

Classtimes: TBA (3 lectures per week)

Textbook: E.V. Anslyn & D.A. Dougherty, "Modern Physical Organic Chemistry".
University Science Books: 2005.

Course Outline

Week 1-2	Strain and Stability - thermochemistry of stable molecules and reactive intermediates; basic conformational analysis; electronic effects; highly strained molecules; molecular mechanics	A&D 2.1-2.6
Week 3	Solutions and Non-covalent Binding Forces - solvent and solution properties; ion pairing and electrostatic interactions; hydrogen bonding; π -effects; induced-dipole interactions; hydrophobic effect	A&D 3.1-3.2
Week 3-4	Acid-Base Chemistry - aqueous solutions; non-aqueous systems; predicting acid-base strengths in solution; Lewis acids/bases & electrophiles/nucleophiles	A&D 5.1-5.6
Week 5	Energy Surfaces and Reaction Kinetics - energy surfaces; qualitative transition state theory; postulates & principles related to kinetics; kinetics of one-step reactions; complex reactions; kinetic methods	A&D 7.1-7.6
Week 6-7	Kinetics, Thermodynamics, and Reaction Mechanisms - isotope effects; substituent effects; other linear free energy relationships; Bronsted relationships; why LFERs work; non-kinetic methods in mechanistic determinations	A&D 8.1-8.8
Week 8	Reading Week	
Week 9	Catalysis -electrophilic and nucleophilic catalysis, Bronsted acid-base catalysis	A&D 8.1-8.3
Week 10-11	Reaction Mechanisms: Additions and/or Eliminations - carbonyl hydrations; electrophilic additions to alkenes and alkynes; nucleophilic additions to carbonyl compounds; nucleophilic additions to alkenes; radical additions; carbene reactions; elimination reactions; addition/elimination reactions; electrophilic and nucleophilic aromatic substitution	A&D 10.1-10.5; 10.8-10.15; 10.18, 10.19
Week 11-12	Reaction Mechanisms: Substitutions and Isomerizations - enol & enolate chemistry; nucleophilic substitution at aliphatic centers; radical substitutions; carbocation and carbanion rearrangements; radical rearrangements	A&D 11.1-11.8; 11.10; 11.11
Week 13	Organic Photochemistry - uni- & bimolecular photophysical processes; energy and electron transfer; photocycloaddition reactions; photoisomerization reactions; carbonyl photochemistry	A&D 16.1-16.3

General References

1. F.A. Carey & R.J. Sundberg, "Advanced Organic Chemistry, Part A"; 3rd Edition; Plenum (1990).
2. T.H. Lowry & K.S. Richardson, "Mechanism and Theory in Organic Chemistry", Harper & Row (1987).
3. F.A. Carroll, "Perspectives on Structure and Mechanism in Organic Chemistry"; Brooks/Cole (1998).
4. N.S. Isaacs, "Physical Organic Chemistry", Prentice Hall (1995).
5. G.W. Klumpp, "Reactivity in Organic Chemistry"; Wiley (1982).
6. H. Maskill, "The Physical Basis of Organic Chemistry"; Oxford Science (1985).
7. R.A.Y. Jones, "Physical and Mechanistic Organic Chemistry", Cambridge University Press (1984).
8. J.H. Espenson, "Chemical Kinetics and Reaction Mechanisms", 2nd Ed.; McGraw-Hill (1995).
9. Frost & Pearson, "Kinetics and Mechanism", 2nd Ed.; Wiley (1961).
10. P. Zuman & R.C. Patel, "Techniques in Organic Reaction Kinetics"; Wiley (1984).
11. E.M. Kosower, "Introduction to Physical Organic Chemistry"; Wiley (1968).
12. L.P. Hammett, "Physical Organic Chemistry", 2nd Ed.; McGraw-Hill (1970).
13. A. Gilbert and J. Baggott, "Essentials of Molecular Photochemistry", CRC Press, Inc. (1991).
14. N.J. Turro, "Modern Molecular Photochemistry". University Science Books: 1991.

Serials

1. "Advances in Physical Organic Chemistry"; V. Gold, D. Bethell, Eds.; Academic Press.
2. "Progress in Physical Organic Chemistry"; A. Streitwieser, R.W. Taft, Eds.; Wiley.
3. "Organic Photochemistry", O.L. Chapman, Ed. (Vols. 1-3); A. Padwa, Ed. (Vols. 4-11). Marcel Dekker.
4. "Advances in Photochemistry", R. A. Noyes, et al. Eds.; Vols. 1-28; Wiley Interscience.
5. "CRC Handbook of Organic Photochemistry", (2 vols), J. C. Scaiano (Ed.), CRC Press, 1989.