Organic Chemistry 2 - Structure & Reactivity 2009

Lecture/Discussion: M, W, F - 9am LBR-252 Dr. Paul Scudder

Recitation Tues. 9am LBR-252 or 8pm HNS-108; Exams & workshops Thurs. 9 am LBR-252
Required Text: "Organic Chemistry," Second Edition, Joseph Hornback, ©2006
Recommended Texts: Paul H. Scudder, Electron Flow in Organic Chemistry, Wiley ©1992
"Student Solutions Manual & Study Guide for Hornback's Organic Chemistry" J. Hornback & B. Murugaverl ©2006

My office is HNS 109 (mailbox in HNS 111, phone 487-4275, email: scudder@ncf.edu, web site: http://www.faculty.ncf.edu/scudder/) and office hours are the half hour before class; I am generally available, so just drop by if you have questions. Any student who anticipates missing an exam is expected to notify me ahead of time and arrange to take it early. The material covered up through Monday is on the Thursday evaluation.

Regular sustained effort and working on your weak areas are the keys to success. Do not allow yourself to get behind. Read the assigned material before class so you don't have to write down things that are already in your text. You are expected to have done the reading and be ready to discuss the assigned homework for the day. Homework for the week is due in the TA boxes by 5pm Friday and will be returned in the Tuesday recitation section. Although class attendance is not mandatory, I will take roll and comment on attendance on the evaluation because poor attendance usually correlates with poor performance on exams. All exams are cumulative, so patch holes.
Assignments and reading are from a working copy of my 2nd ed., handed out in class.

1M Welcome. Organizational stuff. Hand out practice exam. Review proton transfer. Review Substitution and Elimination, energy surfaces, substitution vs elimination decision. Reread PHS Ch 3, 4.2, 4.3, 8.3, 8.4, 9.5 Exercises: Substitution and elimination review handouts

1T TA Recitation sections/workshops. Review material and go over practice exam questions

1W Review Electrophilic Additions to alkenes, alkynes, dienes. Electrophilic Aromatic Substitution. Reread PHS 4.4, 4.6, 4.7, 9.8. Exercises: Addition review handout

1R Theory & Mechanism Workshop in LBR-252 Reread PHS 10.1-10.4 Bring Questions!

1F 17.10 Nucleophilic Aromatic Substitution: Diazonium Ions 17.11 Nucleophilic Aromatic Substitution: Addition-Elimination 17.12 Nucleophilic Aromatic Substitution: Elimination-Addition 17.13 Some Additional Useful Reactions 17.14 Synthesis of Aromatic Compounds PHS 8.9.4 Exercises: 17.23efg, 17.24, 17.27acg, 17.60. (Hornback unless noted)

Feb. 6, Friday, 6pm - 10pm, Chae, Eval 1 (for everyone including semester 1 incompletes)

2M Start Ch18. Additions to the Carbonyl Group: Reactions of Aldehydes and Ketones 18.1 General Mechanisms 18.2 Addition of Hydride: Reduction of Aldehydes and Ketones 18.3 Addition of Water 18.4 Addition of Hydrogen Cyanide. Read PHS 4.4.7, 8.5. Exercises: 18.2ab, 18.3, 18.5, 18.6c, 18.34, 18.37b

2T TA Recitation sections/workshops. Review material and go over exam 1 questions

2W 18.5 Preparation and Properties of Organometallic Nucleophiles 18.6 Addition of Organometallic Nucleophiles 18.7 Addition of Phosphorus Ylides; The Wittig Reaction. Read PHS 8.6 Exercises: 18.8b, 18.9dg, 18.10ag, 18.13e, 18.15c

2R Theory & Mechanism Workshop in LBR-252

2F 18.8 Addition of Nitrogen Nucleophiles 18.9 Addition of Alcohols. Read PHS 7.4.3 Exercises:18.16b, 18.17, 18.18, 18.20a, 18.22, 18.33a

3M 18.10 Conjugate Additions 18.11 Synthesis. Read PHS 8.7, 9.6 Exercises: 18.25ab, 18.26ab, 18.29abcde

3T TA Recitation sections/workshops. Review material and go over practice exam questions

3W Finish Chapter 18 Exercises: 18.38ef, 18.45, 18.46, 18.52, 18.56, 18.57

3R **Eval 2 in LBR-252 @ 8:20 - 10:20 am**

3F Start Ch. 19 Substitutions at the Carbonyl Group: Reactions of Carboxylic Acids and Derivatives 19.1 The General Mechanism 19.2 Preparation of Acyl Chlorides 19.3 Preparation of Anhydrides. Read PHS 4.5, 8.8Exercises: 19.2abc, 19.3, 19.5ab, 19.6b

4M 19.4 Preparation of Esters 19.5 Preparation of Carboxylic Acids 19.6 Preparation of Amides. Exercises: 19.9bd, 19.10, 19.12c, 19.15, 19.40, 19.45

