

Office Hours: Monday, Wednesday, Friday 10.00 AM-11.00 AM *or by previously arranged appointment by e. mail*

**Assessment
And Grading**

The tentative letter grade breakdown for the course is given in the table below. Please note that you will need a minimum grade of C or higher for this course to enroll in other courses that require CHEM 331 as a prerequisite. Please click on the "grading scheme" link in the Lecture Schedule for January 20.

Assignment	Points	Total	% of Total Points
6 On-Line HW assignments**	100	100	9.1
6 Quizzes	25	150	13.5
Midterm Exam 1	125	125	11.4
Midterm Exam 2	125	125	11.4
Midterm Exam 3	125	125	11.4
10 Laboratory Experiments	22	220	20.0
Laboratory Exam	55	55	5
Final Exam	200	200	18.2
Total Points		1100	100

**The number of questions as well as the number of points for each homework assignment will vary depending on how many questions I decide to include in a particular homework assignment. However the total weightage for the 8 homework assignment is 100 points; i.e. your % score for the online homework assignment is what matters and not the actual point on each assignment.

Grading Scale:

Letter Grade	%Points (+)		% Points (-)
A		100-90	>90 - <85
B	>85 - <80	>80 - <75	>75 - <70
C	>70 - <67	>67 - <64	>64 - <60
D	>60 - <57	>57 - <54	>54 - <50
F	Less than 50		

Lecture Schedule: A detailed and completely hyperlinked day-by-day lecture schedule and on-line lecture notes can be found at: <http://www.wiu.edu/users/mftkv/Chem331/>

Course Outline by Week

Week of	Chapters	Concepts Covered
Aug 19	1	Bonding, hybridization, shapes of molecules
Aug 26	1 cont.	Bond angle, bond lengths, resonance, structural formula, common functional groups
Aug 26	3	Acids and bases, pKa value, structure and acidity, Lewis acids and bases, predicting the outcome of

		an acid-base reaction, electromagnetic spectrum, infra-red spectroscopy, recording and analyzing IR spectra, correlation table
Sept 2	2	Alkanes, alkenes, alkynes, alkyl groups, common functional groups, electromagnetic spectrum, infra-red spectroscopy, recording and analyzing IR spectra, correlation table
Sept 9	2 cont.	Infra-red spectroscopy, recording and analyzing IR spectra, correlation table, molecular structure and physical property
Sept 16	4	Nomenclature of alkanes, alkenes, alkynes, cycloalkanes, bicycloalkanes and intro. to conformations
Sept 23		Conformational analysis cont Conformational analysis, Newman formulas, torsional barrier, energetics of conformers, conformation of cycloalkanes
Sept 30		Conformational analysis cont Conformational analysis, Newman formulas, torsional barrier, energetics of conformers, conformation of cycloalkanes
Oct 4		Exam 1
Oct 7	4/9	Mass spectrometry, electron impact ms, fragmentation, molecular ion, Conformational analysis, Newman formulas, torsional barrier, energetics of conformers, conformation of cycloalkanes..
Oct 11		Fall Break
Oct 14	5/9	Conformations of disubstituted cyclohexanes, index of hydrogen deficiency, hydrogenation, alkylation of alkynes Introduction to NMR spectroscopy, (^1H and ^{13}C NMR), chemical shift scale, integration, etc. Chapter 6: Constitutional isomers, stereoisomers, chirality, enantiomers,
Oct 21	9/6	Chapter 6: Stereoisomers, chirality Enantiomers, properties of enantiomers, chirality in biology, R, S nomenclature
Oct 28	8	Introduction to reaction mechanism, electrophilic addition to alkenes, Markovnikov rule etc. carbocations, carbocation stability etc
Nov 1		Exam 2
Apr 8	8 cont.	Alcohols from alkenes, oxymercuration-demercuration, hydroboration-oxidation, molecular rearrangement, oxidative cleavage of alkenes
Apr 15	6	Alkyl halides, nomenclature, $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions, mechanisms, factors effecting $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions

