# Main Group Chemistry

**The University of Toledo**

**Department of Chemistry and Biochemistry**

**College of Natural Science and Mathematics**

**CHEM 8620, CRN 25642, Section 001**

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**Office Hours**: T, W, Th 2:00-3:00 pm

**Office Location**: 3260 Wolfe Hall

**Instructor Phone**: 419-530-1532

**Offered**: Spring 2021

**Class Location**: 2059 Bowman-Oddy Labs **Class Day/Time**: Tuesday, Thursday 5:30 – 7:20 pm

**Credit Hours**: 4

**CATALOG/COURSE DESCRIPTION**

## The inorganic and organometallic chemistry of main group elements is described.  Synthesis, structure, bonding, and reactivity are considered.  The use of main group reagents in synthesis, catalysis, and materials chemistry is discussed.

## COURSE OVERVIEW

## This course will survey the inorganic and organometallic chemistry of the main group elements, primarily in a descriptive manner. Coverage will include aspects of synthesis and reactivity, structure and bonding, and trends amongst the elements of groups 1, 2, and 13-18. Emphasis will be on molecular chemistry, but there will be some coverage of solid-state materials such as borates, silicates, aluminosilicates, and semiconductors. The fundamental concepts introduced throughout this course can be applied to diverse areas of research such as materials synthesis, homogeneous catalysis, and organic synthesis.

## STUDENT LEARNING OUTCOMES Upon completion of this course, students will be able to predict and explain the structures, bonding, and reactivity of the main group elements. Students will also be able to apply course contents to solve problems in materials synthesis, homogeneous catalysis, and organic synthesis.

## TEACHING METHODOLOGY

Course material will be presented in a traditional lecture style using white boards and Power Point slides. The slides will be posted on Blackboard for your convenience. Students should keep up with assigned reading and ask questions in class or by email.

**PREREQUISITES AND COREQUISITES**Graduate student status and permission of the department. A previous course in inorganic chemistry is strongly recommended. Background in physical inorganic chemistry (CHEM 6600/8600) is preferred, but not required.

## REQUIRED INSTRUCTIONAL MATERIALS (TEXTS AND ANCILLARY MATERIALS)

Course material will be taken from the text by Greenwood and Earnshaw, heavily supplemented with material from scientific articles and reviews. Supplementary materials will be posted on Blackboard.

**Recommended Textbook**

Greenwood, N. N.; Earnshaw, A. *Chemistry of the Elements*, Second Edition; Butterworth-Heineman; 1997. ISBN: 978-0-7506-3365-9

**Supplementary Texts**

Elschenbroich, Ch. *Organometallics*, Third, Revised Edition; Wiley-VCH, Weinheim; 2006.

ISBN: 3-527-29390-6

**Blackboard**

Lecture slides, occasional handouts, problem and exam keys, and pdf versions of pertinent scientific articles and reviews will be posted on the Blackboard site for this course. You can login to Blackboard using your UTAD credentials at <https://blackboard.utdl.edu/webapps/login/>. Your course grade book is also located on Blackboard.

**UNIVERSITY POLICIES**  
Policy Statement on Non-Discrimination on the basis of Disability (ADA):

### The University is an equal opportunity educational institution. Please read [The University’s Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](http://www.utoledo.edu/policies/administration/diversity/pdfs/3364_50_03_Nondiscrimination_o.pdf).

**ACADEMIC ACCOMMODATIONS**The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the [Student Disability Services Office](http://www.utoledo.edu/offices/student-disability-services/index.html).

**ACADEMIC POLICIES  
Academic Dishonesty**: The University Policy on Academic Dishonesty will be strictly enforced. See: <http://www.utoledo.edu/dl/students/dishonesty.html>.

**Drop, Withdrawal and Incomplete Grades**

Course drop and withdrawal procedures have been set by the University faculty. Dropped courses do not appear on your transcript. The deadline for dropping a course with 100% tuition refund is **January 25**. The last day to drop the course is **March 22**. If you are in a course after that date, there will be a grade on your transcript. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is **March 26**. Grades of W do not affect your GPA. You do not need your instructor’s permission for either process. *Note that course registration changes might change your financial aid.*

A course grade of Incomplete (I) is given only to those who have completed all but a small percentage of course requirements for an acceptable reason. If you have a serious problem near the end of the course, communicate with me as soon as possible. You will retain all of your previously determined grades.

**Copyright Notice**

The materials in the course website and presentation slides are only for the use of students enrolled in this course for purposes associated with this course, and may not be retained or further disseminated.

## COURSE EXPECTATIONS

Students are expected to attend all lectures, arrive on time, and be prepared to take notes on lecture material and ask questions/discuss reading materials.

**OVERVIEW OF COURSE GRADE ASSIGNMENT**

Final grades will be based on three exams (100 points each) and a comprehensive final exam (150 points). The following final grading scale (out of a possible 450 points) will be applied:

A 383 points B 315 C 270 D 225

A– 360 B– 300 C– 255

B+ 338 C+ 285 D+ 240

Exam dates are provided below:

Exam 1 Thursday, February 18

Exam 2 Tuesday, March 23

Exam 3 Thursday, April 22

Final Exam Tuesday, May 4 5:00-7:00 pm

## Homework: Problem sets will be distributed periodically. These will not be collected or graded, but answers will be discussed in class.

**COURSE SCHEDULE (TENTATIVE)**

**Week Date Topics Notes**

1 January 19 & 21 Introduction, VSEPR, Coordination Chemistry,

Group I Elements, Alkalides

2 January 26 &28 Inorganic Chemistry of Group 1 Elements

3 February 2 & 4 Inorganic Chemistry of Group 1 and Group 2 Elements

4 February 9 & 11 Multicenter Bonding; Polyhedral Boranes; Wades Rules

5 February 18 Wades Rules (continued) **No class, Feb. 16**

**Exam 1, Feb. 18**

6 February 23 & 25 Main Group Organometallics; Group 13 Elements

7 March 2&4 Aluminosilicates, Zeolites, Inorganic Chemistry of Carbon

8 Mach 9 & 11 Group 14 and Organosilicon Chemistry

9 March 16 & 18 Group 14 (continued); Nitrogen

10 March 23 & 25 Nitrogen (continued) **Exam 2, March 23**

11 March 30 & April 1 Phosphorus, Arsenic, Antimony and Bismuth

12 April 6 & 8 Group 15 Elements (continued)

13 April 13 & 15 Group 16 Elements

14 April 20 & 22 Group 17-18 Elements **Exam 3, April 22**

15 April 27 & 29 Wrap-Up and Review **No class, April 29**

16 May 4 **Final Exam, 5:00 – 7:00 pm** **Cumulative**

*The course schedule is subject to change due to weather, cancelled classes, or extended discussion and coverage of some topics throughout the semester.*