Instructor: Prof. Michael T. Ashby  
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Office Phone: 325-2924  
E-mail: mashby@ou.edu

Office Hours: 1:30-2:30 PM Wednesdays  
3:00-4:00 PM Fridays  
in CHBA 219 (or by appoint.)

TA: John W. Tyler  
Office: SLSRC 3055  
E-mail: westyler@ou.edu


Grading: Final grades will be assigned based on total points accumulated. The maximum possible points are 1000. Although I prefer to assign grades using a curve, I will guarantee the following letter grades:

900 or better: A  
800-899: B  
700-799: C  
600-699: D

Each assignment counts toward the final point total as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>4333</th>
<th>5233</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>Periodic Table Quiz</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Two &quot;Hour&quot; Exams</td>
<td>400 (200 each)</td>
<td>300 (150 each)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>350</td>
<td>300</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Writing Assignment</td>
<td>50 points extra credit</td>
<td>100</td>
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</tbody>
</table>

In the event that a curve is applied, the grading of undergraduate and graduate students will be carried out separately.

Homework: Five problem sets will be assigned. Answers to the even number problems must be turned in by the dates indicated. The odd numbered problems are listed as a study guide. Homework will serve two main purposes: (1) provide a review of concepts that you should have covered in other course work that you have taken, but may have forgotten and (2) cover material in greater depth that can be covered in the lectures or on the examinations. Problems similar to those assigned as homework may appear on the exams, so it will be to your advantage to do the homework and understand the solutions. Answer keys will be posted. Late
homework assignments will not be accepted. The best four of the five grades that you receive for the homework assignments will count toward your total point accumulation (the lowest grade will be dropped). Late homework assignments will not be accepted. If you cannot make the class meeting at which the assignment is due, you must make arrangements to turn in your assignment before the class (e.g., during the previous meeting).

Solutions to self-tests and exercises can be found at http://www.whfreeman.com/ichem5e.

Quizzes: A quiz worth 50 points will be given at the beginning of class on September 14 in which you will be given a black Periodic Table and asked to fill in the symbols of the elements (other than the Lanthanides and Actinides).

Examinations: There will be two closed-book in-class exams during the semester. These two closed-book examinations may be supplemented by take-home, open-book problems. Each "hour" exam (a combination of the open-book and closed-book exams) will be worth 200 points (150 points for the graduate students). A mandatory, closed-book final exam worth 350 points (300 points for the graduate students) will be given at the end of the semester.

Oral Presentation: Graduate students (those registered for CHEM 5233) will present a short oral presentation on assigned topics. The presentations will be “mini-lectures” and the subject-matter covered by the student presentations will be included on the hour exams and Final exams.

Writing Assignment: Graduate students (those registered for CHEM 5233) will complete a short writing assignment that will be due toward the end of the semester. The paper will be a critique of an article on inorganic chemistry from the primary literature. More details on this assignment will be provided at a later date. Undergraduates (those registered for CHEM 4333) are invited to complete this assignment for up to 50 points of extra credit.

Extra Credit: Except as described above for the Writing Assignment, there will be NO EXTRA CREDIT in this class.

Make-ups: There will be no make-up "hour" exams. Verifiable illness or emergencies will result in a grade being assigned to the missed exam(s) and homework assignment(s) based on your performance on the other exams and homework assignment(s). The quiz and the final exam are mandatory and in the event of a verifiable illness or emergencies make-ups will be arranged.

Keys to effective learning/performance:

- Read the assigned text pages both before and after class.
- Regularly solve as many homework problems and exercises as possible. The exams will draw heavily on these assigned problems.
• Attend class regularly, and ask questions.

**Recommended Reference Books:** I list here some useful references should you wish to learn more about the given subject.

**General Inorganic Chemistry:**
K. F. Purcell, J. C. Kotz, *Inorganic Chemistry*
A. F. Wells, *Structural Inorganic Chemistry*
W. L. Jolly, *Modern Inorganic Chemistry*
W. W. Proterfield, *Inorganic Chemistry, A Unified Approach*

**Descriptive Inorganic Chemistry:**
N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements*
G. Wulfsberg, *Principles of Descriptive Inorganic Chemistry*
G. E. Rodgers, *Descriptive inorganic, coordination, and solid-state chemistry*

**Experimental Methods:**
R. S. Drago, *Physical Methods in Inorganic Chemistry*
M. L. Martin, J.-J. Delpuech, G. L. Martin, *Practical NMR Spectroscopy*
A. I. Popov, K. Hallenga, *Modern NMR Techniques and Their Applications*
W. R. Croasmun, R. M. K. Carlson, *Two-Dimensional NMR Spectroscopy*
K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*
T. A. Carlson, *Photoelectron and Auger Spectroscopy*
G. J. Long, *Mossbauer Spectroscopy Applied to Inorganic Chemistry*

**Bonding and Quantum Chemistry:**
T. A. Albright, J. K. Burdett, M.-H. Whangbo, *Orbital Interactions in Chemistry*
B. M. Gimarc, *Molecular Structure and Bonding*
J. K. Burdett, *Molecular Shapes*
L. Pauling, E. B. Wilson, *Introduction to Quantum Chemistry*
C. J. Balhausen, H. B. Gray, *Molecular Orbital Theory*
M. C. Day, J. Selbin, *Theoretical Inorganic Chemistry*
W. J. Hehre, et al., *Ab Initio Molecular Orbital Theory*

**Symmetry and Group Theory:**
F. A. Cotton, *Chemical Applications of Group Theory*
H. H. Jaffe, M. Orchin, *Symmetry in Chemistry*
M. Tinham, *Group Theory and Quantum Mechanics*

**Web resources:**
Course website: [http://learn.ou.edu](http://learn.ou.edu)
Interactive periodic table: [http://www.webelements.com](http://www.webelements.com)
Drop Day: The last day to drop with an automatic "W" is October 2. The last day to drop with the permission of the Dean is December 11.

