

Spring 2005

Stephen M. Holmes

Chem 710-001
Physical Methods in Inorganic Chemistry

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Office hours by appointment

When: 11 – 12:15 AM TTh
Where: 111 Chemistry-Physics Bldg.

Required Texts:

E. A. V. Ebsworth; D. W. H. Rankin; S. Cradock, *Structural Methods in Inorganic Chemistry*, 2nd Ed.; CRC Press: New York, 1987.

Supplementary Texts (optional and useful additions to your library):

Y. Jean; F. Volatron; J. Burdett *An Introduction to Molecular Orbitals*

G. L. Miessler; D. A. Tarr *Inorganic Chemistry*, 2nd Ed.

A. Vincent *Molecular Symmetry and Group Theory*

D. F. Shriver; P. W. Atkins; C. H. Langford *Inorganic Chemistry*

K. F. Purcell; J. C. Kotz *An Introduction to Inorganic Chemistry*

N. N. Greenwood; A. Earnshaw *Chemistry of the Elements*

R. S. Drago *Physical Methods for Chemists*, 2nd Ed.

K. Nakamoto *Infrared and Raman Spectra of Inorganic Coordination Compounds*; 5th Ed.

J. E. Wertz; J. R. Bolton *Electron Spin Resonance*

J. W. Cooper *Spectroscopic Techniques for Organic Chemists*

J. B. Lambert; H. F. Shurvell; D. Lightner; R. G. Cooks *Introduction to Organic Spectroscopy*

F. W. McLafferty *Interpretation of Mass Spectra*; 3rd Ed.

H. Friebolin *Basic One- and Two-Dimensional NMR Spectroscopy*; 2nd Ed.

C. N. Banwell *Fundamental of Molecular Spectroscopy*; 3rd Ed.

D. A. Skoog; J. J. Leary *Principles of Instrumental Analysis*; 4th Ed.

P. W. Atkins *Physical Chemistry*; 4th Ed.

G. H. Stout; L. H. Jensen *X-Ray Structure Determination, A Practical Guide*

Grading Distribution

Graduate		Undergraduate	
60%	Exams (3 x 20%)	60%	Exams (3 x 20%)
30%	Final Exam (comprehensive)	30%	Final Exam (comprehensive)
10%	Homework (5-6 expected)	10%	Homework (5-6 expected)

To satisfy recent SACS requirements undergraduate students will answer fewer questions per homework assignments.

CHE 710

Date	Tentative Topics/Order/Assigned Reading
Thursday Jan. 13	Introduction
Tuesday Jan. 18	Molecular Symmetry and Group Theory
Thursday Jan. 20	Group Theory; IR and Raman
Tuesday Jan. 25	Vibrational Spectroscopy: Theory
Thursday Jan. 27	Infrared Spectroscopy: functional group identification
Tuesday Feb. 1	Infrared Spectroscopy: functional group identification
Thursday Feb. 3	Vibrational Spectroscopy: Raman Spectroscopy
Tuesday Feb. 8	Nuclear Magnetic Resonance Spectroscopy (NMR): Background
Tuesday Feb 8	Exam 1: 6 PM, Tue. Feb. 8
Thursday Feb. 10	NMR: Chemical Shift origins (spin-spin splitting, chemical shift equivalence, magnetic equivalence)
Tuesday Feb. 15	NMR: CSE, ME, tree diagrams for coupling interactions
Thursday Feb. 17	NMR: Factors impacting $J_{x,y}$ coupling, relaxation mechanisms
Tuesday Feb. 22	NMR: spin systems, virtual coupling
Thursday Feb. 24	Mass Spectrometry: Ionization techniques and mechanisms
Tuesday Mar. 1	Mass Spectrometry: Fragmentation mechanisms
Thursday Mar. 3	Mass Spectrometry: Functional group fragmentation
Tuesday Mar. 8	Mass Spectrometry: Functional group fragmentation
Tuesday Mar. 8	Exam 2: 6 PM, Tue. Mar. 8
Thursday Mar. 10	Magnetism and magnetic susceptibility basics
<i>Tuesday Mar. 15</i>	<i>Spring Break</i>
<i>Thursdar Mar. 17</i>	<i>Spring Break</i>
Tuesday Mar. 22	Magnetism: Term Symbols, States, Magnetic field-dependence
Thursday Mar. 24	Magnetism: Molecule-based systems
Tuesday Mar. 29	X-ray and neutron diffraction-Parkin
Thursday Mar. 31	Extended X-ray Absorption Fine Structure Spectroscopy-Parkin
Tuesday Apr. 5	Magnetism
Tuesday Apr. 5	Exam 3: 6 PM, Wed. Apr. 5
Thursday Apr. 7	Electron Paramagnetic Resonance: theory and examples
Tuesday Apr. 12	Electron Paramagnetic Resonance, Mössbauer Spectroscopy
Thursday Apr. 14	Electronic Spectroscopy: UV-visible Spectroscopy: Basics, Selection rules, Spectrochemical, Neuphelauxetic Series
Tuesday Apr. 19	UV-vis Spectroscopy: Calculation of D_q , β , Orgel and Tanabe-Sugano diagrams
Thursday Apr. 21	UV-vis examples and identification
Tuesday Apr. 26	Electronic Spectroscopy: Photoelectron Spectroscopy
Thursday Apr. 28	Circular-, Magnetic Circular Dichroism, and Optical Rotary Dispersion

Final Exam: 10:30 AM, Tues. May 3