

## Organic Chemistry 32-335 Syllabus

**Lecture Instructor:** Dr. L. Xie (pronounced as "Shea")

**Office:** HS-445

**Phone:** 424-0436 or 424-1400 (Chem. Office)  
e-mail: [xie@uwosh.edu](mailto:xie@uwosh.edu)

**Office Hours:** M T W F 10:00-11:00 or by appointment

**Lecture:** M W F 11:30-12:30 HS-175

**Lab Instructor:** Dr. Paulson (HS-418, 424-7100, [paulson@uwosh.edu](mailto:paulson@uwosh.edu))  
Section 1: 8-11am Tue; Section 2: 1:20-4:30pm Tue  
Dr. Xie: Section 3: 1:50-5:10 Wed.

**Textbook and Study Guide:**

- Smith "Organic Chemistry" with Solutions Manual, 2<sup>nd</sup> Ed., 2002, Mc-Graw Hill. (Required)
- Anastas and Williamson "Green Chemistry: Frontiers in Benign Chemical Synthesis and Processes", Ed.: Barry Trost, 1998, Oxford University Press (recommended reading)
- Nelson "Green Solvents for Chemistry", 2003, Oxford University Press (recommended)
- Handbook of green chemistry and technology / edited by James Clark and Duncan Macquarr (2002)

**Laboratory Supplies:**

- 32-335 Organic Chemistry II Laboratory Manual. (fall 2008, Required)
- Pavia, et al. Techniques in the Organic Laboratory, 1<sup>st</sup> Ed., Harcourt College Publishers. (required)
- A carbonless-copy notebook. (required) A spiral notebook is NOT acceptable.
- A pair of safety goggles.

**Objectives:**

The following subjects will be emphasized:

1. Theories and techniques of important organic spectroscopy. In particular, infrared, nuclear magnetic resonance (NMR), and Mass spectrometry will be presented and used to identify structures of organic compounds.
2. Discussion of chemical reactions of ethers, conjugate polyenes, aromatic compounds, carbonyl compounds, amines, acids and their related compounds. Emphasis will be placed on the mechanistic aspects of these reactions and their synthetic applications. Conventional electron pushing will be employed in mechanism writing.
3. Further development of organic synthesis skills using various reactions.
4. Theoretic aspects of bonding, aromaticity, resonance structures and other important concepts.

**Some or all of the following topics will be injected into the class discussion:**

- The need for green chemistry and sustainability
- Organic reactions and the concept of atom economy vs. reaction yield
- How to assess the environmental impact of chemical processes
- Innovative technologies and environmentally benign routes to major commodity chemicals
- Catalysts and how they fit the principle of sustainability
- Latest development of environmentally friendly solvents for organic reactions
- Sustainable use of natural resources

**Evaluation of Performance:**

The grades will be based on four hourly exams (400 total points) and your laboratory performance (200 total points). The maximum point possible for the course is 600. There will be no extra credit from any other sources.

- Four hourly exams each worth 100 points will be given in lecture on the tentative dates listed in the lecture schedule on the last page of this document. (400 points)
- A laboratory grade of 200 points will be based on prelab questions, laboratory reports, notebook, and a lab quiz.

The grade will be based on the standards I expect from the class and the average class performance. In the past there has been no need for “curving” the grade. However, curving may be implemented if necessary. The following is a general scale for grade distribution. Final grades may be adjusted slightly and this general scale may not necessarily be followed strictly.

Point Percentage ( <i>out of Total Points</i> )	Grade
$\geq 92\%$	A
$\geq 82\%$	B
$\geq 72\%$	C
$\geq 66\%$	D
$\leq 60\%$	F

This scale is tentative and the instructor reserves the right to assign a grade different from the above scale by taking into consideration of motivation, participation, and efforts.

**Course Policies and Study Hints:**

- Four hourly exams will be given during the regularly scheduled lecture time. NO exam can be taken after the scheduled date. Missing a scheduled exam without **prior** permission (call or email before the exam is given unless it's an emergency situation) from your instructor will result in no credit for that exam.
- Laboratory is an integral part of this course. Missing **TWO** scheduled lab experiments without permission from your instructor will result in a grade of F in the lab, and consequently an F in this course. If you have to miss a lab, inform your lab instructor and try to set up a time for make-up. If a make-up is impossible, ask for your instructor's permission to turn in the lab report so that you can receive a prorated score for that particular lab.