Apr 22	6/7	Factors controlling S _N 1 and S _N 2 reactions, elimination reactions, substitution vs elimination, E/Z nomenclature of alkenes, dehydration of alcohols, mol. Rearrangements, Zaitzev rule
Apr 29		Exam 3
Apr 29	10	Introduction to radicals, chain reactions, stability of radicals, bromine selectivity, polymerization
April 30		Introduction to radicals, chain reactions, stability of radicals, bromine selectivity, polymerization
May 6-10		Final Exam Week

Laboratory:

Your safety in the laboratory is of paramount importance and thus your instructor and the Department of Chemistry will ensure that you are informed of all potential hazards associated with each and every experiment. As students enrolled in an organic chemistry course with a laboratory component you have certain responsibilities too. First and foremost is that Safety Goggles must be worn at all times while you are inside the laboratory. The Right to Know Law protects each and every citizen of our State and require employers and people of authority to let you, the citizen, be informed of the hazards associated with toxic substances that you may come into contact with as part of your employment or training. As your organic chemistry instructor I will do the same. Material Safety Data Sheets (MSDS) information about all chemicals utilized in the laboratory can be found at the following web site. <http://physchem.ox.ac.uk/MSDS/#MSDS>. As a responsible student (citizen) you should visit this site and learn more about the various hazards associated with the different chemicals that you will be working with in the laboratory.

Hands-on experience is a vital factor in learning chemistry. All organic laboratories will be using microscale methods and equipment. Instead of using gram quantities of reagents, milligram quantities will be used thereby reducing reaction times, chemicals used, and waste generated. Consequently, great care must be taken in using the new equipment and employing impeccable microscale laboratory technique. The laboratory grade will be based upon your completion of the experiments, lab reports, technique evaluation, and lab quizzes. *Since the laboratory experience is integral to the overall course, failure to earn a passing grade in the lab will result in automatic failure for the course (see grading scheme at: <http://www.wiu.edu/users/mftkv/Chem331>).*

It is extremely important to keep a careful and complete record of the experiments in your laboratory notebook. A reasonable guideline and helpful instructions for record keeping are provided in the laboratory manual (pp. 592-613, read it, know it, use it!). Your notebook must be permanently bound and have the carbonless copy (or carbon-copy) numbered pages. All entries in your notebook must be done with a pen and be clear, complete, and erasure free. Any inadvertent errors may be struck through with a single line and an explanation, if necessary. Since you will not be working singly, it is important that you do keep your notebook separately and uniquely. When a lab is completed, you must submit a report comprised of the

copy sheets from your notebook and any other forms/papers that are required by the instructor for a particular experiment.

Please note on the schedule that there is one week's worth of make-up lab sections. The following restrictions apply: **You may only makeup ONE lab exercise**, and you must submit a "Make-Up Lab Request" Form by the deadline specified by the instructor.

Students enrolled in this course are levied a non-refundable laboratory usage fee of \$35 to cover the cost of consumable supplies utilized during the semester.

Laboratory Schedule by Week

Week of	Title of the Experiment	Laboratory concepts covered
Aug 26	Check-in	Laboratory Safety rules
Sept 2	Experiment 1: Separation of an acid-neutral mixture	Extraction, extraction coefficient, acid-base chemistry, use of drying agent, recrystallization, mp determination
Sept 9	Experiment 1: Separation of an acid-neutral mixture, cont.	Extraction, extraction coefficient, acid-base chemistry, use of drying agent, recrystallization, mp determination
Sept 16	Experiment 2: Isolation of natural products.	Stream distillation, IR spectroscopy
Sept 23	Experiment 3: Separation of plant pigments	Chromatography, column chromatography, thin-layer chromatography, R_f values
Sept 30	Experiment 4: Synthesis of Aspirin	% yield calculation, MP determination, IR
Oct 7	Experiment 5: Synthesis of Banana oil	% yield calculation, MP determination, IR, and GC-MS
Oct 14	Experiment 6: NMR spectroscopy (Special lecture)	Introduction to the instrument, sample preparation Fourier transform etc.
Oct 21	Experiment 7: Reduction of camphor	Use of hydride reagents, % yield calculation use of ^1H nmr for estimation of product ratios, IR
Oct 28	Experiment 8: Bromination of trans-	% yield, IR and ^1H NMR

	cinnamic acid	
Nov 4	Experiment 9: Oxidation of 3-chlorotoluene	Reflux, % yield, IR, ¹ H & ¹³ C NMR
Nov 11	No lab this week; Special lecture during the lab time	
Nov 18	Experiment 10: Reactivity of alkyl halides	S _N 1 and S _N 2 reaction mechanisms.
Dec 5	Laboratory Exam	