4T TA Recitation sections/workshops. Review material and go over exam 2 questions

4W 19.7 Reaction with Hydride Nucleophiles 19.8 Reduction of Acid Derivatives to Aldehydes 19.9 Reactions with Organometallic Nucleophiles. Read PHS 9. 2 Exercises: 19.17abcd, 19.19a, 19.34abc

4R Theory & Mechanism Workshop in LBR-252

4F 19.9 Reactions with Organometallic Nucleophiles 19.10 Preparation of Ketones 19.11 Derivatives of Sulfur and Phosphorus Acids. Exercises: 19.21b, 19.22, 19.23b, 19.24b, 19.25a, 19.34def

5M Finish Chapter 19 Exercises: 19.35bd, 19.43, 19.48, 19.50, 19.52, 19.57, 19.58

5T TA Recitation sections/workshops. Review material and go over practice exam questions

5W Start Ch. 20 Enolate and Other Carbon Nucleophiles 20.1 Enols and Enolate Anions 20.2 Halogenation of the a-Carbon 20.3 Alkylation of Enolate Anions 20.4 Alkylation of More Stabilized Anions. Read PHS 9.3, 9.4. Exercises: 20.1a, 20.5abc, 20.6abc, 20.7b

5R **Eval 3 in LBR-252 @ 8:20 - 10:20 am**

5F 20.5 The Aldol Condensation. Exercises: 20.11cd, 20.12, 20.13bc, 20.30h, 20.36, 20.41d

6M 20.6 Ester Condensations 20.7 Carbon and Hydrogen Leaving Groups 20.8 Enamines. Exercises: 20.16d, 20.17, 20.18abe, 20.41ab

6T TA Recitation sections/workshops. Review material and go over exam 3 questions

6W 20.9 Other Carbon Nucleophiles 20.10 Conjugate Additions 20.11 Synthesis. Exercises: 20.25b, 20.28, 20.29ac, 20.30af, 20.42ag

6R Theory & Mechanism Workshop in LBR-252

6F Finish Chapter 20 Exercises: 20.39abc, 20.43c, 20.47, 20.48b, 20.60, 20.61

7M Start Ch. 21 The Chemistry of Radicals 21.1 Radicals 21.2 Stability of Radicals 21.3 Geometry of Carbon Radicals 21.4 Generation of Radicals 21.5 General Radical Reactions Read PHS Ch 11.1 to 11.5, and do PHS prob.11.1, 11.5. Exercises: 21.1, 21.2, 21.4, 21.5be

7T TA Recitation sections/workshops. Review material and go over practice exam questions

7W 21.6 Halogenation 21.7 Dehalogenation, 21.8 Autoxidation Read PHS Ch 11.6 to 11.9 and do PHS prob. 11.9, 11.10 Exercises: 21.6, 21.8cd, 21.10b, 21.11a

7R **Eval 4 in LBR-252 @ 8:20 - 10:20 am**

7F Finish Radical Reactions 21.9 Radical Additions to Alkenes 21.10 Reductions and Radical Anions. Exercises: 21.14ad, 21.15b, 21.16cde, 21.35

8 Semester Break and study period. Catch up if you are behind. Bring your book!

9M Start Ch. 22 Pericyclic Reactions 22.1 Pericyclic Reactions 22.2 Molecular Orbital Theory for Conjugated Molecules 22.3 Electrocyclic Reactions. Read Qualitative MO Theory PHS 12.1 – 12.9.1, 12.9.3. Exercises: 21.38, 21.39, 22.1ab, 22.2bc, 22.3e

9T TA Recitation sections/workshops. Review material and go over exam 4 questions.

9W 22.4 Examples of Electrocyclic Reactions 22.5 Cycloaddition Reactions 22.6 The Diels-Alder Reaction. Read PHS 12.9.2 Exercises: 22.6a, 22.9ae, 22.11, 22.13, 22.14fg.

9R Theory & Mechanism Workshop in LBR-252

9F 22.6 The Diels-Alder Reaction 22.7 Other Cycloaddition Reactions 22.8 Sigmatropic Rearrangements 22.9 Examples of Sigmatropic Rearrangements 22.10 Rearrangements to Electron-Deficient Centers. Read PHS 12.9.4 Exercises: 22.16b, 22.21e, 22.22, 22.23c, 22.28b, 22.29c, 22.35

10M Methods of Testing Mechanisms Read PHS 10.7 Do PHS prob. 10.5abce Exercises: 22.41, 22.42, 22.44, 22.49, 22.51, 22.54

10T TA Recitation sections/workshops. Review material and go over practice exam questions

10W Start Ch. 23 The Synthesis of Organic Compounds 23.1 Protecting Groups for Alcohols 23.2 Protecting Groups for Aldehydes and Ketones 23.3 Protecting Groups for Carboxylic Acids 23.4 Protecting Groups for Amines. 23.5 Retrosynthetic Analysis Exercises: 23.1cd, 23.2, 23.3, 23.4a, 23.5c, 23.7d, 23.8, 23.10c