3. You may only go to another lab section by consulting with your instructor.
4. Problem assignments are given in the package of lecture notes (available in the bookstore), and should be worked out promptly following each lecture. Try to work out each problem yourself at least twice before checking into the "Solutions Manual".
5. Study Hints: 1) attend classes with preparation (read 8-12 pages of textbook before coming to lecture); 2) take notes; 3) study regularly; 4) solve as many assigned problems as possible; 5) DO NOT fall behind.

### Laboratory

- Laboratory experiments will not start until the beginning of the second week. During the first week, you should read the assigned material and be prepared for the first experiment. These include some parts of the Pavia's Manual and the 335 Lab Manual. Required readings are listed at the beginning of each experiment under the heading "required reading". You should also read this hand-out carefully for additional information. Prelab sheets will be distributed one week before each lab and will be collected at the **beginning** of each actual lab.
- Organic laboratory and lecture complement each other. The lecture supplies fundamental theory about molecular and electronic structure, chemical reactions, and their mechanisms. In the laboratory you will put this knowledge into practice and learn supplementary theoretical concepts and mechanisms when necessary to help you more fully understand the chemical process in progress.

The following is a typical procedure you should follow for each laboratory experiment:

1. Prelab: Answer prelab questions. Read each experiment in the lab manual **before** coming to the laboratory. These include the theories related to each experiment, required reading materials, and procedures involved in each experiment.
2. Preparation of Notebook: Refer to Chapter 2 of ORGANIC CHEM LAB SURVIVAL GUIDE for more information on notebook keeping. The following are the items to be included in your lab notebook. The completeness and neatness of the lab notebook will be graded and be part of the lab report scores. Up to 4 points of 10 points may be deducted from this portion.
  - Page number: print the number consecutively.
  - Date: the date when the experiment was performed.
  - Title: a brief title of the experiment to be performed.
  - Purpose: the purpose of running the experiment using your own words.
  - Main reaction: write the main reaction involved in each experiment (for exploratory experiments, you may not need to write one).
  - Physical constants of main reagents: list all the **key** reagents in a table format; look up their molecular weight (MW), boiling point if any (b.p.), melting point (m.p.), and density. (These numbers will help you decide, e.g., which layer to take, how fast to heat, what solvent to use, etc.)
  - Experimental procedure: list a brief procedure as to how the experiment is to be done. Leave some space for recording actual reagent quantity and observations

- Observations (such as color change, solid formation, gas released, etc.)
  - Calculations: list the actual amount of all reagents used; record the weight of products, GC peak area, retention time, m.p., b.p., and **other raw data**. Then calculate moles, limiting reagent, yield, etc.
  - Conclusion and comments: if you have any comments or conclusions to make in terms of the success or failure of the experiment.
3. Begin the experiment: Discussion of the theory and concepts involved in each experiment will be given by your instructor at the beginning of each lab period. Arrive **on time** for the discussion!
  4. During the experiment: Record all data and observations in your notebook **while you are working, not after!** Refer to entry 2 above for what to record in the notebook.
  5. End of the experiment: Check to make sure chemical wastes are properly disposed of, bench cleaned, all community items returned to their original places.
  6. Postlab: Write up the discussion and conclusion part of the experiment, calculate the yields and work on the lab report. Do them as soon as possible so that the experimental details are still "fresh".
  7. Submit your lab report at the **beginning** of the next experiment.
  8. Physical constants can be found in many chemistry handbooks. Here are the most common ones you may use in this course (see Pavia's book on how to use these handbooks):

**CRC Handbook of Chemistry and Physics      QD 65 .H3**

Available at the *Polk Reference Desk*, *Halsey Resource Center Reserve*, and on the shelf in the *Polk main collection*.

**Aldrich Catalog Handbook of Fine Chemicals**

On reserve at the Halsey Resource Center and also available in the organic labs.

