

**Final Exam: Thursday, December 20, 2001 from 7 – 9 pm in Room 314 CB**

Comprehensive Final (150 pts): approx. 40% new material since 2<sup>nd</sup> exam.

Office hours next week: Mon. (3-5 pm), Wednesday (2-3:30 pm), Thursday (10:30-11:30 am)

Selection of topics covered in Chem. 170

Atomic properties (orbitals, electron filling, energy levels, wave functions, shielding, EA, IE, electronegativity).

Localized electrons in covalent bonds ( Lewis structures, VSEPR, distortions, hybrids)

Molecular orbitals (diatomics- homonuclear and heteronuclear, s-p mixing, pictorial approaches, group A.O.'s, Walsh diagrams)

Molecular symmetry (point groups and symmetry, use of character tables, applications to spectroscopy and bonding)

**First Exam**

Solid-state chemistry (ionic bonding, unit cells, common structure types, radius ratio, ionics and lattice energy, Born-Haber cycles, band theory, electrical conductivity, semiconductors, superconductors, and defects)

Main group chemistry (acid base definitions, NH<sub>3</sub> as a solvent, halide and noble gas chemistry, P, S and Si chains and rings, boron hydrides and Wades rules)

Transition metal chem (coordination, isomers, oxidation states, 18 e- rule).

**Second Exam**

More transition metals (metal carbonyl clusters, crystal field theory, distortions, electronic transitions and color, MO approach to  $\pi$  interactions and backbonding, Orgel and TS diagrams and assignment of electronic transitions, magnetism and spinels, ligand substitution kinetics, and organometallic homogeneous catalysis)

**Inorganic Chemistry Research at the University of Iowa**

<http://www.uiowa.edu/~chemdept/>

**Darrell P. Eyman**, Organoiron, -manganese, and -rhenium chemistry; activation of coordinated carbon monoxide; synthesis and reactivities of new metal formyls and (arene) metal carbonyl hydrides; homogeneous and heterogeneous catalysis of small molecule reactions.

**Sonya Franklin**, Bioinorganic chemistry; design and development of artificial endonucleases; lanthanide-peptide DNA binding and cleavage motifs; structure and function of a zinc-binding protein implicated in Multiple Sclerosis.

**Edward G. Gillan**, Materials synthesis via controlled decomposition of single-source organometallic precursors; synthesis of metastable carbon nitrides; use of high pressure/temperature non-aqueous solutions in semiconductor crystal growth.

**Harold Goff**, Synthesis, spectroscopy, and catalysis by high-valent metalloporphyrins and organometallic porphyrin derivatives; high-field NMR of peroxides enzymes.

**Louis Messerle**, Synthetic and mechanistic organometallic chemistry of early transition metals, particularly mid-valent and metal-metal multiply-bonded compounds; organopolymetallics of main group elements, inorganic complexes in medical diagnostic imaging.

**Jason Telford**, Supramolecular and nanochemistry of metal complexes. De novo metalloprotein design. Design and synthesis of outer sphere coordination complexes for environmental remediation

Inorganic chemistry in related disciplines

**Donald J. Burton**, New synthetic methodology, fluorinated organometallics, palladium-catalyzed perfluoroalkenyl coupling reactions, fluorinated phosphorous ylides and their reactions, fluorinated phosphonic and phosphinic acids, fluorinated polymeric electrolytes.

**Vicki H. Grassian**, Surface science studies as related to catalysis, materials, and environmental and atmospheric chemistry; photo-assisted catalysis of environmental toxins; metal oxide and oxide-supported metal surface chemistry; ice surface photochemistry; infrared spectroscopy of adsorbed molecules.

**Sarah C. Larsen**, Magnetic resonance techniques; solid state NMR and EPR; in situ studies of catalytic systems, in particular environmental catalysts based on zeolites.

**Len MacGillivray**, photochemistry in crystalline organic crystals, synthesis of porous molecular solids and nanometer scale molecular structures for applications in separations, catalysis, and molecular switching.