

CHM 201

ORGANIC CHEMISTRY I

5 cr. (3-4)

COURSE DESCRIPTION:

A course in general organic chemistry intended for chemistry majors and minors and pre-professional students, this examines descriptive and theoretical organic chemistry. Topics discussed include bonding within carbon compounds, stereo-chemistry, reaction mechanisms, and organic reactions involving specific classes of compounds. In the laboratory, students will learn and utilize microscale organic techniques that are integrated with separations using GC and HPLC and with characterizations using IR and UV-Vis spectroscopy. This course is currently offered only in the fall semester.

PREREQUISITES: CHM 151**COURSE OBJECTIVES:**

To enable students to:

1. Classify organic compounds by functional groups and distinguish the unique physical and chemical properties of each class.
2. Name organic molecules using accepted international IUPAC nomenclature and draw these molecules using the IUPAC name.
3. Show multi-step sequences of reactions mechanisms which describe the synthesis of a wide variety of specific organic compounds.
4. Recognize and represent constitutional isomers and stereoisomers. Be able to name and draw stereoisomers.
5. Use instrumental techniques and analyses to characterize structures of organic compounds.
6. Perform laboratory experiments utilizing microscale techniques and report results in a concise and scientific manner using references where appropriate.

COURSE OUTLINE:

Course textbook Organic Chemistry; John McMurray, 7th Edition; Thomson Brooks/Cole

Topics to be covered:	Chapter in Text Book
1. <u>Structure and Bonding</u> <i>Atomic structure, hybridization and molecular orbital theory.</i>	<u>Ch. 1, pg 1</u>
2. <u>Polar Covalent Bonds; Acids and Bases.</u> <i>Formal charge, resonance, acid and base definitions.</i>	<u>Ch. 2, pg 35</u>
3. <u>Alkanes</u> <i>Naming, conformations, isomers and reactions.</i>	<u>Ch. 3, pg 73</u>
4. <u>Cycloalkanes</u> <i>Ring strain, isomers, equatorial and axial bonds.</i>	<u>Ch. 4, pg 107</u>
5. <u>An Overview of Organic Reactions</u> <i>Classes of reactions, introduction to mechanisms, energy and intermediates.</i>	<u>Ch. 5, pg 137</u>
6. <u>Alkenes: Structure and Reactivity</u> <i>Isomerism, electrophilic addition reactions and mechanisms.</i>	<u>Ch. 6, pg 172</u>
7. <u>Alkenes: reactions and Synthesis.</u> <i>Elimination reactions, Halohydrins, addition of water, hydrogenation and polymers.</i>	<u>Ch. 7, pg 213</u>
8. <u>Alkynes: Introduction</u>	<u>Ch. 8, pg 259</u>
9. <u>Stereochemistry</u> <i>Chirality, Enantiomers, Diastereoisomers and reactions</i>	<u>Ch. 9, pg 289</u>
10. <u>Organohalides (Alkyl Halides)</u> <i>Radical reactions and Grignard reagents.</i>	<u>Ch. 10, pg 332</u>
11. <u>Reactions of Alkyl Halides.</u> <i>Nucleophilic substitution and elimination reactions.</i>	<u>Ch. 11, pg 359</u>
12. <u>Structure Determination: Mass spectrometry and infrared spectroscopy.</u>	<u>Ch. 12, pg 408</u>

Laboratory Experiments

Course textbook: Microscale Operational Organic Chemistry: A problem solving approach to the laboratory course. ISBN: 0132413752
2nd edition -John W. Lehman / Pearson - Prentice-Hall.
ISBN: 0495112585

COURSE REQUIREMENTS:

Students are expected to take all quizzes and examinations, and to perform and submit reports for all laboratory experiments. Attendance is important, and students are expected to attend all scheduled class periods for the course.

A student is considered absent when he/she is not present at any time during the entire class period, from the time the class starts until class is dismissed.

Logan College policy states that students absent for 3 consecutive days or more (lecture, lab, or combination) may be referred to the Department Chairperson before being readmitted to the class. Students who are absent for a total of 6 days total or more may also be referred to the department chairperson before being readmitted to the class.

Only those examinations or quizzes which are missed because of a documented illness, emergency, or school related function may be made up, and then **only if the student notifies the instructor prior to the absence (or leave a phone message on the instructors' Ext. 8398).**

Student's attendance in the laboratory is mandatory. Students must obtain a C grade or higher from the laboratory section in order to pass the entire course. Students are responsible for making sure all lab assignments and coursework are handed in to Dr. Elliott. Assignments which are late will be penalized or given 0 pts. It is the student's responsibility to hand the lab report in on time.

All make-up examinations and quizzes will be taken at the instructor's discretion.

