Intermediate Inorganic Chemistry

Instructor
Prof. Siddhartha Das
Phone # 797-2267; E-MAIL: siddhartha.das@usu.edu (best way to contact me)
Office hours: By appointment

Required Text:

Reference Textbooks (Relevant sections will be discussed in the class and will be provided, if required):

Prerequisites: Chem 1220 (or equivalent), 2310 & 2330. A good understanding of Physical Chemistry is highly recommended.

Course Objectives:
This course is the first step towards learning the vast field of chemistry wherever Metal is involved. It is targeted to teach the student how and why several theories have been developed and rejected to understand metal-related chemistry, and their basis. It is aimed to develop a taste for curiosity in chemistry and to build a mind-set for creative research.

Topics to be Covered:
Electronic structure of Atoms: Nucleus, Electronic Configurations, Effective Nuclear Charge (Slater’s Rule).

Theories of Bonding. Lewis representation, the VSEPR model, Ionic Bonding and Covalent Bonding, Valence Bond Theory, Hybridization, Molecular Orbital Theory, Crystal field theory (CFT), Ligand field theory (LFT).

Valence, Oxidation number and Formal charge (electron counting): 18-electron rule

Acid-Base chemistry. Hard and soft acids and bases; Lewis acids and bases.


Group Theory. Symmetry operations, point groups.

Molecular chemistry to Materials, advancement of inorganic chemistry in 21st century and its impact on (a) industrial catalysis, (b) biomedical applications, (c) environmental applications, (d) renewable energy. (will be discussed separately as well as with relevant sections).

Grading: Points are distributed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes (4 x 15 points)</td>
<td>60pts</td>
</tr>
<tr>
<td>Literature presentation</td>
<td>50pts</td>
</tr>
<tr>
<td>Assignments (2 x 20 + 35 pts)</td>
<td>75pts</td>
</tr>
<tr>
<td>Midterm Exam #1 (02/05/2013, during class)</td>
<td>50pts</td>
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<tr>
<td>Midterm Exam #2 (02/07/2013, during class)</td>
<td>50pts</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100pts</td>
</tr>
<tr>
<td>Group Discussion Involvement</td>
<td>15pts</td>
</tr>
<tr>
<td>Total points</td>
<td>400pts</td>
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</tbody>
</table>

*Gain Score Assessment Tests (Extra credit) 10pts
**Canvas**

Canvas is the Learning Management System that we will use for our course. You can login to Canvas at https://online.usu.edu. Your username is your A#, and your password is your global password (the same one you use for Banner or Aggiemail). **Materials for the class will be available through Canvas.**

**Course Resources:**

Canvas

**Course Activities:**

**Quizzes:** Quizzes will be given on selected dates and will consist of 5-10 short questions that are relevant to the topics discussed in lectures going back to the previous quiz or exam. There will be no make-up quizzes.

**Exams:** Exams will include multiple choice questions, short-answer type questions and subjective questions (such as drawing MO energy level diagrams, drawing symmetry elements, writing basic reaction mechanisms, etc).

**Literature Presentation:** To facilitate your familiarity with the field of inorganic chemistry and the application of the course in recent seminal works, each student is expected to make a formal ~10 minute presentation on a classic literature article (1960-2000). Each student is expected to make a PowerPoint – Presentation. The article will be chosen by each student and approved by Prof. Das in advance (no later than March 19th). The presentations will take place during two class periods on April 23 and 25, 2013. Grading will be based on your ability to present the core information of the article with your own insights, on the clarity of the presentation, on proper citation of reference sources and on your demonstration of a good understanding of the material (based on answering questions during presentation). This is expected to prepare students to get familiar with the current scientific world.

**Group Discussion Involvement:** Discussion of science with friends and colleagues, leading to productive collaborations, is a cornerstone of current scientific research. During several classes Dr. Das will raise certain questions pertaining to what is being taught in the class, without any advance notice. The students will be encouraged to have informal discussions among themselves and present their thoughts to answer the problem or approach towards solving the problem in an analytical fashion. Students will be graded based on (a) their active involvement, (b) their presentation of thoughts in a clear fashion, and (c) creativeness of their idea. **This is expected to prepare students for impromptu discussions, which is highly important both in academia and in industries.**

**Following the DUE DATES:** Students are expected to follow the deadlines or due dates. For assignments delay in their submission will cost a 5% deduction in points per day. In case of medical/family emergency supported by appropriate documentation (e.g. note from physician), an exception may be made.

**“Gain-Score” Assessment Tests:** Two short tests (~10 min) will be given – one in the 1st week and another in the beginning of the last week of classes. These short tests are given to assess your ability to apply, analyze, and synthesize information that is delivered throughout the course. You will receive 5 extra credit points for simply taking each “gain-score” assessment test, regardless of performance.

**Missed Exam Policy:** If a student misses, or will miss an exam, due to illness or family emergency, the student should speak to Prof. Das as soon as possible. A make-up exam will be offered if the absence is supported by appropriate documentation (e.g. note from physician or parent).

**Withdrawal Policy and “I” Grade Policy:** The administration of Chem 5520 will adhere strictly to the academic regulations stipulated in the most recent Schedule of Classes and the USU General Catalog. Withdrawal from the course will follow official USU procedures. Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term 'extenuating' circumstances includes: (1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

**Tentative Grading Scale:** (Brackets could be lowered to consider a weighted avg. - they will not be raised):

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>A/A</td>
<td>90-100%</td>
</tr>
<tr>
<td>B-/B/B+</td>
<td>80-89%</td>
</tr>
<tr>
<td>C-/C/C+</td>
<td>70-79%</td>
</tr>
<tr>
<td>D/D+</td>
<td>60-69%</td>
</tr>
</tbody>
</table>

**Course Resources:**

Canvas
University Policies:

**Honor Pledge**

Students will be held accountable to the Honor Pledge which they have agreed to: “I pledge, on my honor, to conduct myself with the foremost level of academic integrity.”

**Academic Dishonesty**

The Instructor of this course will take appropriate actions in response to Academic Dishonesty, as defined the University’s Student Code. Full text of the Student Code available at [http://www.usu.edu/studentservices/pdf/StudentCode.pdf](http://www.usu.edu/studentservices/pdf/StudentCode.pdf):

**Students with Disabilities**

Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be eligible for services. All accommodations are coordinated through the Disability Resource Center (DRC) in Room 101 of the University Inn, (435) 797-2444 voice, (435) 797-0740 TTY, (435) 797-2444 VP, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.

**Plagiarism**

Plagiarism includes knowingly “representing, by paraphrase or direct quotation, the published or unpublished work of another person as one’s own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.” The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

**Sexual Harassment**

Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any “unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature.” If you feel that you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266.