Quizzes & Exams: Eight in-class quizzes (10-15 min. duration) will be administered during the term and the “best six” scores for the quizzes will be considered along with other scores (see Grading Scheme on the course homepage) when assigning the final grade for the course. **Students will not be allowed MAKE-UP missed quizzes.** In class exams will consist of multiple choice questions as well as those requiring short paragraph answers. **Under no circumstance will a student be allowed to make-up a missed exam without a doctor’s note indicating your inability to attend class on the day of the exam.**

Useful Resources: <http://sdo.wiu.edu/facultyStaff/absencepolicy.asp> (absence policy)

<http://www.wiu.edu/policies/acintegrity.php> (academic integrity policy)

<http://sjp.wiu.edu/CodeOfConduct/index.asp> (disorderly conduct)

Emergency Preparedness:

WIU Office of Risk Management and Emergency Preparedness provides resources on how to respond to emergency situations. Please view the video resources at www.wiu.edu/rmep/ (Click “Resources” on the right side of the page)

WIU Policies:

In accordance with University policy and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. For the instructor to provide the proper accommodation(s) you must obtain documentation of the need for an accommodation through Disability Resource Center (DRC) and provide it to the instructor. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire about such particular needs of students. Students who may require special assistance in emergency evacuations (i.e. fire, tornado, etc.) should contact the instructor as to the most appropriate procedures to follow in such an emergency. Contact Disability Resource Center (DRC) at 298-2512 for additional services

CHEMISTRY 331 - LABORATORY INFORMATION & SAFETY RULES

Hands-on experience is a vital factor in learning chemistry. For the first semester of this organic sequence, the emphasis of the laboratory exercises will be on microscale methods and techniques. The laboratory grade will be based upon your completion of the experiments, lab reports (pre-lab and post-lab), and technique evaluation. *Since the laboratory experience is integral to the overall course, failure to earn a passing grade in the lab will result in automatic failure for the course.* Notebooks will be checked to verify that they contain the information necessary for the day's experiment. If a student comes to the lab with an incomplete prelab report or does not seem to be prepared to do the work, that student will not be allowed to continue in that day's lab until the lab instructor is convinced of the student's preparedness for the experiment.

Notebooks: It is extremely important to keep a careful and complete record of the experiments in your laboratory notebook. A reasonable guideline and helpful instructions for record keeping are provided in the laboratory manual (pp. 20 -26). Your notebook must be permanently bound and have the carbonless copy (or carbon-copy) numbered pages. All entries in your notebook must be done with a pen and be clear, complete, and erasure free. Any inadvertent errors may be struck through with a single line and an explanation, if necessary. Since you will not be working singly, it is important that you do keep your notebook separately and uniquely.

The laboratory notebook is a record of what happened in the experiment. It should be understandable to others and should contain enough information such that the experiment could be repeated at a later date by you or by someone else. You are free to develop your own style for the notebook within some guidelines. Using your own style does not mean that you have license to be sloppy or careless. Much of the notebook will be data (descriptions, numbers, calculations, etc.), but a modicum of other information is also required. Procedural information, changes in method or technique, etc. should be recorded immediately, providing a complete narrative of everything you do as you are doing it. Therefore, you will have to do a little writing before, during, and after each lab. All entries in your notebook should be in pen. A table of contents in your notebook should also be kept current. Any graphs, computer print-outs, and spectra should be attached in the notebook (taped or stapled) for a permanent record of the data.

Reports: When a lab is completed, you must submit a report comprised of the copy sheets from your notebook and any other forms/papers that are required by the instructor for a particular experiment. This includes copies of any graphs, print-outs, and spectra obtained during the experiment. Record all information in **ink!** (Since we are using carbonless-copy pages, make sure you use the cardboard backer sheet between copy sheets, and that you write firmly and legibly so the lab instructor may read and grade your reports!)