Changes to the Syllabus: The instructor reserves the right to change by addition and/or subtraction the content of this syllabus. This includes, but is not limited to, course content, assignments, due dates, and portion(s) of the grade assigned to individual components of the course.

Absences: Students are responsible for the content of courses in which they are enrolled. Students have a responsibility to inform the instructor prior to absences whenever possible. It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays.

Accommodation of Students with Disabilities: The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the instructor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173. Each student should acquaint her or his self with the University's codes, policies, and procedures involving academic misconduct, grievances, sexual and ethnic harassment, and discrimination based on physical handicap.

Plagiarism and Academic Misconduct: Students engaging in academic misconduct (including cheating, plagiarism, and any other action that may improperly affect evaluation) will be subject to sanctions in accordance with the Norman Campus Academic Misconduct Code. Dr. Ashby routinely recommends "F" for the course and expulsion from the University for all such violations.
# CHEM 4333/5233
## Advanced Inorganic Chemistry - Periodic Systems
### Fall Semester 2012

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### THE BASICS

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<thead>
<tr>
<th>August</th>
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<th>pp. 3-20</th>
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<tr>
<td></td>
<td>22</td>
<td>Overview of the Periodic Table</td>
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<td>24</td>
<td>Covalent Bonding (Lewis Theory)</td>
<td>pp. 34-42</td>
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<td></td>
<td>29</td>
<td>Covalent Bonding (MO)</td>
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<td>31</td>
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<td>September</td>
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<td>Ionic Bonding</td>
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<tr>
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<td>5</td>
<td>Labor Day Holiday</td>
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<td></td>
<td>7</td>
<td>Inorganic Thermodynamics</td>
<td>pp. 86-95, 106-107</td>
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<tr>
<td></td>
<td>10</td>
<td>Acids and Bases I</td>
<td>pp. 111-123</td>
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**Problem Set 1 due September 10**

| #12  | 9   | Acids and Bases II                | pp. 123-142 |
| 14   | 10  | Oxidation and Reduction I         | pp. 62, 264, 147-154 |
| 17   | 11  | Oxidation and Reduction II        | pp. 154-169 |
| 19   | 12  | Periodic Trends I                 | pp. 258-272 |
| 21   | 13  | Periodic Trends II                | pp. 258-272 |
| 24   |     | Symmetry (An Aside)               | pp. 179-186 |

**Problem Set 2 due September 24**

| 26   |     | Review                             |          |
| 28   |     | Practice Problems                  |          |

### CHEMISTRY OF THE GROUPS

<table>
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<th>October</th>
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<th>FIRST HOUR EXAMINATION (Chapters 1-9)</th>
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<tr>
<td></td>
<td>5</td>
<td>Hydrogen</td>
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<tr>
<td></td>
<td>8</td>
<td>Group 1 (Alkali Metals: Li, Na, K, Rb, Cs, Fr)</td>
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<tr>
<td></td>
<td>10</td>
<td>Group 2 (Alkaline Earth Metals: Be - Ra)</td>
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<tr>
<td></td>
<td>12</td>
<td>Group 13 (B, Al, Ga, In, Tl)</td>
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<tr>
<td></td>
<td>15</td>
<td>OU/Texas Holiday</td>
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<tr>
<td></td>
<td>17</td>
<td>Group 14 (C)</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Group 14 (Si, Ge, Sn, Pb)</td>
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<tr>
<td></td>
<td>22</td>
<td>Group 15 (N)</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>Group 15 (P, As, Sb, Bi)</td>
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<tr>
<td></td>
<td>26</td>
<td>Group 16 (O)</td>
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<tr>
<td></td>
<td>29</td>
<td>Group 16 (S, Se, Se, Te, Po)</td>
</tr>
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**Problem Set 3 due October 29**

| 31  | 24  | Group 17 (Halogens: F, Cl, Br, I, At)  | pp. 419-438 |
November  
2 25 Group 18 (Noble Gases: He, Ne, Ar, Kr, Xe, Rn)  pp. 440-447  
5 26 Introduction to Transition Metals  pp. 449-471  
7 27 Introduction to Transition Metals  pp. 473-487  
9 28 Properties of Transition Metals (Groups 4-7)  pp. 449-471  
12 29 Properties of Transition Metals (Groups 8-11)  pp. 449-471  

November 25 Group 18 (Noble Gases: He, Ne, Ar, Kr, Xe, Rn) pp. 440-447

5 26 Introduction to Transition Metals pp. 449-471
7 27 Introduction to Transition Metals pp. 473-487
9 28 Properties of Transition Metals (Groups 4-7) pp. 449-471
12 29 Properties of Transition Metals (Groups 8-11) pp. 449-471

Problem Set 4 due November 12

14 Review
16 Review
19 SECOND HOUR EXAMINATION (Chapters 10-19)

-------------------------------------------------------------------------------------------------------- ADVANCED TOPICS--------------------------------------------------------------------------------------------------------

21 30 Group 12 (Zn, Cd, Hg) pp. notes
23 Thanksgiving Vacation
27 Thanksgiving Vacation
26 31 Main-Group Organometallic Chemistry pp. notes
28 32 Organotransition Metal Chemistry pp. 534-575
30 33 Lanthanides and Actinides 579-597

December

3 34 Main-Group Bioinorganic Chemistry TBA
5 35 TM Bioinorganic Chemistry TBA

Problem Set 5 due December 5

7 Review
14 FINAL EXAMINATION (comprehensive) 1:30-3:30 p.m.

# Periodic Table Quiz