

DR. J. S. WALIA
 MONROE 228
 (504) 865-3275
 walia@loyno.edu

ORGANIC CHEMISTRY
 (CHEMA 300+ 001)

Fall 2004
 MWF; MO 157
 12:30 PM-1:20 PM

OFFICE HOURS:

M, W, F - 10:45 AM-11.45 AM
M, T, W - 2:00 PM - 3:00 PM

“YOU ARE WELCOME TO THE WORLD OF ORGANIC CHEMISTRY”
ENJOY AND HAVE FUN IN, AND, THROUGH ORGANIC CHEMISTRY!
“GOOD LUCK”

PREREQUISITES: *Successful Completion of one year of General Chemistry*

TEXT:

1. Paula Y. Bruice, “Organic Chemistry”, 4th edition, Prentice Hall (2004)
2. Paula Y Bruice, “Solution Manual and Study Guide - Organic Chemistry”, 4th edition, Prentice Hall (2004).
3. A set of Molecular Models.

SUPPLEMENTARY READING:

The following books may be consulted for you may find another presentation helpful in complete understanding of a particular concept, or a reaction.

1. M. Jones,” Organic Chemistry”, 3rd edition, W. Norton and Company (2005).
2. J. McMurray, “Organic Chemistry”, 6th edition, Brooks/Cole Publishing Company, Monterey (2004).
3. G. Solomons and C. Fryhle, “Organic Chemistry”, 8th edition upgrade, John Wiley & Sons, Inc., New York, (2004)
4. F. A. Carey, “Organic Chemistry”, 5th edition, McGraw Hill (2003).
5. L. G. Wade,” Organic Chemistry”, 5th Edition, Prentice Hall (2003).
6. M. A. Fox & J. K. Whitesell, “Organic Chemistry”, 3rd edition, Jones & Bartlett (2003)
7. G. Mare London, “Organic Chemistry”, 4th edition, Oxford University Press, New York (2002)
8. W. H. Brown and C. S. Foote, “Organic Chemistry”, 3rd edition, Brooks/Cole, (2002).
9. A. Miller and P. Solomon, “Writing Reaction Mechanisms in Organic Chemistry,” 2nd edition, Acad. Press (2000).
10. W. C. Groutas”, Organic Reaction Mechanisms”, John Wiley and Sons, Inc. New York (2000).
11. S. Rosenfeld, “Basic Skills for Organic Chemistry”, Jones and Bartlett Publishers, Boston (2000).
12. F. A. Carroll,”Perspectives on Structure and Mechanism in Organic Chemistry”, Brooks/Cole Publishing Co. (1998).
13. D. P. Weeks, “Publishing Electrons. A guide for students of Organic Chemistry”, 2nd edition, Saunders College Publishing (1995).

REFERENCES FOR DESIGNING A LOGICAL CHEMICAL SYNTHESIS

1. J-H Fuhrhop & G. Li, “Organic Synthesis”, 3rd edition, John Wiley & sons (2003)
2. M.B. Smith, “Organic Synthesis,” McGraw Hill, Inc, (1994).
3. R.O.C. Norman and J.M. Coxon, “Principles of Organic Synthesis,” 3rd Ed., Blackie Academic & Professional (1993).

BRIEF PREFACE TO ORGANIC CHEMISTRY COURSE

Organic Chemistry is involved in practically everything you do. Therefore, the Chemistry of carbon compounds is more important to you in your everyday life than the chemistry of any other elements. We are made up of largely organic substances and we are continuously nourished by them. These include, but are not limited to, **proteins, carbohydrates, fats and oils, lipids, genes, nucleic acids, enzymes, vitamins and hormones.** In a sense we live in an **Age of Organic Chemistry**. Our three main requirements: **Food, fuel and clothing** - all involve carbon compounds. Look at yourself and around yourself and you will see the manifestations of organic chemistry. Indeed, organic chemistry has influenced the

development of civilization by providing us with a vast array of products such as **drugs, perfumes and flavors, soaps, insecticides, pesticides, fertilizers, explosives, dyes and pigments, refrigerants**, and host of **polymers**. Of course, some organic compounds like the insecticides do cause some environmental problems. Organic chemistry is therefore concerned with almost every aspect of your life. Shouldn't you then **try to master it as best as you can?**

The present organic chemistry course would meet the needs of all the students aspiring to be **Chemists, Biologists, Dentists, Physicians, Chemical Engineers, Pharmacists or Veterinarians**. Indeed, **Organic Chemistry will be presented as a living and a growing thing, useful in your everyday life.**

KEY TO THE COURSE:

I know, you the dear student would like to get a **decent** grade in this course. Here is a **10-point recipe**. Follow it from **today** and **rewards** will be yours.