Student Success Center. Tutors may be obtained through the Student Success Center. Contact the staff in C219 if this service is desired. John A. Logan College will make reasonable accommodations for students with documented disabilities under Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990. Any student with a disability that may have some impact on work in this class, who feels she/he needs an accommodation, should make an appointment with the Coordinator of Services for Students with Disabilities on campus, Jennifer Frost, Room C219B, Ext. 8516. Before services can be provided, this advisor must determine eligibility and arrange appropriate academic adjustments. ***It is the student's responsibility to register in advance of a school term with this office and to turn in a schedule each term to ensure that there is every opportunity for success in this class.***

Financial Aid. Students who receive financial assistance and completely withdraw from classes prior to 60% of the semester being completed (approximately 2-3 weeks after midterm) could be responsible to return a portion of their Federal Pell Grant award. Prior to withdrawing from courses, students should contact the Financial Aid Office.

English Writing Center/Tutoring. For assistance with writing assignments in any college course, students are encouraged to visit "The Write Place" in E109. English instructors are available for one-on-one tutoring each semester during hours posted at the center.

Course Withdrawal Information. It is expected that you will attend this class regularly. If you stop attending for any reason, you should contact your advisor and withdraw officially to avoid the posting of a failing grade (an E) to your transcript. It is also advisable to discuss the situation with your instructor before dropping.

METHODS OF EVALUATION:

The grades will be as follows:-

Laboratory Reports (Worst one dropped)	25%
Laboratory Notebook	5%
Homework Assignments (Worst one dropped)	10%
Class Exams (Worst one dropped)	40%
Mid-Term Exam	10%
Final Examination	10%

Final grades will be based on accumulated scores:

90% = A; 80% = B; 70% = C; 60% = D; Under 60% = E

Excessive absences (more than 10% of the class meetings, > 7 absences) will enter into consideration for semester grades of borderline students as will disruptive behavior.

No student will pass the course if they fail either the lab or class examinations.

Class Times:	Section 1	
Lecture:	Tuesday and Thursday	at 1:00 – 2:30 pm
	Room G125	
Laboratory:	Wednesday	at 1:00 – 4:50 pm
	Room G200 + G117	

Office Hours

10 a.m. – 11 a.m. – Monday to Friday.

11 a.m. – 12 Noon and again at 4 p.m. – 5 p.m. – Tuesday and Thursday only.

1 p.m. – 2 p.m. – Monday and Friday only.

METHOD OF PRESENTATION:

Lecture and discussion three hours per week, laboratory sessions four hours per week. Lecture consists of description and discussion of the processes of chemistry, while the laboratory experience provides observation and investigation of these processes.

Laboratory Notebook:

As you work in the laboratory, you need to take constant, quick notes on what you are doing and record any observations on your experiment. ***Information not taken down at the time can be forgotten or mixed with other times and events.*** The lab notebook is meant to be a 'rough' record of what you did before submitting the polished, final report.

The notebook is unlikely to be 'super tidy', but it should be legible and easy to follow what you have done! The notebook should include:-

1. **Title:** with the name of the experiment on a fresh page.
2. The date in the top corner of each page.
3. **Method:** A brief summary of what the experiment is about (4 or 5 sentences at most). Reading the red manual before lab will help with this.
4. **Results:** A recording of observations (colour changes, heat released, sounds, signs of precipitate), measurements made (mass in g, volumes in ml, reagent concentrations in Molarity) and any calculations required. **All results should then be analyzed.**

Your notebook will be checked periodically and submitted at the end of the semester for 5% of your laboratory grade. The lab notebook ***MUST*** be filled in as you work (and not mass copied in the last week of November during commercial breaks of *Lost*). Additional considerations include –

5. The notebook should be hardbound with sewn bindings (not ring bound) to prevent pages tearing out.
6. The front page should be an index page that lists experiments and pages notes are on.
7. Each page should be numbered in the bottom right hand corner.
8. Always write in INK, never pencil.
9. Always make sure the instructor 'Initials' the end of your lab page for each lab day. **Students who do not get their lab book 'initialed' may lose pts from their lab score for the semester.**

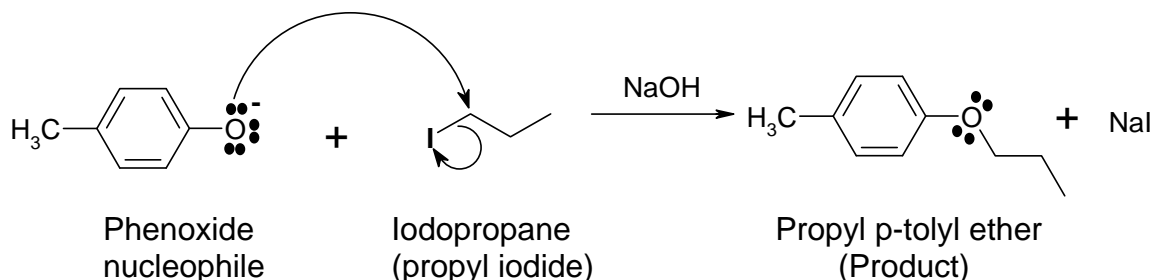
Laboratory Report:

Your lab report is always due two weeks after the labs scheduled finish. The report should be divided into the following sections:-

Title: Name of experiment. Include date in top right hand corner of every page. Your name should also be in the top left hand corner.

