

Introduction to Physical Organic Chemistry ***(Blackmond, Donna G – 5 hours)***

Aims:

To provide an introduction to important physical aspects of organic chemistry as a complement to synthetic chemistry modules.

Building upon: Foundation Chemistry and Organic Synthesis

Looking forward to: Year 4 “Reaction Kinetics” and “Advanced Problems”

Structure:

Lecture 1: Review of structure and bonding; review of acid-base chemistry.

Lecture 2: Kinetics and Thermodynamics; reactive intermediates and transition states.

Lecture 3: Developing the languages we use to describe chemical reactions: energy diagrams and reaction rate laws.

Lecture 4: Linear free energy relationships: Hammett plots; Hammond postulate.

Lecture 5: Reaction mechanisms: multi-step reactions; introduction to catalysis; introduction to experimental methods in mechanistic analysis

At the end of the course, students should:

- Appreciate the relationships between physicochemical properties and reactivity of molecules
- Have an appreciation of the main factors influencing the rates and outcomes of chemical reactions
- Be aware of the basic methods used for experimental mechanistic analysis
- Understand how free energy relationships can be used to analyze and predict reactivity.
- Understand experimental approaches to studying reaction mechanisms
- Apply all the above to unfamiliar examples.

Recommended textbooks:

“Mechanism and Theory in Organic Chemistry” Lowry & Richardson, (HarperCollins, 3rd edition, 1987).

“Structure and Mechanism in Organic Chemistry”, Carroll, (Brooks/Cole Publishing Company 1998).

“A GuideBook to Mechanism in Organic Chemistry”, Peter Sykes, (Longman, 6th edition 1986).

“Organic Chemistry”, Clayden, Greeves, Warren and Wothers, (Oxford University Press, 2001)