

**CHM 6620: Introduction to Advanced Inorganic Chemistry****Fall 2013 Location: CLB 414, MWF 10:40AM – 11:30AM (period 4)**

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Office Hours: MWF 8:30AM – 9:30AM or by appointment

**Course Description and Objective**

To provide a graduate-level introduction to advanced inorganic chemistry, focused on molecular orbital theory and reactivity. Major themes include application of group theory to structure and bonding, molecular orbital treatment of reactivity, fundamental organometallic chemistry, and an introduction to vibrational and electronic spectroscopy.

**Required Text**Miessler, G. L. and Tarr, D. A., *Inorganic Chemistry* 4<sup>th</sup> Ed.

Handouts will be provided, supplemented by recommended reference texts and references to literature reviews and other sources.

**Recommended or Reserve Texts**

1. Bowser, J. R., *Inorganic Chemistry*
2. Cotton, F. A., *Chemical Applications of Group Theory*
3. Cotton, F. A., Murillo, C. A. and Bochmann, M., *Advanced Inorganic Chemistry* 6<sup>th</sup> Ed.
4. Crabtree, R. H., *The Organometallic Chemistry of the Transition Metals*
5. Greenwood, N. N. and Earnshaw, A. *Chemistry of the Elements* 2<sup>nd</sup> Ed.

**Grades**

Grades will be based on problem sets (20%), two mid-term exams during the semester (total: 40%), and a final exam (40%). For information on UF's Grading Policy, see:

<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html> and

<http://www.isis.ufl.edu/minusgrades.html>

**Problem Sets**

Distributed weekly in class on Friday, due in class on the following Tuesday. Problem sets are open-notes and open-book and students are encouraged to search the chemical literature. Students are also encouraged to work on problem sets in groups.

**Exams**

Exams cover all lectures and reading assignments. It is the student's responsibility to ask questions (either during class or at office hours) if they do not understand lecture or reading materials. The final exam covers the entire semester, but will focus on material after the second mid-term exam. Exams are take-home and open-notes and open-book, but **students must work individually and cannot search the chemical literature** for content directly related to the question. Make-up exams will only be given by pre-arrangement or under extraordinary circumstances (e.g., medical emergencies).

**Attendance and Absence Policy**

Attendance is expected although not used as part of student assessment.

**Academic Honesty**

Students are required to be honest in their coursework. Any act of academic dishonesty will be reported to the Dean of Students, and may result in failure of the assignment in question and/or the course. For University of Florida's honor code, see <http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php>.

**Accommodations for Students with Disabilities**

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. Contact the Disability Resources Center (<http://www.dso.ufl.edu/drc/>) for information about available resources for students with disabilities.

**Counseling and Mental Health Resources**

Students facing difficulties completing the course or who are in need of counseling or urgent help should call the on-campus Counseling and Wellness Center (352-392-1575; <http://www.counseling.ufl.edu/cwc/>).

## Course Outline (corresponding chapters in Miessler and Tarr given in parentheses, subject to change)

### I Introduction

The Elements & Atomic Structure (1 & 2)

### II Molecular Orbital Theory and Group Theory

Bonding in Diatomics (5.2 & 5.3)

Group Theory (4)

- *symmetry operations*
- *point groups*
- *character tables*

Bonding in Polyatomics (5.4)

Hückel Theory

- *bonding in extended systems*
- *"non-Pauling" bonding (e.g., 2e3c, 4e3c)*

Ligand-Field Theory (10.3 – 10.7)

- *$\pi$  acids and bases*
- *metal-ligand multiple bonding*
- *metal-metal bonding*

### III Inorganic Reactions

Acids and Bases (6)

Mechanisms of Inorganic Reactions (12)

Organometallic Chemistry (13 & 14)

Isolobal Analogy (15)

### IV Vibrational Spectroscopy and Electronic Transitions (also covered in CHM 6626)

Vibrational Modes

- *symmetry and projecting modes*

Electronic Spectra (11)

- *selection rules*
- *correlation diagrams*
- *charge-transfer spectra*

Inorganic Photochemistry