

**Chem 370 - Spring 2019**  
**General Information and Syllabus**  
**Dr. Robert L. Carter**  
**robert.carter@umb.edu**

**All information regarding this course is available exclusively on the course web site, <http://alpha.chem.umb.edu/chemistry/ch370/>. The Blackboard page for this course is only used for the course evaluation at the end of the semester.**

### **Office and Office Hours**

My office is Y03-3427 (diagonally across the the hall from the Chemistry Department main office) and my telephone number is (617) 287-6193. My regular office hours this semester will be 9:00-10:00 Mondays, Wednesdays, and Fridays. However, feel free to drop by my office at any other time, and I will try to see you if I am free. In addition, I would encourage you to contact me by email anytime you have a question.

### **Course Structure**

**Please see the separately posted Course Calendar for the planned timing of lectures, discussions, and tests.** Chem 370 consists of lecture (3 hrs/wk) and discussion (1 hr/wk). Lectures will be held MWF at 10:00 in Y04-4120, and the discussions will be held M at 1:00 in Y03-3350. Please realize that discussion attendance is expected every bit as much as lecture attendance. Keeping with past practice, I intend to use the discussion meetings in a very flexible way. Most often they will be devoted to discussing assigned homework and other material presented in lectures, but occasionally they may serve as an additional lecture sessions. Likewise, any one of the weekly class meetings may be designated as the discussion section for the week, depending in large part on how we progress through the material. In the Course Calendar, anywhere you see "Double Lectures" that means the Monday afternoon meeting will be a second lecture for the day. If a Wednesday or Friday is indicated for a discussion, that will occur at the normal morning lecture time.

In order to receive graduation credit toward either a B.A. or B.S. in Chemistry, you must also have taken Chem 371, the co-requisite laboratory course. The only people who are exempt from this requirement are graduate students and any students retaking Chem 370 (assuming they satisfactorily completed Chem 371).

### **Grades, Test Policy, and Homework Assignments**

Your grade in this course will be based on three examinations (100 points each) and an optional comprehensive final examination (200 points). Keeping with past practice, the final exam is offered as an option to those students who may want to take it to improve their grades, based on

the three exams. In addition, I may from time to time give pop quizzes in discussion, which will add bonus points to the total from the tests. Expressed as a percentage of either 300 points (three exams and no final) or 500 points (three exams plus the optional final), the break points on my grading scale work out as follows:  $>85\% \geq A^-$ ;  $75 - 84\% \geq B^-$ ;  $65 - 74\% \geq C^-$ ;  $55 - 64\% \geq D^-$ . I routinely exercise some discretion at the borders between grades, but no one receiving  $\leq 50\%$  passes unless they have received  $>100$  points on the comprehensive final examination.

In general, you are required to take tests on the day they are given to the class; i.e., *I do not give make-up tests*. However, if you cannot make an announced test for some legitimate reason known in advance (e.g., graduate school interview, religious holiday), talk to me about the circumstances ahead of time and we will try to work something out. If you must miss a test owing to something beyond your control (e.g., sickness, car accident on the way to school), call or email me as soon as possible under the circumstances and we will try to work something out.

I will give regular assignments, mostly using problems from the book, but I will neither collect nor grade these. That does not mean that you can ignore the homework assignments! Indeed, it would be very foolish to fail to do the assigned homework problems. We will go over the assignment each week, usually in the regular discussion. Be advised that homework problems or their near clones can occur on tests.

### Required Text and Model Kit

The required text for this course is *Inorganic Chemistry* by Miessler, Fischer and Tarr (Pearson/Prentice Hall). This text is now in its 5<sup>th</sup> edition, which actually is missing some appendix material that was in the 4<sup>th</sup> edition. The additional material is slight. Moreover, the print 5<sup>th</sup> edition is obscenely expensive (about \$200). Therefore, I strongly urge you to avoid purchasing the print 5<sup>th</sup> edition new. You can save considerable money by obtaining an electronic version of the text. You can check this out on the publisher's web site ([www.pearsonhighered.com](http://www.pearsonhighered.com)), and you can get it through our bookstore or from amazon.com, etc. Alternately, if you can get it, buy a used copy of either the 5<sup>th</sup> or the 4<sup>th</sup> edition. (I will do my best to indicate the comparable sections and problems in both editions in all assignments.) However, beware of buying the so-called International Edition, which seems to have different end-of-chapter problems and is not really that much cheaper. (The International Edition is a clever ploy by the publisher to kill sales of these cheaper paperback editions in the US.) Regardless of the form or edition you obtain, **please bring the book with you to class routinely, because we will occasionally need to refer to tables, drawings, or other data that are in the text**. If you are going electronic, bring whatever device you can read it on to class. (I would advise against using your smart phone for this, however.) My lectures on symmetry and group theory are based on my own text, which you might want to consider having: Robert L. Carter, *Molecular Symmetry and Group Theory*, John Wiley & Sons, 1998.