For each experiment, the notebook/report should contain:

Prelab Report will contain	Postlab Report will contain
Title and Date	Title and Date
Purpose	Results
A brief procedure in your own words with safety	Discussion of results with explanations provided for

issues, if any, noted	low yields, unexpected result/observations etc.
Reagents and chemicals used with quantities (preferably in a tabular form)	Conclusions
Answers to the assigned pre-lab questions (in complete sentences)	Answers to all assigned post lab questions (in complete sentences)
	Spectra and other recordings must be attached

Chemistry Lab Safety

WIU CHEMISTRY DEPARTMENT

The chemistry laboratory can be a place of discovery and learning. However, by the very nature of laboratory work, it can be a place of danger if proper common-sense precautions aren't taken. While every effort has been made to eliminate the use of explosive, highly toxic, and carcinogenic substances from the experiments which you will perform, there is a certain unavoidable hazard associated with the use of a variety of chemicals and glassware. You are expected to learn and adhere to the following general safety guidelines to ensure a safe laboratory environment for both yourself and the people you may be working near. Additional safety precautions will be announced in class prior to experiments where a potential danger exists. Students who fail to follow all safety rules may be asked to leave the lab or suffer grading penalties.

Attire

1. Safety goggles must be worn at all times while in the laboratory. This rule must be followed whether you are actually working on an experiment or simply writing in your lab notebook. You must wear safety goggles provided by the chemistry department.
2. Contact lenses are not allowed. Even when worn under safety goggles, various fumes may accumulate under the lens and cause serious injuries or blindness.
3. Closed toe shoes and long pants must be worn in the lab. Sandals and shorts are not allowed.
4. Long hair must be tied back when using open flames.

Conduct

1. Eating, drinking, and smoking are strictly prohibited in the laboratory.
2. No unauthorized experiments are to be performed. If you are curious about trying a procedure not covered in the experimental procedure, consult with your laboratory instructor. Never work alone in the lab.
3. Never taste anything. Never directly smell the source of any vapor or gas; instead by means of your cupped hand, waft a small sample to your nose. Do not inhale these vapors but take in only enough to detect an odor if one exists.
4. Coats, backpacks, etc., should not be left on the lab benches and stools. There is a hook rack along the back wall at either end of the lab. There are coat racks just inside the each entrance to the balance room at the back of the lab. Beware that lab chemicals can destroy personal possessions.
5. Always wash your hands before leaving lab.
6. Learn where the safety and first-aid equipment is located. This includes fire extinguishers, fire blankets, and eye-wash stations.
7. Notify the instructor immediately in case of an accident.

Proper Handling of Chemicals and Equipment

1. Consider all chemicals to be hazardous unless you are instructed otherwise. Material Safety Data Sheets (MSDS) are available in lab for all chemicals in use (<http://www.msdsonline.com/msds-search/>) These will inform you of any hazards and precautions of which you should be aware.
2. Know what chemicals you are using. Carefully read the label twice before taking anything from a bottle. Chemicals in the lab are marked with hazardous labels when necessary. Assume all chemicals to be hazardous.
3. Excess reagents are never to be returned to stock bottles. If you take too much, dispose of the excess.
4. Many common reagents, for example, alcohols and acetone, are highly flammable. Do not use them anywhere near open flames.
5. Always pour acids into water. If you pour water into acid, the heat of reaction will cause the water to explode into steam, sometimes violently, and the acid will splatter.
6. If chemicals come into contact with your skin or eyes, flush immediately with copious amounts of water and consult with your instructor.
7. Never point a test tube or any vessel that you are heating at yourself or your neighbor--it may erupt like a geyser.
8. Dispose of chemicals properly. Waste containers will be provided and their use will be explained by your TA. Unless you are explicitly told otherwise, assume that only water may be put in the lab sinks.
9. Clean up all broken glassware immediately and dispose of the broken glass properly.
10. Contact the instructor for clean-up of mercury spills.
11. Never leave burners unattended. Turn them off whenever you leave your workstation. Be sure that the gas is shut off at the bench rack when you leave the lab.
12. Beware of hot glass--it looks exactly like cold glass.
13. Never pipette a liquid by mouth. Use a pipette bulb.
14. Do not use cracked or broken glassware.

I _____ acknowledge that I have read and understand the Chemistry Lab Safety Rules above and agree to follow the safe laboratory practices listed.

Signed _____ Date _____

