

## Fields of Advanced Difficulty

### Theoretical

**Kinetics:** Integrated first order rate equation; analysis of complex reaction mechanisms using the steady state approximation; determination of reaction order and activation energy.

**Thermodynamics:** Relationship between equilibrium constant, electromotive force and standard Gibbs free energy; the variation of equilibrium constant with temperature.

**Quantum Mechanics:** Energetics of rotational, vibrational, and electronic transitions using simple model theories.

**Molecular Structure and Bonding Theories:** The use of Lewis theory, VSEPR theory and hybridization for molecules with coordination number greater than four.

**Inorganic Chemistry:** Stereochemistry and isomerism in coordination compounds.

**Spectroscopy:** Interpretation of relatively simple  $^{13}\text{C}$ - and  $^1\text{H}$ -NMR spectra; chemical shifts, multiplicities, coupling constants and integrals.

### Practical

Column chromatography.

Thin layer chromatography.