1. Take good lecture **notes**. Write down as much information as you can (**A MUST**).
2. **Supplement** lecture notes, wherever necessary, before you come for the next lecture. This can be done by reading relevant sections of the textbook.
3. Make sure you understand the **why, how, and when** of different concepts, and of organic reactions.
4. Go **over** and **over** your notes until you feel you have really mastered the material.
5. **Memorize** conceptual and factual information only with complete understanding.
6. Only after you have thoroughly understood the fundamental concepts, start **applying** your knowledge to solving problems, and to make **predictions about Structure and Reactivity, and the chemical reactions**. Learn the **strategy** for planning of chemical synthesis.
7. Do appropriate **problems** at the end of each chapter faithfully and regularly.
8. **DON'T PROCRASTINATE**. (Don't put off 'til tomorrow the things you can do today).
9. In case of any difficulty, please feel free to ask any **questions** during lectures. After lecture, you are **welcome** to visit me during my office hours, which will be posted on my office door.
10. **WORK HARD!** Remember, those who do things that count, never stop to count them. It is all the result of hard work.

LECTURE SEQUENCE:

In designing the sequence for contents in this course, the guiding force has been to present a unifying story about organic compounds, their structures, their reactions, structure-reactivity relationships, and their applications in your everyday life.

1. **ORGANIC COMPOUNDS:**
Their Characterization, Isolation, Purification, Analysis, Structure and Electronic Formulae. (CHAPTER 1).
2. **PRINCIPLES OF BONDING**
Elementary Molecular Orbital Theory. Hybrid Orbitals and Hybridization. (CHAPTER 1).
3. a.) **MOLECULAR PROPERTIES:** Bond Length, Bond Strength, Intramolecular Forces. Polarity of Bonds, Electronegativity, Hydrogen Bonding.
b.) **STRUCTURE AND PHYSICAL PROPERTIES:** Intermolecular Forces. Melting Points. Boiling Points, Solubility.
c.) **LEWIS ACID AND BASE CONCEPTS:** Electrophiles, Nucleophiles. (CHAPTERS 1, 2, 2.9 & 6.2).
4. **FUNCTIONAL (GROUPS AND CLASSIFICATION OF ORGANIC COMPOUNDS:**
Families of Organic Compounds. (CHAPTERS 2, 7.1, 8.9, 15.1, 16.1, 17.1, 21.1 and 22.1)
5. **NOMENCLATURE OF ORGANIC COMPOUNDS:**
a.) Common, Trivial and IUPAC names.
b.) Use of Suffix and Prefix forms.
c.) Naming of Cyclic Compounds.
(CHAPTERS 2.1- 2.7, 3.2, 3.4, 3.5, 6.1, 8.1, 8.10, 16.1, 17.1, 18.1, 21.1 and 23.1).

6. ISOMERISM:

- a.) Skeletal, Positional and Functional Isomers. (CHAPTER 1).
 b.) Free Rotation and Single Bond: Rotational Isomers, (Conformational Isomers).
 (CHAPTERS 2.10 - 2.14, 3.4, 5.1 and 5.2).

7. STEREOCHEMISTRY:

- a.) GEOMETRICAL ISOMERISM: cis and trans-isomers.
 b.) CHIRAL OR OPTICAL ISOMERISM:
 Causes of Chirality or Molecular Disymmetry. Enantiomers, Diastereomers, Racemic and Meso Forms, Erythro-Threo Concept. Resolution. Racemization and Epimerization. Relative and Absolute Configuration. Specification of Configuration (R and S concept). Molecular Disymmetry other than due to an asymmetric center (no chiral center). E and Z Nomenclature.
 c.) STEREOCHEMISTRY OF CYCLIC COMPOUNDS:
 Conformational Analysis, especially of cyclohexanes (mono and disubstituted cyclohexanes).
 (CHAPTERS 5.2 - 5.11, 5.13, 5.16 and 8.2).

8. THEORY OF RESONANCE:

- a.) Acidity in Phenols and Carboxylic Acids.
 b.) Basicity of Amines; Steric Factors (Steric Hindrance and Steric Acceleration). (CHAPTERS 7, 15 + 16).

