours/Weekly tutorial: We will decide on a time via a survey on Brightspace.

Prerequisites: Chemistry 1050 and 1051 (or equivalent e.g. 1010, 1011 and 1031) (If it is a while since you took these courses, please review your notes and this material especially topics such as electronic configurations, VSEPR etc.)

Course Book:

- “Inorganic Chemistry” 7th Ed. by Weller, Overton, Rourke & Armstrong, Oxford 2018
 - This book is used for all inorganic chemistry courses at MUN

Other Useful References are in the Library, and some are available electronically ☺:

- E.g. "Chemistry of the Elements" 2nd Ed. by Greenwood and Earnshaw (1st edition in the library, QD 466 G74 1984 and 2nd edition is available online via the QEII library website).
 - This 'advanced' texts might be useful for your term paper (assignment 5)

The Internet is awash with useful websites for various topics in inorganic chemistry. Please let me know of any you find particularly useful. One I go to frequently for information on a particular element is <http://www.webelements.com/> (developed by M. J. Winter). Another nice website is the ACS's special periodic table edition of C&E News: <http://pubs.acs.org/cen/80th/elements.html> These might be useful for assignment 5 (your essay on an element).

The grading scheme for the course and important dates (times are for Newfoundland):

Event/Task	Event Date/Due Date & Time	% of Final Grade
Assignment 1: ChemDraw Software	5.00 pm, October 2 nd (Fri)	5%
Assignment 2: 'The Elements' Song	5.00 pm, October 9 th (Fri)	5%
Assignment 3: Mercury Software	5.00 pm, October 26 th (Mon)	5%
Assignment 4: Infographic – Picture an Inorganic Chemist	5.00 pm, November 6 th (Fri)	5%
Assignment 5: Your Element Essay	5.00 pm, December 4 th (Friday)	5%
Assignment 6: Participation	5 or more interactions on discussion boards over semester (before Dec. 5 th)	5%
<u>Quiz 1</u>	<u>September 28th (Monday)</u>	<u>10%</u>
<u>Quiz 2</u>	<u>October 16th (Friday)</u>	<u>10%</u>
<u>Quiz 3</u>	<u>November 2nd (Monday)</u>	<u>10%</u>
<u>Quiz 4</u>	<u>November 20th (Friday)</u>	<u>10%</u>
<u>Laboratory</u>	Every week (begins Sept 14 th)	<u>25%</u> (all labs must be <u>completed and submitted</u> in order to pass)
<u>Final Examination/Quiz (last 2 weeks of material)</u>	(held during regular exam period)	<u>10%</u>

You will note that the % reported in the table above add up to 105% and so there is the opportunity for bonus marks.

I have provided a rough outline of what you should be studying and viewing videos on in a file called '2210_CourseContent_Dates_2020' on Brightspace

The lecture and laboratory components must both be passed to pass the course. All experiments must be studied/performed 'virtually' and submitted before the end of the course in order to pass. As highlighted in the table above the quizzes, labs and final quiz provide the majority of your grade (75%/100%) so if you are struggling with the work/study load you should focus on these. Each assignment is worth 5% each. If you submit all 6, you can potentially get 5% in bonus marks.

****Assignment 5 is an essay, the topic assigned via brightspace during the 1st week of classes – this can be turned in early!! The last day of classes (December 4th) is the absolute last day to turn it in especially if you want to know your grade before exams. Some students in previous years have turned this in after the Thanksgiving break in order to get it out of the way early!*****

****All assignments can be turned in early via the D2L/Brightspace Dropbox****

Assignments should be submitted as pdf files, or suitable video/movie file formats (if applicable). Assignment 6 is based on your participation across the whole semester.

If you do not have access to a scanner to save handwritten work/drawings as a pdf file, you can take a photo and then insert the jpeg into your 'doc' file and then save/print as pdf, or you can install a free app on your smartphone: "Scanbot" or "Genius scan" are two free options.

