

COURSE SYLLABUS: CHEM 242 - Inorganic Chemistry II

Chemistry of the Main Group Elements

Winter 2017

Teacher: Dr. Georges Dénès, L-SP-201.11, tel.: 514-848-2424, ext. 3346
e-mail: georges.denes@concordia.ca
madenes@videotron.ca

Office hours: Wed. and Thu.: 3:00-4:30pm. More in an e-mail to be sent to you and pasted on the door of my office.

If needed, extra office hours will take place before both the midterm and final exams.
Dates and times will be announced in due time.

Lectures: Thu., 6:00-8:30pm, room CC-405

Lab TA: Kathryn Balind and her email address is kbalind@hotmail.com.

Prerequisite: Chem241 is a prerequisite to this course, and it is assumed that the students have a thorough understanding of the material covered in this course. The Chem242 teacher will specify what are the most important parts of Chem241 that the students should start studying immediately on their own. The teacher may choose to teach rapidly some of these in class, and to supply some additional information. Questions regarding Chem241, that are directly relevant to Chem242, will be asked in both the midterm and the final examinations.

Textbooks:

1. For lectures:

a) *Descriptive Inorganic Chemistry*, by Geoff Rayner-Canham and Tina Overton, Freeman, ISBN 0-7167-4620-4 [**required**]. Current edition or older editions will do. The course is based on edition 1, with some materials added as needed. The teacher will supply the students with a copy of extra pages required for additional material and for differences between various editions, at the teacher's discretion.

b) *Ionic Structures - Crystal Structures*, course notes by G. Dénès: to be e-mailed to you (no charge). [**required**]

c) **Most general chemistry textbooks**, such as *Chemistry* by Steven S. Zumdahl and Susan A. Zumdahl, Houghton Mifflin, previously used for Chem205, or *Chemistry & Chemical Reactivity* by Kotz & Treichel,

Thomson - Brooks/Cole, currently used for Chem205, can also be useful for understanding the basic on the structure of the atom and bonding, however, they are no substitute for the textbook used in this course.

d) Many other inorganic chemistry textbooks are available, however, they are no substitute for the required textbook. This comment is also valid for the textbook you used in Chem 241: it is no substitute for the required Chem242 textbook.

Examples of optional textbooks for additional reading (they cannot replace the required textbook):

- *Inorganic Chemistry*, by D. F. Shriver, P. W. Atkins and C. H. Langford, Freeman
- *Modern Inorganic Chemistry*, by J. J. Lagowski, Dekker
- *Advanced Inorganic Chemistry. A Comprehensive Text*, by F. A Cotton and G. Wilkinson, Wiley Interscience.

2. For laboratories: *Microscale Inorganic Chemistry*, by Z. Szafran, R. M. Pike and M. M. Singh, Wiley, ISBN 0-471-61996-5 [**required**]

Chapters to be studied:

1. Reminders from Chem 241 and complementary information: Most was done in Chem241. To be studied on your own, except 8.7 to the end of chapter 8 and all of chapter 9.

Chapter 1: The electronic structure of the atom: A review.

Chapter 2: An overview of the periodic table

Chapter 3: Covalent bonding

Chapter 4: Metallic bonding

Chapter 5: Ionic bonding

Chapter 6: Inorganic thermodynamics

Chapter 7: Acids and bases

Chapter 8: Oxidation and reduction

Chapter numbers above 8 may vary by 1 depending on the edition.

Chapter 9: Periodic trends. This chapter, not present in the earliest editions, will not be studied the way it is in the textbook. Particular trends described in this chapter will be used as appropriate, when needed, in other chapters.

2. Crystal structures – Ionic structures: This will provide a very basic understanding of crystallography in order to understand crystal structures. This is not in your textbook. Course notes for this will be e-mailed to the students free of charge.

3. The Main Group Elements: they will be studied in the following order. Chapter numbers may vary depending on the edition.

Chapter 10: Hydrogen.

Chapter 11: Group 1, except H - The alkali metals: Li, Na, K, Rb, Cs, and Fr

Chapter 20: Group 11 - Properties of transition metals: Only 20.9 (group 11): Cu, Ag and Au, only in the +1 oxidation number.

Chapter 12: Group 2 - The alkaline earth metals: Be, Mg, Ca, Sr, Ba and Ra

Chapter 21: Group 12: Zn, Cd and Hg

Chapter 13: Group 13: B, Al, Ga, In, and Tl

Chapter 14: Group 14: C, Si, Ge, Sn and Pb

Chapter 15: Group 15 - The pnictogens: N, P, As, Sb and Bi

Chapter 16: Group 16 - The chalcogens: O, S, Se, Te and Po

Chapter 17: Group 17: The halogens: F, Cl, Br, I and At

Chapter 18: Group 18: The noble gases: He, Ne, Ar, Kr, Xe and Rn

Purpose of the course:

The aim of Chem 242 (Inorganic II) is to give the students a minimum knowledge of the properties of main group elements (groups 1, 2, and 13-18), and also of the elements of group 11 in the +1 oxidation number (full *d* subshell) and of the elements of group 12 (also full *d* subshell). The properties of these elements must be understood based on their position in the periodic table and the trends of properties within the periodic table, studied in Chem 241 (Inorganic I). The students will also learn how to derive a thorough description of the simple crystal structures, using some basic crystallography, in contrast with memorizing some structures.

