Syllabus

CH4310  Inorganic Chemistry I (3)   Fall, 2010

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Lectures,  RM 19-104A:  M, W & F 10:05 - 10:55 AM
Office Hours: RM 701b  M, W & F 11:00 - 12:00 AM

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. Prerequisite: CH3520.

Textbook. 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.

General Marking Scheme:   Term Work (Tests and Essay)  60%
                         Final Examination   40%

There will be four problem sets assigned for a total of 20% of the final grade and two term exams (Oct. 6 and Nov. 17) each worth 20%. A final cumulative examination will be held during the examination period (Dec 13-17) and this date will be established later.

Outline of topics for Inorganic Chemistry I:
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.

Grading Scheme:
90-100 A, 85-90 AB, 80-85 B, 75-80 BC, 70-75 C, 65-70 CD, 55-65 D, <55 F.

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. See the Michigan Tech Student Planner and Handbook for the complete Academic Integrity Policy.
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

General Outline.
Background/Symmetry/Point groups
Acids/Super acids
Hydrogen
Halides
NMR, especially multinuclear
Group IA
Group IIA
Group IIIA
Group IVA
Phosphorus
Crystal Field Theory
Transition element chemistry, Ti, Cu, V, Cr, Mn, Fe, Co & Ni
   Ligand Chemistry/Special topics (We will attempt to cover these topics sequentially)
   CO Compounds and olefins
   Allyl
   Olefin Isomerization
   Arenes and acetylene
   Oxidative addition reactions
   Hydrogenation
   Various catalytic processes

Specific Topics covered.
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, $\pi$-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.
MID-TERM Evaluation for CH4310--- Rudy Luck

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?