In Word, Googledocs and Open office, you can save your typewritten work as a pdf file either directly in the save options or click print and then select the 'pdf' option. If you cannot figure out how to do this by trial and error, google the appropriate terms, e.g. how do I save my word file as a pdf, and you will find instructions online.

Course Content

Chem 2210 comprises three lectures and one lab per week. In addition to the graded assignments, students will sometimes be assigned short 'homework' problem sets (one or two questions) during class and this material can be discussed on the brightspace discussion boards. No marks for these problem sets will be assigned, but class participation will be assessed as part of the 'assignment' grad. See marking scheme on brightspace

Subjects covered in Chem 2210 (Chapters refer to Inorganic Chemistry, 7th edn):

The flow of the course will be approximately the following:

- Introduction: What is inorganic chemistry and why study it?, and some review of high school and General Chemistry
- Chapter 1 Atomic structure
- **Quiz 1 (Monday September 28th)**
- Chapter 6 Molecular symmetry
- Chapter 2 Molecular structure and bonding (and a return to Chapter 6)
- **Quiz 2 (Friday October 16th)**
- MO theory, isolobal theory
- Patterns around the periodic table/Chapter 9 Periodic trends
- **Quiz 3 (Monday November 2nd)**
- Chapter 4 Acid-Base chemistry
- **Quiz 4 (Friday November 20th)**
- Chapter 7 An introduction to coordination compounds, incl. intro to crystal-field theory (Chapter 20)

The course breakdown above should only be treated as a guide. We may change the order of the lectures, or spend more/less time on a specific topic, if the need arises. **NOTE:** The course content and structure is different to previous years....so even though I will provide example tests/exams on brightspace some of the material will be irrelevant this year and some new material will be in its place. Use end of chapter questions as examples to study from/practice.

I will be providing lists of **learning objectives** for each section of the course as we proceed. Use these to help you revise for the term test and final exam. You should use the problems at the end of chapters in S&A and any additional problem sets provided on brightspace to help you review material. Just as in first year chemistry courses, it is up to you to organize your time and make sure you keep on top of the material covered and know how to solve different types of problems. Therefore, if you are having problems with constructing MO diagrams and you only try to find help the day before the quiz... I will not have much patience for explaining it to

you. You must seek help as soon as you find out you are struggling with a particular concept. Weekly student hours/tutorials will take place. Staff and students in the 'virtual' chemistry resource room can also help.

Note: The assignments teach you transferable skills (e.g. software and communication skills) so **you need to work on the problem sets in the textbook and provided on brightspace, as well as do the assignments** in order to develop your knowledge of inorganic chemistry. Just memorizing material from class will not be enough to become a well-rounded chemist!

One final reminder: It is *extremely* important, as in any course, to keep up with the required reading. One can become lost very quickly, and the pace of this course, combined with the fact that many of the topics discussed rely heavily on a firm knowledge of general chemistry material, can leave you behind and frustrated. If you are experiencing difficulty, get help as soon as possible from the resource room, Dr. Kerton or graduate students in inorganic chemistry (e.g. teaching assistants). Please put all important dates into your diary/calendar as soon as possible.

Policy concerning late submission of assignments/missed tests: Late submissions of assignments will be accepted up to two calendar days following the due date at a penalty of 10% per day unless reasonably excused due to illness or other valid cause given by email. Missing a quiz due to illness or other valid reason (again provided by email/in writing) will result in adding the value of the quiz to other quizzes/final exam. If more than two quizzes are missed during the semester, please contact Dr. Kerton for 'make-up' material/quizzes to be done at the end of the semester (i.e. as part of a 'personalized' final exam to make sure you have been assessed across all the material covered in the course).

APPLICATIONS AND RESEARCH AREAS RELATING TO CHEM 2210: In 2210 you will learn about molecules and solids that contain a range of elements (not just C, H, N, O, S and halogens). They have a variety of uses and an overview of some applications is presented below.