10R **Eval 5 in LBR-252 @ 8:20 - 10:20 am**

10F 23.6 Examples of Syntheses. 23.7 Reactions That Form Carbon-Carbon Bonds 23.8 Preparation of Functional Groups. Exercises: 23.11d, 23.13bh, 23.14d, 23.17ac, 23.15ab,

11M Finish Chapter 23 Exercises:23.18cd, 23.19cd, 23.21, 23.22

11T TA Recitation sections/workshops. Review material and go over exam 5 questions

11W Ch. 24 Synthetic Polymers 24.1 Radical Chain Polymerization 24.2 Structures of Polymers 24.3 Ionic Polymerization 24.4 Coordination Polymerization 24.5 Physical Properties of Polymers 24.6 Major Thermoplastic Addition Polymers 24.7 Elastomers 24.8 Condensation Polymers 24.9 Thermoset Polymers 24.10 Chemical Properties of Polymers. Exercises: 24.18ace, 24.19d, 24.20, 24.21, 24.22, 24.23c

11R Theory & Mechanism Workshop in LBR-252

11F Start Ch. 25 Carbohydrates 25.1 Structures of Carbohydrates 25.2 Stereochemistry of Carbohydrates 25.3 Cyclization of Monosaccharides 25.4 Reactions of Monosaccharides 25.5 Fischer's Structure Proof for Glucose. Exercises: 25.3, 25.5, 25.18, 25.21cd, 25.23

12M 25.6 Disaccharides 25.7 Polysaccharides 25.8 Other Carbohydrate-Containing Compounds. Exercises: 25.25, 25.27ab, 25.30, 25.46, 25.52

12T TA Recitation sections/workshops. Review material and go over practice exam questions

12W Start Ch. 26 Amino Acids, Peptides, and Proteins 26.1 Amino Acids 26.2 Acid-Base Chemistry of Amino Acids 26.3 Chemical Reactions of Amino Acids 26.4 Laboratory Synthesis of Amino Acids. Exercises: 26.6bc, 26.7a, 26.8c, 26.10c, 26.24, 26.25ab

12R **Eval 6 in LBR-252 @ 8:20 - 10:20 am**

12F 26.5 Peptides and Proteins 26.6 Sequencing Peptides 26.7 Laboratory Synthesis of Peptides 26.8 Protein Structure 26.9 Enzymes and Principles of Catalysis Handout. Exercises: 26.19ab, 26.20b, 26.33d, 26.34bd, 26.37, 26.38

13M Reading Day - Workshop in LBR-252

13T Reading Day - TA Recitation sections/workshops. Review material and go over exam 6 questions

13W Reading Day - no class

13R Theory & Mechanism Workshop in LBR-252

13F Enzyme mechanisms - Glycolysis. Exercises: 25.29, 25.33, 25.35, 25.44, 25.45

14M Enzyme mechanisms - Glycolysis. Exercises: 25.37, 25.43, 25.47, 25.48, 25.49

14T TA Recitation sections/workshops. Review material and go over general questions

14W Ch. 27 Nucleotides and Nucleic Acids 27.1 Nucleosides and Nucleotides 27.2 Structure of DNA and RNA 27.3 Replication, Transcription, and Translation. 27.3 Replication, Transcription, and Translation 27.4 Sequencing DNA 27.5 Laboratory Synthesis of DNA. Exercises: 27.7, 27.11, 27.13a, 27.17, 27.21, 27.22, 27.24, 27.25

14R **ACS Standardized Organic EXAM in LBR-252 @ 8:20 - 10:20 am Please be on time!**

14F Ch. 28 Other Natural Products 28.1 Terpenes 28.2 Monoterpenes 28.3 Sesquiterpenes 28.4 Larger Terpenes 28.5 Steroids 28.6 Synthesis of Steroids. 28.7 Alkaloids 28.8 Fats and Related Compounds 28.9 Prostaglandins Exercises: 28.22, 28.28, 28.37, 28.41, 28.43

15M TA workshop. Review material and go over practice final exam

15T TA Recitation sections/workshops. Review material and go over practice final exam

15W Catch-up or **Food additives special lecture** (last day of class)

FINAL EXAM - MONDAY, May 18, 1 P.M. Chae Auditorium (graduating seniors must take the exam early)The course is evaluated on the basis of six cumulative exams together counting for 60%, the homework counts for 10%, the ACS standardized organic chemistry exam counting 10%, and final exam counting 20%. If your final exam score is higher than any of your other scores, then the low score will be dropped, and the final exam will count for 30%. If the ACS score is higher than your second lowest 10% score, then the second lowest 10% score will be dropped and the ACS will count for 20%. An overall average of 65% correct is considered minimally satisfactory work.