CH4310 Inorganic Chemistry I (3)

Fall 2011

Instructor Information

Instructor: Rudy Luck
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Office Hours: M, W & F 11:00 - 12:00 AM

Course Identification

Course Number: CH4310-L01
Course Name: Inorganic Chemistry I
Course Location: RM 19-104A
Class Times: M, W & F 10:05 - 10:55 AM
Prerequisites: CH3520

Course Description/Overview

Descriptive chemistry of the main group elements with some emphasis on the non-metals. Transition metal compounds: aspects of bonding, spectra, and reactivity; complexes of n-acceptor ligands; organometallic compounds and their role in catalysis; metals in biological systems; preparative, analytical, and instrumental techniques.

Course Learning Objectives

The topics mentioned below will be covered in the lectures. You are responsible for all the material in the lectures, any notes or material handed out in class and the appropriate sections covering material in class described in the text.

<table>
<thead>
<tr>
<th>General Outline</th>
<th>Crystal Field Theory</th>
<th>Transition element chemistry</th>
<th>Ligand Chemistry/Special topics</th>
<th>CO Compounds and olefins</th>
<th>Allyl</th>
<th>Olefin Isomerization</th>
<th>Arenes and acetylene</th>
<th>Oxidative addition reactions</th>
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</thead>
<tbody>
<tr>
<td>Background/Symmetry/Point groups</td>
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<td>Acids/Super acids</td>
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<td>Halides</td>
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<td>NMR, especially multinuclear</td>
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<td>Group IA</td>
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<td>Group IIA</td>
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<td>Group IIIA</td>
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### Group IVA

| Hydrogenation | Phosphorus | Various catalytic processes |

#### Course Website(s)

- Blackboard [http://www.courses.mtu.edu](http://www.courses.mtu.edu), mainly for listing scores.

#### Required Course Text

- Inorganic Chemistry (Fifth edition or (Fourth used) by Shriver and Atkins) should be available in the bookstore. Advanced Inorganic Chemistry (Sixth edition by Cotton and Wilkinson) is highly recommended for those serious about chemistry. The library also has several inorganic textbooks.

#### Course Fees

Lab fee with CH4311.

#### Course Supplies

Useful if you have your own computer with internet access.

#### Grading Scheme

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
<th>Grade points/credit</th>
<th>Rating</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
<td>4.00</td>
<td>Excellent</td>
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<tr>
<td>AB</td>
<td>85-90</td>
<td>3.50</td>
<td>Very good</td>
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<tr>
<td>B</td>
<td>80-85</td>
<td>3.00</td>
<td>Good</td>
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<tr>
<td>BC</td>
<td>75-80</td>
<td>2.50</td>
<td>Above average</td>
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<tr>
<td>C</td>
<td>70-75</td>
<td>2.00</td>
<td>Average</td>
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<tr>
<td>CD</td>
<td>65-70</td>
<td>1.50</td>
<td>Below average</td>
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<tr>
<td>D</td>
<td>55-65</td>
<td>1.00</td>
<td>Inferior</td>
</tr>
<tr>
<td>F</td>
<td>55% and below</td>
<td>0.00</td>
<td>Failure</td>
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**I**

Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student’s control. A grade of incomplete may be given only when approved in writing by the department chair or school dean.

**X**

Conditional, with no grade points per credit; given only when the student is at fault in failing to complete a minor segment of a course, but in the judgment of the instructor does not need to repeat the course. It must be made up within the next semester in residence or the grade becomes a failure (F). A (X) grade is computed into the grade point average as a (F) grade.
**Grading Policy**

Grades will be based on the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Homework (4 assignments)</td>
<td>20</td>
</tr>
<tr>
<td>Exams (2 exams) (Oct. 5 and Nov. 16)</td>
<td>40</td>
</tr>
<tr>
<td>Final</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>100</strong></td>
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</table>

**Late Assignments**

Late work is not accepted. Hand the assignments in on time.

**Course Policies**

Please do not disrupt the lecture.

**Collaboration/Plagiarism Rules**

Cell phones, Blackberries, iPods, PDAs, or any other electronic devices are not to be used in the classroom. Calculators on other devices are strictly prohibited. Information exchanges on these devices during class are also prohibited and violate the Academic Integrity Code of Michigan Tech.