Catalysis – A wide variety of both soluble and insoluble inorganic compounds are effective as catalysts. Many 'heterogeneous' catalysts are based on silica, alumina and related main group oxides. Many 'homogeneous' catalysts contain transition metals but reactions using main group elements in this role are currently being developed. Some catalysts are used to make small amounts of research chemicals in the lab, others are used to make chemicals such as pharmaceuticals on a ton scale, and others are used to make widely used chemicals (incl. solvents and detergents) and polymers on an even bigger scale.

Green Chemistry – Research in this area includes the production of biodegradable polymers and the development of new materials to harvest solar energy. Many researchers are also involved in the development of catalysts that use O₂ as an oxidant instead of stoichiometric, toxic metal oxidants such as dichromate. Other research involves reactions in water or supercritical carbon dioxide instead of volatile organic solvents.

Metal Extraction, Mining and Industrial Waste Treatment – The ability to selectively complex one metal and not another is of huge importance in this area. Also, new technologies to clean up waste streams of these industries and to monitor water, etc. are being developed by inorganic chemists and engineers.

Other Uses (by no means exhaustive) – Batteries, paints (TiO₂, blue cobalt compounds etc.) and optical materials, fuel additives, electronic and magnetic materials, corrosion resistant coatings, alloys for various uses, nuclear related technologies (for power plants, radiotherapy,

radiopharmaceuticals), biomimetic materials (e.g. artificial bone), bioinorganic chemistry, metallopharmaceuticals, structural metals, basic electrical metal, metals for jewelry etc.

Academic Misconduct:

Cheating is not permitted. The act of cheating includes, but is not limited to, the copying of lab materials and assignments from previous or current years, or using unreferenced information in a lab write up, paper, or presentation. University regulations pertaining to cheating are found in the university calendar in section 6.12. If you are caught cheating, the first incident will be forwarded to the Head of Chemistry for a resolution. If you are found guilty at the Departmental level, the penalty is usually a zero on the work in question as well as a letter of reprimand copied to the registrar describing the incident and the resolution, and will be kept on file. In the event of a second offence, the incident will be directed to the Senate Committee on Undergraduate Studies, SCUGS, (which can also happen on the first offence). An incident which is resolved by SCUGS usually result in harsher penalties such as reduction of your mark for the course, probation, suspension, or expulsion. Note that SCUGS resolves all offences that involve allegations of impersonation, submission of forged documents, or academic misconduct on exams or works in excess of 20% of the grade.

Plagiarism: This is a form of cheating. Please see material online for further information e.g. <http://www.mun.ca/writingcentre/plagiarism/> In Dr. Kerton's opinion, the best way to avoid it is to make notes on what you read (and note the reference/citation used), and then when assembling your paper/lab report – rephrase your notes in your own words and include the reference for the source where you took your original notes (e.g. textbook, website, journal article). Dr. Kerton will pay special attention to plagiarism in assignment 5 and in the past has given grades of 0 when significant copying/plagiarism has been observed.

Respect, equality and accommodations:

Memorial University of Newfoundland is committed to ensuring an environment of understanding and respect for the dignity and worth of each student and also to supporting inclusive education based on the principles of equity, accessibility and collaboration. For more information on Memorial University's commitment to accommodation of students with disabilities, see <http://www.mun.ca/policy/site/policy.php?id=239>

Equity

Dr. Kerton works to provide a safe learning environment regardless of race, colour, nationality, ethnic origin, social origin, religious creed, religion, age, disability, disfigurement, sex (including pregnancy), sexual orientation, gender identity, gender expression, marital status, family status, source of income or political opinion. This applies to all aspects of Chem 2210 including discussion boards. If students behave in an inappropriate manner, this will be addressed by Dr. Kerton and the behavior reported to the University administration as a form of academic misconduct.

Land Acknowledgement

We respectfully acknowledge the territory in which we gather as the ancestral homelands of the Beothuk, and the island of Newfoundland as the ancestral homelands of the Mi'kmaq and Beothuk. We would also like to recognize the Inuit of Nunatsiavut and NunatuKavut and the Innu of Nitassinan, and their ancestors, as the original people of Labrador. We strive for respectful relationships with all the peoples of this province as we search for collective healing and true reconciliation and honour this beautiful land together.