CHEM 462: Inorganic Chemistry

Fall 2011 SYLLABUS

T/Th 9:35-10:50 am, CHAN 2121

INSTRUCTOR: **Professor Janet Bluemel**—Reed McDonald building (RMD), room 323 (via 321)
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Homepage Bluemel: http://www.chem.tamu.edu/rgroup/bluemel/

OFFICE HOURS: **T/Th 11:00 am-12:00 pm, or by appointment**

TEACHING ASSISTANT: **Eric Steffensmeier—**RMD, room 428 or 402 (both via room 428)
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OFFICE ASSOCIATE: **Jennifer Belcik**—RMD, room 321
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TEXTBOOKS:

[1] Inorganic Chemistry. Catherine E. **Housecroft** and Alan G. **Sharpe**. Prentice Hall, 2nd Edition.
ISBN: 0130399132

[2] Inorganic Chemistry. D. F. **Shriver**, P. W. **Atkins**, and C. H. Langford. Oxford Univ. Press, 4th Edition.
ISBN: 9780716723981

[3] Chemistry of the Elements. N. N. **Greenwood** and A. **Earnshaw**. Pergamon Press, 2nd Edition.
ISBN: 0-7506-3365-4 (paperback)

[4] Advanced Inorganic Chemistry. F. Albert **Cotton**, Carlos A. **Murillo**, and Manfred **Bochmann**. John Wiley & Sons, Inc., 6th Edition. **ISBN: 0471199575**

[5] Inorganic Chemistry. Nils Wiberg, A. F. **Holleman** and Egon **Wiberg**. Academic Press. 1st Edition (in English), 2001. ISBN: 0-12-352651-5

COURSE GRADING:

Exam I (Oct. 11, 2011, CHAN 2121)	25 %
Exam II (Nov. 10, 2011, CHAN 2121)	25 %
Final Exam (Friday, December 9, 2011, from 7:30-9:30 am, CHAN 2121)	50 %

COURSE DESCRIPTION and LEARNING GOALS:

My aim is to provide a comprehensive and contemporary introduction to the diverse and fascinating discipline of inorganic chemistry. Inorganic chemistry deals with the properties of all the elements in the periodic table. These elements range from highly reactive metals to noble metals, such as gold. The nonmetals include solids, liquids and gases. Although this variety and diversity are intrinsic features of inorganic chemistry, there are underlying patterns and trends which enrich and enhance our knowledge of the discipline. My goal is to provide all students with an insight into these ordering principles, and a foundation on which to build understanding. Achievements in recent research, as well as industrial aspects of inorganic chemistry, will be included. Examples from publications and seminar talks presented by visitors during the semester will be discussed.

COURSE OUTLINE:

I. Introduction to Inorganic Chemistry

A. Brief Repetition: Atomic Structure
- Origin of the Elements
- The Ordering Principles of the Elements: The Periodic Table
- Atomic Orbitals
- Atomic Parameters

B. Molecular Structure and Bonding
- Lewis Structures, Octet Rule and VSEPR Model
- Valence-Bond Theory
- Molecular Orbital Theory and Bond Properties

C. Structures of Solids

- Metals and Alloys
- Ionic Solids and Liquids
- Energetics and Electronic Structures of Solids

D. Purification of Inorganic Compounds and Materials
- Distillation and Sublimation
- Crystallization and Zone Melting
- Chromatographic Methods and Extraction

E. Characterization of Inorganic Compounds and Materials
- Elemental Analysis, Melting and Boiling Points
- X-ray Powder and Crystal Diffraction
- NMR and EPR of Liquids and Solids
- IR, Raman, UV-VIS, Mass Spectrometry
- Photoelectron and Atomic Absorption Spectroscopy
- Mößbauer Spectroscopy

F. Coordination Chemistry and Organometallic Chemistry
- Ligands
- Constitution and Geometry
- Reactions of Coordination Compounds

II. The Chemistry of the Main Group Elements: Following the Periodic System

III. The Chemistry of the Transition Metals

A. The d-Block Metals and their Complexes
- Trends in Chemical Properties
- Crystal- and Ligand-Field Theory and Electronic Spectra

B. d-Metal Organometallic Chemistry
- Ligands and their Bonding
- Compounds and Reactions

C. f-Block Metals and their Chemistry
- Lanthanoid Chemistry
- Actinoid Chemistry

IV. Solid-State and Materials Chemistry in Academia and Industry
- Oxide Glasses and Pigments
- Layered Materials and Intercalation
- Metal Organic Frameworks (MOFs)
- Fullerides, Graphene, and Nanorods

V. Introduction to Catalysis

A. Homogeneous Catalysts
- Basic Principles
- Examples of the most Important Catalytic Reactions

B. Heterogeneous Catalysts

C. Hybrid Catalysts
- Solid/Liquid Systems
- Liquid/Liquid Biphasic Systems

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Cain Hall, Rm. B118, or call 845-1637.

"*An Aggie does not lie, cheat or steal, or tolerate those who do*."