**University Policies**

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance the University’s policies. If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following: *Michigan Technological University complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office at 487-2212. For other concerns about discrimination, you may contact your advisor, Chair/Dean of your academic unit, or the Affirmative Programs Office at 487-3310.*

**Academic Integrity:**

Students who cheat, plagiarize, or fabricate data as well as students who help others cheat, plagiarize or fabricate data will receive sanctions ranging from warning to special failing grade to expulsion from the University, depending on the severity of the offense. Read and examine [http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html](http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html) for the complete Academic Integrity Policy.
Affirmative Action:
http://www.admin.mtu.edu/aao/

Disability Services:
In accordance with University policy and the Americans with Disabilities Act (ADA) academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire about such particular needs of students. Students who may require special assistance in emergency evacuations (fire, tornado, etc.) should contact the instructor as to the most appropriate procedures to follow in such an emergency. Contact the Office of Affirmative Programs if you have any questions about issues related to the ADA at 487-3310

Equal Opportunity Statement:

Course Schedule

We will cover the following topics as the days progress

Background-atomic structure, periodicity, chemical bonding, group valencies, molecular shapes, hybrid orbitals, naming of compounds.
Chapter 1, 2, 3, 6, 9

Acids-definitions, oxyacids, superacids/magic acids.
Chapter 4

Hydrogen-periodicity, salt like hydrides, formation, ionic lattices, simple covalent hydrides, properties, structural features, hydrogen bonding, ice, inter vs. intra H-atom bonding.
Chapter 10

Halides-group IV and group V, Group III, structures, hybridization, octet expansion, halide abstraction, autoionization, halides as Lewis acids.
Chapter 17

NMR-some theory, conducting the experiment, nuclear energy levels, multinuclear spectra (P, F, etc.)
Handout
Chapter 8

Group IA-general properties, lattice energy effects, Born-Haber cycle considerations, solvation effects, bidentate ligand chemistry, crown ethers chelation, cryptans, organolithium compounds structure and bonding aspects.
Chapter 11
Group IIA-general properties, simple covalent molecules, aqueous chemistry with Be, unusual reactions, bonding considerations, Mg and Grignard reagents, structure and bonding therein.
Chapter 12

Group IIIA-covalent chemistry of B, halides of B, structure and bonding considerations, boron hydrides, extensive coverage of boranes, boron-nitrogen compounds, other Gp III elements, halides/Lewis acid properties, oxides, nitrides, aqueous chemistry, hydrides, organometallic AlR₃ compounds, synthesis, structure and bonding.
Chapter 13

Group IVA-C, graphite, diamond and bucky balls, C-atom compounds, halides, simple C-N compounds.
Chapter 14

Phosphorus-allotropes, reactions of elemental P, oxides, oxyacids, P/S systems, P-N chemistry (phosphazenes).
Chapter 15

Crystal Field Theory-different systems, MO considerations, Ï€-acid ligands, orders of the orbitals, backbonding considerations, paramagnetism, Cu-acetate complexes structure and bonding considerations, Jahn-Teller theorem, Co-complexes of CO vs. NO, bonding aspects,
Chapter 20

Transition Element Chemistry: Ti 6 Cu-oxidation states and stabilization, Ti, Cu, V, VO bond, Cr, Cr₂(acetate)₄, Mn, MnO₄⁻, Fe, Co, Ni. Essentially, an examination of some noteworthy compounds looking at synthesis, structure and bonding.
Chapter 19, 21-22

Ligand chemistry/Special topics-these will be discussed if time permits in the order listed above.
Course Resources
By the end of the fourth week of this class, i.e., September 24, please fill out your answers to these two questions and hand this to the secretary in the chemistry office to place in my mailbox. I will discuss the responses to these questions in class during the fifth week, i.e., Sept 27 – Oct 1. It is hoped that by so doing improvements can be made in the instruction so as to assist you in learning the material. Feel free to write the answers in your own handwriting or, if you prefer, type out the answers to the questions on a separate piece of paper and hand this in to the secretary on the 6th floor.

1. What about this course, or my teaching, is helping you to learn?

2. What could I change about this course, or my teaching, that would improve your learning?