Chemistry 2281G: Inorganic Chemistry of the Main Group Elements

1. Course Information

Course Description
Chemistry 2281G will be composed of two main components; (1) Introduction to bonding in polyatomic molecules followed by (2) The chemistry of selected main group elements.

Part 1: Experimental methods in inorganic chemistry and an introduction to bonding in polyatomic molecules. This will include a brief review of Lewis, VSEPR and valence bond models followed by a study of molecular shape, symmetry and molecular orbital theory. We will also cover multi-nuclear NMR spectroscopy, IR spectroscopy and Mass spectrometry.

Part 2: We will then use what we learned in Part 1 to understand the structure, bonding and reactivity of selected elements and their simple compounds. This will include a discussion of main group element hydrides, halides and oxides.

Supplementary: Other topics that may be introduced throughout the course will include methods used to determine structures of inorganic molecules.

Website
OWL will be used as a main form of communication for course notes, assignments, grades and notifications. The missing of critical information due to your failure to check OWL cannot be used as a basis for appeal.

Prerequisite Requirements
The prerequisite for this class is Chem 2271A or Chem 2211A/B with a minimum grade of 80%.

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Instructor
J.M. Blacquiere
- Office: BGS 2022
  - Office Hours: Tuesdays 12:30-1:30 pm, or by appointment.
- Email: johanna.blacquiere@uwo.ca,
  Email correspondence must be from your @uwo.ca account. Please include Chem 2281G in the subject line
3. Course Syllabus

Lecture and Laboratory Information
- Lectures
  - 3 h/week
  - NS-7
  - MWF, 12:30-1:30 pm
- Laboratory
  - 3 h/week
  - ChB 080
  - You must be registered for one of the following:
    - Tuesday: 2:30 – 5:30 pm
    - Wednesday: 2:30 – 5:30 pm
    - Thursday: 9:30 am – 12:30 pm or 2:30 – 5:30 pm

Course Objectives
Students are expected, as a result of laboratory experiments and associated reading, to know the concepts and theories used to describe the chemistry of the main group elements with an understanding of bonding models such as valence bond theory and molecular orbital theory for polyatomic molecules. Selected examples illustrating the chemistry of the elements in Group 14 to 18 will be discussed. This is a continuation of Chemistry 2271A.

Course Learning Outcomes
- Predict and sketch expected heteronuclear NMR, IR and mass spectra for various inorganic compounds
- Describe and identify the symmetry elements
- Use knowledge of symmetry to identify the point group of molecules
- Construct molecular orbital diagrams for molecules more complex than diatomics.
- Identify and describe common reactivity of Groups 14-17 of the periodic table
- Justify chemical reactivity based on knowledge of simplified molecular orbital diagrams.
- Differentiate the expected reactivity of different compounds based on periodic trends of the main group elements.
- Demonstrate proper inorganic synthetic techniques, including use of a glovebox

Important Course Dates
- First Class: Jan 8th
- Test #1: In-class time (location TBA), Jan 24th
- Reading Week: Feb 19-23th
- Test #2: In-class time (location TBA), Feb 28th
- Test #3: In-class time (location TBA), Mar 21nd
- Last Day of Class: Apr 11th
Laboratory Information

- **Attendance**: Students must complete (complete lab and report) at least 5 of the labs (not counting library session and intro session) to be eligible to pass the course.
- Laboratory TAs (TBA)
- Specific questions regarding the experiments are to be directed to your individual laboratory TA
- **Be Prepared** - Prior to each lab, read the introductory pages in the Lab Manual – they have been printed for a reason.
- **Be on Time** – there is no provision for making the lab period last longer. Being able to finish the required experiment in the allotted time is part of the challenge and your evaluation. If you are late for your laboratory period you may not be allowed to enter the lab. This will depend on which experiment you were scheduled to do and how much of the laboratory period has elapsed. Judgment on this matter will be left to the T.A.s.
- **Be Safe** – This is a number one priority. Please listen to and be respectful of your TAs in all cases, but especially on matters of safety. To help you find the hazards/safety information for the reagents that you will be using in the lab the following reference will help you: [http://www.uwo.ca/chem/safety/msds_information.htm](http://www.uwo.ca/chem/safety/msds_information.htm)

Laboratory Schedule

**Before the week of Jan. 29th, you should complete a prelab, and have your safety ready to hand in to your TA at your first lab period.**

Week 1: (Jan 8) No Laboratory

Week 2: (Jan 15) Library session. You must attend during your usual lab time, however note that the start times are different from lab times to accommodate room availability. **The library assignment is due to your TAs in the lab intro session during the week of Jan 22nd.**

