

Advanced Inorganic Chemistry
Fall 2014

Text: *Inorganic Chemistry*, 4th Ed. by J.E. Huheey, E.A. Keiter, and R.L. Keiter

Location: Lecture: Science 307, Pre-lab Science 374, Lab Science 414

Handouts: All available on-line @ <http://science.marshall.edu/castella/C448.html>
Lecture notes for all chapters This syllabus and the lab syllabus
Homework assignments A set of old tests & answer keys
Study suggestions

Course Description: Study of physical properties and periodic relationships of inorganic materials. 3 lec. – 4 lab. (PR: CHM 356 and either 307 or 358)

Instructor: Michael Castellani

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Learning Objectives: 1) to apply the principles of quantum mechanics learned in Physical Chemistry to chemical bonding, 2) to introduce the relationship between molecular structure and chemical reactivity, 3) to learn to determine molecular symmetry and to understand its effects on molecular properties and spectroscopy.

| <u>Date</u> | <u>Subject</u> (all dates tentative) | <u>Chapter</u> |
|-------------|--|------------------|
| Week 1 | Introduction, Atomic Structure | 2 |
| Week 2 | Atomic Structure | 2 |
| Week 3 | Symmetry | 3 |
| Week 4 | Symmetry | 3 (Test 1) |
| Week 5 | The Ionic Bond: General Information | 4 |
| Week 6 | The Ionic Bond: Theory | 4 |
| Week 7 | The Covalent Bond: Valence Bond Theory | 5 |
| Week 8 | The Covalent Bond: Molecular Orbital Theory | 5 |
| Week 9 | Structure and Reactivity | 6 (Test 2) |
| Week 10 | Solid State Chemistry | 7 |
| Week 11 | Chemical Forces | 8 |
| Week 12 | Coordination Chemistry, Valence Bond Theory | 11 |
| Week 13 | Crystal Field and Molecular Orbital Theories | 11 |
| Week 14 | Boranes | Handout (Test 3) |

Final Exam: Tuesday, Dec. 9 from 8:00 - 10:00 a.m.

Office hours: MWF 10:00 to 11:00 a.m., other times by appointment or walk-in.

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|-----------------|---------------------|------------|
| Grading: | 3 tests x 20% | 60% |
| | Laboratory | 10% |
| | Elements assignment | 5% |
| | 1 final exam | <u>25%</u> |
| | | 100% |

Tests will cover Chapters 2 & 3, 4 – 6, and 7, 8 & 11, plus handouts as described below or assigned in class.

There are **no** make-up exams. Those students with excused absences must see me in advance if at all possible. Students requiring accommodation because of a disability must obtain appropriate documentation (from the HELP Center or Sandra Clements) and contact me sufficiently far in advance of a test that necessary accommodation can be made.

Grading for the laboratory portion of the class will be discussed during the first meeting of the lab (Sept. 3).

Handouts: There are 9 handouts available online.

Elements – You are responsible for knowing the method of isolation (except where told otherwise), physical and chemical properties, and reactions for each of the elements. You may find the remaining information interesting, but it won't be tested. These handouts will be tested as follows: (this is separate from the "elements assignment")
Test 1: Groups IA - IIIA, VIIIA Test 3: First transition series, Uranium
Test 2: Groups IVA - VIIA Final exam: All handouts

Periodic table – This handout contains two blank periodic tables. You will need to memorize the location of all elements in it. Use these tables to help you. Please note you are not responsible for the lanthanides, actinides, and new synthetic elements. You should know the symbol for each element and its name. You are not responsible for other information (except for the handouts as described above).

Particle-in-a-box – This handout will help clarify some of the discussion in Chapter 2.

Ion names – You will not be tested on this, but I may use these names in the lecture notes and in class. You may also see them in lab. Knowing them will help you.

Transition metal electron configurations – This handout goes into greater depth than do the Chapter 2 notes in explaining why the 4s electrons are filled before the 3d electrons, but are also emptied first.

Molecular structure – This handout supplements the text in Chapter 6 (pp. 233 – 237).

Boranes – This handout will touch on one of the more interesting series of inorganic compounds.

Elements Assignment

You will write a short paper 2-3 pages, double-spaced, 12 pt Times New Roman or 10 pt Arial font on two elements to be assigned to you randomly. Roughly half of the paper should be devoted to each element. It should have multiple, original references from print media using formatting from the [ACS Style guide](#), i.e. The paper should not simply be the expansion or synopsis of reviews. You may find the references online (e.g. Some journals publish online or have old issues online, but the reference should be to where it appears in print.)

You should select some property or application of each element that is interesting and discuss it. One of the “interesting” features could come from an elements handout. Part of your grade will come from the originality of your choice so going with something off the handout would hurt you in that category. The element could be part of a molecule, but the element itself would have to be central to the functioning of the molecule. For example, replacing the hydrogens on linear hydrocarbons with fluorine results in a molecule that can act as artificial blood. A person could discuss how and why the fluorine allows that to happen. Likewise, writing a page on why the atomic weight of carbon is 12.011 amu/atom, would not be a good choice.

The paper will be due on Thursday, September 25 as a Word document emailed to me by 5:00 p.m. unless there is a test that week. If there is, the due date will be Thursday, October 2.

You will also make an up-to-10-minute presentation in either a class or a lab period that will be determined later. In it you will present a short summary of both your elements to the class.

Marshall University's policies regarding academic honesty, excused absences, and disabled students may be found at http://www.marshall.edu/wpmu/academic-affairs/?page_id=802.

If an assignment falls on a day that is cancelled by the university (e.g. a snow day), it should be turned in to me on the next day the university opens before 5:00 p.m.

Please turn off cell phone ringers before class. Failure to do so may result in you being removed from the room, even during an assignment.