The knowledge acquired in Chem 242 is necessary in order to study the properties of the transition elements that the students will study in Chem 341 (Inorganic III). Therefore, Chem 242 is a prerequisite for Chem 341.

How to study and how to answer questions:

Knowing the material in chapters 1-9 is necessary in order to understand how the elements behave, and the concepts contained in these chapters will be used to explain the bonding and properties of the elements of each group of concern for this course.

Two past Chem242 midterm exams and final exams will be e-mailed to the students, in due time. Make sure you use them to familiarize yourself with the kinds of questions that will be asked, and the kind of answers expected.

Pay particular attention to the fact that **explaining the facts based on the position of the appropriate elements in the Periodic Table of the Elements** is much more important than memorizing facts. *Possession of a Periodic Table* during exams is strictly forbidden, regardless of whether it was used or not. You will have to know how to draw it and to fill the boxes with the

symbols for the elements of concern in this course (groups 1, 2, and 11-18). Explaining the properties and bonding of any element will have to start from the position (group number and period number) of the element in the Periodic Table, followed by the electronic structure of the elements of concern.

Grading:

- midterm exam: /25
- Final exam: /50 ==> Theory = /75 ==> 37 minimum required
- Laboratory: /25 ==> 15 minimum required, no more than 2 absences allowed, even if justified.

If you do better in percentage in the final exam than in the midterm exam, your final exam mark (higher) will count for both (75% instead of 50%), and the lower midterm mark will not count, provided you wrote the midterm exam or you gave me a valid written note of excuse for not writing the midterm exam. This makes the midterm exam a risk-free good test of how well you are doing, and it will give you the signal that changes in your study habits might be necessary.

Number to letter grade conversion:

| | | |
|----------------------------------|-----------------|------------------|
| A+ : ≥ 86.7 | A : 83.4 – 86.6 | A- : 80.0 – 83.3 |
| B+ : 76.7 – 79.9 | B : 73.4 – 76.6 | B- : 70.0 – 73.3 |
| C+ : 66.7 – 69.9 | C : 63.4 – 66.6 | C- : 60.0 – 63.3 |
| D+ : 56.7 – 59.9 | D : 53.4 – 56.6 | D- : 50.0 – 53.3 |
| F : Theory < 40 | R : Theory < 28 | R : Labs < 12 |
| R : > 2 Absences in laboratories | | |

Laboratories:

Labs starts in the second week of the term. The first lab is just checking in.

Like for all labs, you will be required to wear a lab coat and safety glasses (or prescription glasses), and to have a spatula and a scoopula.

If you miss labs for valid reasons (medical, funeral) bring an appropriate note of justification (from a doctor or person of authority) to your teacher, and you will be excused for missing the lab. Non-justified absences will result in a zero mark.

Warning: you cannot miss more than two labs, even with a valid excuse, otherwise your grade will be R.

Midterm exam:

1. Date and time:

The date of the midterm exam will be announced at the beginning of the term. It will take place in the classroom used for the lectures, CC-405. The exam will be one hour long (6:00-7:00pm).

Late comers to the exam will get no extra time. A missed midterm exam cannot be made up at another time.

A missed midterm exam will get a zero mark, unless you bring me a valid note of excuse (such as medical). If you do not feel well but you come to the exam anyway, the fact you did not feel well cannot be used to increase your mark. If you do not feel well and you think it is going to lower your performance in the course, do not come to the exam. Go to a doctor instead and get a justification for being absent.

2. Material required for the midterm exam:

- pens;
- a non-programmable calculator with no storage capacity;
- have your Concordia ID card on you during the exam.

3. Material allowed for the midterm exam: Students whose mother tongue is not English are allowed to have a printed dictionary that translates words. The bigger the dictionary, the less likely it is acceptable for an exam. The fact that another department accepts it does not guarantee that is acceptable in this course.

4. Materials not allowed:

- periodic tables;
- dictionaries that define words and technical or scientific dictionaries;
- any personal paper (scrap paper will be provided for work, or you will use the back of the questionnaire if it is printed single sided). Any writing on scrap will not be graded;
- all books of any kind;
- electronic dictionaries and any kind of electronic equipment (cell phones and all other electronic equipment must be turned off and kept in your bag, away from you, during the exam);

5. Missed midterm exam:

- if you miss the midterm exam without a valid excuse, you will get a zero;
- if you have a valid reason (such as medical, or a funeral) for missing the midterm exam, bring a note from your doctor (medical) or from someone of authority (funeral) to your teacher. If your excuse is valid and documented, you will get no mark in the midterm exam, and the final exam will count for both (75% instead of 50%).