- **Schedule**

<table>
<thead>
<tr>
<th>Regular Laboratory Time</th>
<th>Library Session Time and Location</th>
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<tbody>
<tr>
<td>Tuesday 9:30 am – 12:30 pm</td>
<td>Jan 16th, 10:30 am – 12:30 pm Kellogg Rm Taylor</td>
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<tr>
<td>Tuesday 2:30 – 5:30 pm</td>
<td>Jan 16th, 2:30 – 4:30 pm Kellogg Rm Taylor</td>
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<tr>
<td>Wednesday 2:30 – 5:30 pm</td>
<td>Jan 17th, 3:30 – 5:30 pm Kellogg Rm Taylor</td>
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<tr>
<td>Thursday 9:30 am – 12:30 pm</td>
<td>Jan 18th, 10:30 am – 12:30 pm Kellogg Rm Taylor</td>
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<tr>
<td>Thursday 2:30 – 5:30 pm</td>
<td>Jan 18th, 2:30 – 4:30 pm HSB 16 Computer Lab</td>
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Week 3: (Jan 22) Mandatory Laboratory Info Session in ChB 115 during your regular lab times, **note the start times.**

- **Schedule**

<table>
<thead>
<tr>
<th>Regular Laboratory Time</th>
<th>Lab Intro Session Time and Location</th>
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<tbody>
<tr>
<td>Tuesday 9:30 am – 12:30 pm</td>
<td>Jan 23rd, 9:30 am, MSA 3204</td>
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<tr>
<td>Tuesday 2:30 – 5:30 pm</td>
<td>Jan 23rd, 2:30 pm, ChB 115</td>
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</table>
Wednesday 2:30 – 5:30 pm | Jan 24th, 3:00 pm, ChB 115
---|---
Thursday 9:30 am – 12:30 pm | Jan 25th, 9:30 am, MSA 3204
Thursday 2:30 – 5:30 pm | Jan 25th, 3:30 pm, ChB 115

Week 4 (Jan 29): Rotation (order will be posted to OWL)

Week 5 (Feb 5): Rotation

Week 6 (Feb 12): symmetry tutorial week - tutorials to be held in (location TBD) during your regular lab time

Week 7 (Feb. 19): Reading week – no labs

Week 8 (Feb 26): Rotation

Week 9 (Mar 5): Rotation

Week 10 (Mar 12): Rotation

Week 11 (Mar 19): Rotation

Week 12 (Mar. 26): Finish up and Check out

4. Course Materials

**Required Course Materials**

Textbook:


Laboratory Manual:

*Experiments in Main Group Inorganic Chemistry: Chemistry 2281G Laboratory Manual*. The manual is available at the UWO Bookstore on campus.

Laboratory Materials:

- *Lab Coat*. A lab coat must be worn at all times when working in the lab.
- *Safety Glasses*. Safety glasses must be worn at all times when working in the lab. Those that normally wear prescription glasses must wear safety glasses over their prescription glasses. Contact lenses are not allowed.
- *Hayden McNiel Laboratory Notebook (Organic Version) – Available at the bookstore*. A notebook must be used to record all procedures, data and observations in the laboratory. Partially filled notebooks may be used only if the content is from a previous (not concurrent) lab course.


5. **Methods of Evaluation**

**Evaluation**

- Homework: 3%
- In-class tests: three total with your best worth 17% and the other two worth 15%
- Laboratory: 15% (a passing grade on the lab component must be obtained to pass the course)
- Final Exam: cumulative; 35%

The student must obtain an overall grade of ≥50% to pass the course. See additional notes below on evaluation policies.

**Evaluation:**

If an in-class test is missed, there will be no make-up option. If the reason for absence is valid and appropriate documentation is provided (see below) then the weighting of the test will be transferred to the final exam.

If illness or other serious circumstances prevents a student from completing a course requirement (test, assignment, presentation or exam) valid medical or supporting documentation from the Dean’s Office must be provided as soon as possible. If the accommodation is approved, it is the student’s responsibility to contact me regarding alternative arrangements for evaluation. If the circumstances prevent attendance at the final exam, the student must immediately obtain a ‘Recommendation of Special Examination’ form from the Dean’s Office. For more information, see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

Students seeking academic accommodations based on medical (physical or mental) illness should begin by contacting the Academic Counsellors of their home faculty. Please visit the following link for policy on Accommodation for Illness:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

If you miss the Final Exam, contact your faculty’s Academic Counselling Office as soon as possible. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

6. **Additional Statements**

**Use of Electronic Devices:**

Please turn your cell phones to silent and refrain from answering them during class. Use of a laptop or tablet to take notes is permitted. Basic scientific calculators are the only electronic devices permitted during tests or exams.

**Statement on Academic Honesty:**
Written assignments and presentations must be in the students’ own words. Data, ideas, conclusions, etc. from other sources must be referenced to acknowledge their source and can only be used word-for-word if enclosed in quotations. Plagiarism is considered a major scholastic offence.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Accessibility:

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 (ext 82147) for any specific question regarding an accommodation.

Support Services:

For help in developing your learning skills please see the Student Development Centre (http://www.sdc.uwo.ca). The Learning Help Centre offers individual support on a drop-in basis (during Fall and Winter terms) and through scheduled individual counseling (year round).

Students who are in emotional/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

If you are a science student, the Academic Counselling Office of the Faculty of Science is located in WSC 191, and can be contacted at 519-661-3040 or scibmsac@uwo.ca. Their website is http://www.uwo.ca/sci/undergrad/academic_counselling/index.html.

The University Student Council offers additional support (http://westernusc.ca/services).

Registrarial Services provides useful course information (http://registrar.uwo.ca).