**Merck Index – available in the organic lab as well as in the Halsey Resource Center**

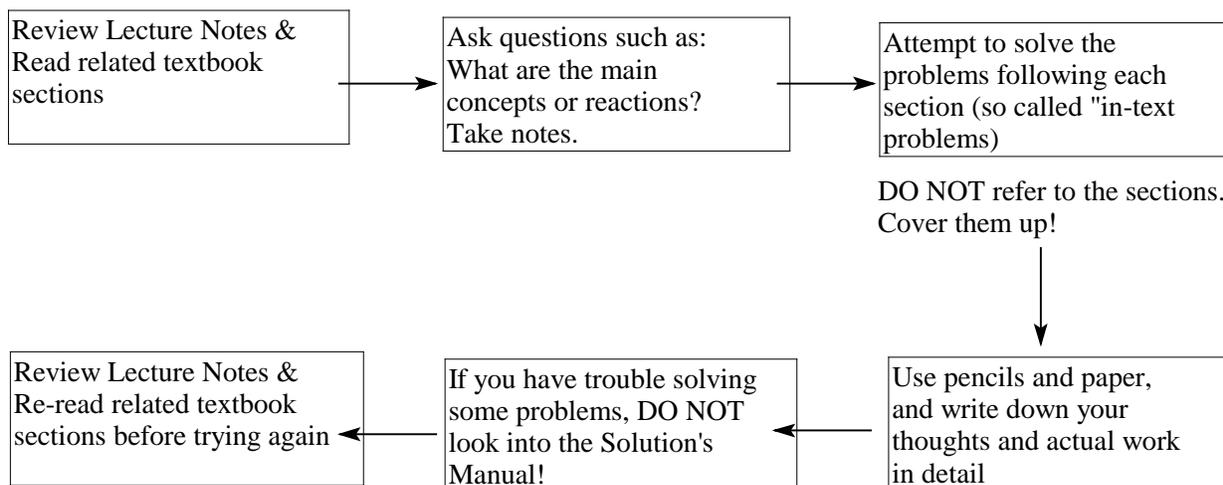
**Some or all of the following topics will be injected into the lab component of this course:**

- a. Introduction to the twelve principles of Green Chemistry
- b. Identification and evaluation of chemical hazards
- c. Chemical exposure and environmental contamination—proper disposal of organic wastes
- d. Strategies and tools of green chemistry
- e. Reaction designs and efficiency of each experiments conducted in this laboratory courses

## Suggestions to help you succeed in this course:

### *Procedure for learning lecture materials:*

1. Scan 4-5 pages of lecture notes and the corresponding sections in the textbook. Spend about 15-20 min before each lecture. You don't have to completely understand them.
2. Attend the lecture, take additional notes to help you learn the materials after lecture.
3. After lecture, spend 1-2 hours reviewing notes, reading the textbook, and doing assigned homework problems. Try to study on a regular basis—the best way is to study everyday. Although everyone has his/her own way of studying, the following is my suggested procedure:



### *Procedure for learning lab materials:*

1. Before coming to the lab, complete the assigned reading listed in each experiment in the 335 Lab Manual. A tentative lab schedule has been included in the lab manual.
2. Complete the prelab sheet during the week BEFORE the actual experiment.
3. Read the actual experimental procedure in the lab manual and prepare the Lab Notebook according to the Pavia's book and the syllabus.
4. Turn in the prelab at the beginning of each week's lab.
5. Carry out the actual experiment and record all prominent data.
6. Work up the data and complete the lab report as soon as possible.
7. Turn in the lab report at the beginning of the next experiment, unless announced otherwise.

### Tentative Lecture and Exam Schedule

<u>Week</u>	<u>Topic</u>	<u>Chapter</u>
1	Spectroscopy (MS, IR)	13
2	Spectroscopy (IR, NMR)	13, 14
3	Spectroscopy (NMR), Oxidation and Reduction	14, 12
4	Conjugated Systems	16
	<i>Exam #1: 9/24</i>	
5	Conjugated Systems	16
6	Aromatic Compounds	17
7	Aromatic Substitution Reactions	18
	<i>Exam #2: 10/22</i>	
8	Carboxylic Acids	19
9	Carbonyl reactions with Organometallic Compounds	20
10	Carbonyl Reactions: Nucleophilic Addition	21
	<i>Exam #3: 11/14</i>	
11	Derivatives of Carboxylic Acids	22
12	Carbonyl Reactions at alpha carbon	23, 24
13	Amines	25
14	Review and Tests	
	<i>Exam #4: 12/12</i>	