Final exam:

- Date, time and location: to be decided by the Examination Office;
- Duration: 3 hours;
- materials required/allowed/forbidden: the same as for the midterm exam.
- materials covered: everything from the beginning: the final exam is cumulative;
- missed exam: if you have a valid reason (such as a medical or a funeral) for missing the final exam, get a note from your doctor and bring it to the Examination Office, not to your teacher. If the Examination Office accepts your excuse, you will be allowed to write a deferred exam at a later date, without penalty. If you have no valid excuse, your grade will be F. Beware: there is a deadline for bringing a note of excuse to the Examination Office.

RIGHTS AND RESPONSIBILITIES OF THE STUDENT

Read this syllabus and keep it for reference throughout the term:

Be prepared for lectures & labs:

Lectures: Read the lecture materials before class, and then be ready to (i) answer questions (including calculations) during the lecture and (ii) engage in discussion with classmates to clarify each others' understanding.

Labs: Read the experiment thoroughly & complete the prelaboratory exercises (individually), and then be ready to

(i) perform the experiment together with a lab partner and (ii) write a lab report based on your data (individually).

Contribute to a positive learning environment:

Disruptive or disrespectful behavior will not be tolerated in classrooms or laboratories. Cell phones and other electronic communication devices may not be used in these settings. Laptop computers are permitted for course-related activities.

Students engaging in inappropriate behavior will be asked to leave, without the opportunity to make up the missed work.

Complete the MANDATORY “Chem 101” seminar & quiz:

If you took Chem 241 at Concordia University, you have already completed Chem 101.

If you are coming from another university, then you must complete Chem 101. Talk to your teacher about it. This includes : you **must** (i) attend a Chemistry and Biochemistry seminar on the academic conduct code and the appropriate use of information sources **and** (ii) get 100% on the “Chem 101” online quiz. The aim of the seminar and quiz is to clarify the academic code of conduct in terms of what practices are considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. You are exempt from this requirement **ONLY** if you already did both (i) and (ii) in Winter 2008 or more recently;* otherwise, you must complete both this term. You are exempt if you can find your ID in the pdf file found on the CHEM 101 Moodle site (for guest login, go to: <http://moodle.concordia.ca/moodle>, Arts & Science, Chemistry & Biochemistry, Specialized Chemistry Sites, CHEM 101; look under FAQ). The seminar (1 hour) will be held at various times in mid-January. Please sign up for your preferred time, as seating is limited. **Late-comers will not be admitted.** Sign-up sheets will be located outside SP 201.01 (Departmental office). If you do not

complete Chem 101, your final Chem 205 grade will be lowered by one letter grade and carry an incomplete notation (e.g., C+/INC if you earned a B-). Please refer to the Undergraduate Calendar (section 16.3.6) for details on removing an incomplete notation (thus restoring your grade) via the “Late Completion” process.

The academic code of conduct can be found in section 17.10 of the academic calendar (<http://registrar.concordia.ca/calendar/pdf/sec17.pdf>). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The Chem 101 seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

Demonstrate academic integrity: (Source: Academic Integrity Website: <http://provost.concordia.ca/academicintegrity/plagiarism/>)

Plagiarism: The most common offense under the Academic Code of Conduct is plagiarism, which the Code defines as “*the presentation of the work of another person as one’s own or without proper acknowledgement*”. This could be material copied word for word from books, journals, internet sites, professor’s course notes, etc. It could be material that is paraphrased but closely resembles the original source. It could be the work of a fellow student, for example, an answer on a quiz, data for a lab report, or a paper or assignment completed by another student. It might be a paper purchased through one of the many available sources. “Presentation” is not limited to written work – it can also refer to copying images, graphs, tables, ideas, oral presentations, computer assignments and artistic works. Finally, if you translate the work of another person into French or English and do not cite the source, this is also plagiarism. In simple words: **DO NOT COPY, PARAPHRASE OR TRANSLATE ANTHING FROM ANYWHERE WITHOUT SAYING FROM WHERE YOU OBTAINED IT!**

NOTES:

1. This syllabus was prepared at the request of the Department of Chemistry and Biochemistry in July 2016, even though the course will start only in January 2017. This is too early for me to know some information, such as the name of the lab TA and the date of the midterm examination, and possibly other information. However, the course content will not change.

2. In the event of extraordinary circumstances beyond the University's control (e.g., influenza pandemic, lengthy ice storm), the content and/or grading scheme in this course may be subjected to changes. Details will be outlined only if this happens.