CHEMISTRY 1060
CHEMICAL STRUCTURE and REACTIVITY

A Summer Program for high-ability High School Students who have completed a one year high school honor’s chemistry course.

Directed and taught by:
Professors Ronald O. Ragsdale and Gothard C. Grey

6 weeks, 130 hours of class and lab, 12 hours of seminars. A daily program from 7:00 am to 12:30 pm. Preceded by an orientation and a lab check-In and lecture.

**Texts:** Kotz & Treichel, *Chemistry & Chemical Reactivity* 4th ed.
Basolo and Johnson, *Coordination Chemistry*

5 Handouts

**Problem assignments:** 200 graded problems

**Course outline:**

**Review and extension:**
- Names, ionic compounds, acids, bases
- Reactions, redox, moles

**Periodic Table:**
- Quantum numbers, orbitals
- Electron configuration, Paramagnetism
- Periodic properties

**Energy and Structure:**
- Ionic solids
- Enthalpy, Bond Energies, Born-Haber Cycle

**Bonding and Structure:**
- Lewis Structures, Lewis Acid & Base
- VSEPR, Shape and Polarity, Hybridization
- Molecular Orbitals, diagrams, MO shapes, multiple bonds

**Coordination Chemistry:**
- Transition metals, Lewis Acid-Base reactions
- Ligands, synthesis reactions
- Nomenclature
- Isomerism, optical, geometric, bonding
- Bridging ligands
- Ligand field, crystal field
  - Geometry and crystal field splitting, Jahn-Teller effect
  - Paramagnetism
  - Spectra, spectrochemical series
- Ligand replacement, trans effect
Organic Chemistry:
  Nomenclature, hydrocarbons, functional groups
  Typical reactions
  Optical isomers, configurations
  Polymers
  Infrared spectra and functional groups

Laboratory:
  17 Experiments (most experiments require 2 lab periods) an in house lab manual

Laboratory work:
Density of a metal
Identification and Reactions of
  Some Inorganic Compounds
9 Solutions and an Unknown
Some Chemical Properties of
  Chromium and Manganese
Relative Stabilities of Complex Ions
  And Precipitates of Copper(II)
Determination of the Formula of a
  Complex Ion by Spectrophotometry
Synthesis of Some Coordination Compounds
Synthesis of a Coordination Compound of Iron
The Chemistry of Silver and the
  Photographic Process
Analysis of Ag⁺, Pb²⁺ and Hg₂²⁺
Synthesis of Aspirin
Analgesic Drug Analysis by TLC
Synthesis of Esters
Polymer Synthesis and Properties
Determination of Functional Groups by IR
Exams:
  5 – 1 ¼ hr exams
  1 – Final, 2 hr exam