CHEM 673 - Symmetry and Group Theory in Chemistry

T-R 11:10 a.m.-12:25 p.m. CHEM 2122  Cr. 3

Course Description: Applications of symmetry and group theory to various types of chemical systems; classification of molecules into symmetry point groups and use of character tables.

Pre-requisite: Bachelor’s degree in chemistry except by permission.

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Textbook: Chemical Applications of Group Theory, 3rd edition
Author: F. Albert Cotton


4. Chapter 3. Linear Algebra in “Mathematics for Quantum Chemistry” by J. M. Anderson. This is an old book and there are many equivalent chapters on linear algebra elsewhere.

Course Topics: 0. There will be an ungraded examination on day 1 to determine the background of the class.
1. Definitions and Theorems of Group Theory
2. Molecular Symmetry and the Symmetry Groups
3. Crystallographic Symmetry
4. Representations of Groups
5. Vibrational Symmetry
6. Group Theory and Quantum Mechanics
7. Symmetry-Adapted Linear Combinations
8. Molecular Orbital Theory and Its Applications in Organic Chemistry
9. Molecular Orbital Theory for Inorganic and Organometallic Chemistry
10. Ligand Field Theory
Assignment/Exam Schedule and Grading policy:

There will be two examinations and a final. The first examination will be on Thursday, September 30, 2004. The second Examination will be on November 11, 2004. The Final is scheduled for December 10, 2004 from 3-5pm.

Examinations will count 40% of the grade. The final will count 40%. Quizzes and homework will account for 20% for the grade.

Attendance/Absence Policy:

Attendance is required and actions regarding absences must follow University regulations. However, no attendance record will be kept.

American with Disabilities Act (ADA) Policy Statement:

The Americans with Disabilities Act (ADA) is a federal anti-discrimination 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 Room 126 of the Koldus Building, or call 845-1637.

Aggie Honor Code

“All Aggie does not lie, cheat, or steal or tolerate those who do.”

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

For additional information please visit: www.tamu.edu/aggiehonor/

Learning Outcomes Expected of Class

Thorough recognition by examination of molecular symmetry and the symmetry group to which a molecule of known structure belongs.
Evidence of some practical understanding of crystallographic symmetry.
A thorough understanding of what constitutes a group and group properties along with mathematical representations of groups.
Evidence of understanding of the nomenclature of atomic and molecular spectroscopy and how this nomenclature relates to symmetry properties.
Evidence of understanding how molecular properties such as vibrations, electronic spectra, molecular orbitals and other are to be represented in various symmetries.
Success in reading and answering questions about the symmetry properties described in a
chemical research paper taken from the literature.