9. THE ELECTRONIC EFFECTS: INDUCTIVE AND RESONANCE EFFECTS:

- a.) Structural Effects on Basicity of Organic Bases.
 b.) Structural Effects on Acidity of Carbon Acids (CHAPTERS 1.16 - 1.19, 1.21; CHAPTERS 7, 15, 16 + 21)

10. SPECTROSCOPIC METHODS OF STRUCTURE DETERMINATION:

Wavelength. Frequency. Wave Number. Relationship of Energy and Radiation. Ultraviolet and Visible Spectroscopy. Color and Constitution. Infrared Spectroscopy. Nuclear Magnetic Resonance Spectroscopy. Magnetic Resonance Imaging (MRI). Mass Spectroscopy (CHAPTERS 13 & 14).

11. THE SATURATED HYDROCARBON:

Alkanes and cycloalkanes. Corey-House Synthesis. Reaction Intermediates. Carbanions. Transition State. Free Radical Substitution. Energy Diagram. Knocking and Octane Number. Cracking. Designing a Logical synthesis (CHAPTER 9).

12. THE UNSATURATED HYDROCARBONS:

Alkenes and Alkynes. Elimination Reactions (Dehydration and Dehydrohalogenation). Carbocation or Carbonium Ions. Zaitsev's Rule. Hoffmann's Rule. Electrophilic Addition Reactions. Stereospecific Reactions. Ozonolysis. Baeyer's Test. Allylic (benzylic) Halogenation. Free Radical Addition Reactions. The Dienes. Diel's Alder Reaction. Index of Hydrogen Deficiency. Planning of Organic Synthesis. Polymerization. The Polymers (Giant Molecules): Polyethylene, Polystyrene, Acrylics, Saran, PVC, PVA, Plexiglass, Teflon, Superglue, Neoprene, SBR (Synthetic Elastomers), Plasticizers (PCB's). (CHAPTERS 4,6, 20 and 28).

ATTENDANCE POLICY:

You are required to come on time to all lectures, unless you have a good reason to be absent. Excessive absences and/or tardiness (more than 4) will result in lowering of your semester average at the rate of 1 percentage point off per absence (or tardiness).

WITHDRAWALS: Last Date for an Administrative "W" is Friday, November 5, 2004.

FREE CONSULTING AND TUTORING SERVICE:

You, and we mean You, are more than **welcome** any time you feel lost or are puzzled about anything. Remember, it is only you who can tell if you need the help; this is readily available simply on asking.

You are responsible for all the material presented during lectures, and for the material assigned in the homework. Most of the questions for your examinations will be from the lectures and/or the homework assignments. Analytical thinking and reasoning will be necessary to make 100% on a test. Any one who does not pass the first examination must make an appointment to discuss your situation with me, so that we can try to determine the cause of your poor performance and thus be of some help. Please **DO NOT WAIT** until you are desperate to seek assistance.

CHEATING:

The University policy on cheating and plagiarism (see 2003-05 Bulletin, page 46) will be strictly enforced.

DISABILITY SERVICES:

Students with disabilities who wish to receive accommodations in this class should contact Disability Services at 865-2990 as soon as possible so that warranted accommodations can be implemented in a timely fashion. Disability Services are located in the Academic Enrichment Center, Monroe Hall 405.

EXAMINATION SCHEDULE AND GRADING POLICY:

You will be given four 1 hour examinations worth 100 points each. The final examination will be cumulative and will be for 2 hours, worth 200 points. Grades are based almost entirely on performance on examinations.

<u>DATE</u>	<u>EXAMINATION</u>	<u>TIME</u>	<u>POINTS</u>
September 20 (M)	1	50 MIN	100
October 11 (M)	2	50 MIN	100
November 1 (M)	3	50 MIN	100
November 22 (M)	4	50 MIN	100
Dec. 17 (F) 11.30-1.30	FINAL	2 HRS	200

GRADING SCALE

<u>GRADE</u>	<u>SEMESTER AVERAGE</u>
A	89% or above
B+	82-88%
B	75-81%
C+	70-74%
C	65-69%
D+	60-64%
D	55-59%
F	Less than 55%

MAKE-UP EXAM:

A make-up examination is given only if a student was sick on the day of the scheduled examination, or could not be present because of an unusual hardship. In any event, it is your responsibility to inform me if you are going to miss a test **before** the scheduled test.

REVIEW SESSIONS: (Tentative) will be held during windows on **Thursdays before the examinations in MO 157 for review sessions on 9/16, 11/18 & 12/9, and 127 for others.** Make plans to attend all of these, for you will find them extremely valuable in not only mastering all the key concepts but also for earning a decent grade.

GOOD LUCK

OVERCOME ANY REAL OR PERCEIVED FEAR AND/OR THREAT OF ORGANIC CHEMISTRY WITH THE THREE C's: CONFIDENCE COURAGE and COMMITMENT.

REMEMBER YOUR FIVE P's: “PRIOR PREPARATION PREVENTS POOR PERFORMACE”