The content of this course, for which you will be responsible on tests, is the material discussed in class and discussion sessions. All of the lecture presentation materials are available as PDF

documents on the web site, and solutions to all assignments will be posted shortly after each discussion session and before any test covering that material. Past students have found it convenient to have PDF copies of the lecture materials (either in print or electronic form) with them in class for note taking purposes. You will also find other useful information (e.g., sample tests, additional worked out examples, printable periodic table) on the web site.

In addition to the text, you must have a model kit. Model kits for organic chemistry generally are not suitable, because we routinely use greater than four coordination, and most organic kits take too long to build each model. The best kit currently available is the **Mega Molecules Inorganic Chemistry Molecular Model Kit - Coordination Compounds and Complex Ions** (MG-265), available from [www.megamolecules.com](http://www.megamolecules.com) for only \$27.99. This should also be available in our bookstore. You will want to have your model kit with you in class, especially when we are discussing molecular symmetry and group theory. You may use your model kit during any test, so be sure to have it with you on test days.

## Topical Outline and Syllabus

We will cover most of the material in Chapters 1 through 12 of the required text, as indicated below. I will give specific reading and homework assignments as we go along.

*Introductory and Review Material* [Most of this material will not be covered in lecture. Read all sections, but see notes on next page for information about emphasis]:

Chapter 1	Introduction to Inorganic Chemistry
Chapter 2	Atomic Structure
Chapter 3	Simple Bonding Theory [Lewis dots, formal charge, electronegativity, size trends, etc.]

*New Material* [Lectures will be given on the following material.]:

Chapter 3	Simple Bonding Theory [VSEPR & LCP Theories]
Chapter 4	Symmetry and Group Theory Test I
Chapter 5	Molecular Orbitals
Chapter 6	Acid-Base and Donor-Acceptor Chemistry Omit section 6-3 (4 <sup>th</sup> ed.) or 6.6 (5 <sup>th</sup> ed.) on Hard and Soft Acids and Bases
Chapter 7	The Crystalline Solid State Selected topics from sections 7.1, 7.2, and 7.5
Chapter 9	Coordination Chemistry I: Structures and Isomers [Read for background information only; no lectures on this material]
Chapter 10	Coordination Chemistry II: Bonding
Chapter 11	Coordination Chemistry III: Electronic Structure Test II
Chapter 12	Coordination Chemistry IV: Reactions and Mechanisms Selected topics (to be announced)
Chapter 8	Chemistry of the Main Group Elements Section 8-1 is review material and will not be covered in lectures. Most of the content on main group descriptive chemistry will come from the lectures, rather than the book <i>per se</i> . Test III

Final Examination (optional)

### Comments on Introductory and Review Material

Read chapter 1 in the text (either 4<sup>th</sup> or 5<sup>th</sup> edition) for general interest and to acquire an overview of the field of inorganic chemistry.

Read chapters 2 and 3 for review. Most, if not all, of the material in these two chapters *should* be material from your previous course work, particularly general chemistry (e.g., Chem 115 & 116) and physical chemistry. Therefore, I will assume that you have mastered the concepts in these chapters, and I will not present lectures on most of these topics. However, *you may be called upon to demonstrate your mastery of this material on tests or quizzes*. The expected level of mastery will be evident from the first homework assignment I will give you from these chapters. Be sure that you have truly mastered VSEPR theory (section 3-2 in both 4<sup>th</sup> and 5<sup>th</sup> editions), which will be very important as we discuss symmetry and group theory (chapter 4). I will begin with a review lecture or two on VSEPR (adding a few twists you have not seen before) to be sure that you are up to speed. You probably have not encountered the concept of Ligand Close Packing (LCP) Theory (section 3-2-4 in both editions), so I will lecture on this as new material. My coverage of this topic will be much more detailed than in the text.