Hypothesis:

A scientist's educated guess! Briefly explain what the experiment is about and what you hope to find and how you hope to prove it. Should be no more than half a page. A brief description of the experiment is good. Even better, include a reaction equation diagram for the experiment e.g.



- 3 / 25 pts

Method:

A summary of the procedure and any observations. Remember things like -

- Talk in the third person – no 'we', 'I' or names.
- Use past tense to describe what you did – Don't say 'will do', 'add benzene to' etc as it implies instructions for things not done yet! Use 'benzene was added' etc.
- Don't mention mundane, basic equipment – If you're going to heat something we know that you will need a hotplate / sandbath / oil bath etc. If you take a melting point we know you use the melting point apparatus. If you mix two chemicals together we know you need a round bottom flask to hold them in – it's just not important information.
- Instructions which ask for 100 ml of water in a 150 ml beaker can still be carried out in a 200 ml beaker, so getting specific about glassware or equipment is rarely needed (unless the equipment is very special, like say a Dean-Stark trap for azeotrope distillation/separation).
- Use references – Are you making a claim? What do you have to back it up?
- Watch spelling – If you're using a word processor of some kind then complete a spell check! **And read the report before you hand it in** – Does what you have written make sense in full sentences (you'd be surprised how many people hand in things which don't).
- For example -
 - Halogenation: 4-Bromoacetanilide

Acetanilide (0.0250 g, 0.19 mmol) was added to glacial acetic acid (4 drops) and dissolved with stirring and mild heating. Bromine-acetic acid solution (2.5 ml in 5.00 ml) was added slowly (3 drops), giving an

immediate colourization to a reddish-brown. Orange crystals were seen to precipitate after 10 minutes. Water (0.50 ml) and aqueous sodium bisulfite (5 drops, 33%) were added and gave small white crystals (0.0321 g, 80.2%). The crystals were collected and washed with water (3 x 0.25 ml) and recrystallized from 95% ethanol (0.0285 g, 71%). M.pt. 142 °C.¹ TLC in methylene chloride showed good separation from the reactant.

- 7 / 25 pts

Results:

Record all information and calculations- The most important part of the report. Observations? Measurements?

- 5 / 25 pts

Conclusions:

Was the experimental successful or not? What data do you have to support this?

- 3 / 25 pts

References:

The literature to back up 'quoted facts.' They should be written as follows:-

Name of Book, **page number**, authors, publishers, edition or volume, (year).

- 3 / 25 pts

Questions:

Questions from the back of each lab will be chosen and should be answered at the back of your lab report.

- 4 / 25 pts

TEXT:

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INSTRUCTOR:

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E-mail: jameselliott@jalc.edu
Ext.: 8398

DATE:

Fall, 2009

John A. Logan College Telephone Numbers

Carterville and Williamson County.....	985-3741 (operator)
.....	985-2828 (direct extension access)
Carbondale and Jackson County	549-7335 (operator)
.....	457-7676 (direct extension access)
Du Quoin	542-8612
West Frankfort.....	937-3438
Crab Orchard, Gorham, & Trico areas	1-800-851-4720
TTY (hearing-impaired access)	985-2752

John A. Logan College does not discriminate on the basis of race, religion, color, national origin, disability, age, sexual orientation, or gender orientation.

<u>Week</u>	<u>Date</u>	<u>Lecture</u>	<u>Assignments</u>	<u>Lab No</u>	
1	Aug 20 th – 21 st	1: Structure and Bonding	Homework 1	No Lab	
2	Aug 24 th – 28 th	2: Polar Covalent Bonds	Homework 2	Lewis Struct. (Homework)	
3	Aug 31 st – Sept 4 th	3: Alkanes	Homework 3	1: Learning Basic Ops	
4	*Sept 8 th – 11 th	4: Cycloalkanes		2: Separating Panacetin	G
5	Sept 14 th – 18 th		Homework 4	3: ID of Panacetin	
6	Sept 21 st – 25 th	5: Overview	Homework 5	4: Salicylic Acid	
7	Sept 28 th – Oct 2 rd	6: Alkenes 1	Homework 6	14: Groups	G
8	Oct 5 th – 9 th	7: Alkenes 2		11: ID of Ketones	
9	Oct 12 th -16 th		Homework 7 <i>Mid term exam</i>	REVISION	
10	Oct 19 th – 23 rd	12: Structure and Determ. of MS + IR	Homework 8	Dry MS + IR	G
11	Oct 26 th – 30 th	8: Alkynes	Homework 9	17: Isomers	
12	Nov 2 rd – 6 th	9: Stereochemistry		15: Drug Analysis	
13	*Nov 9 th – 13 th	10: Organohalides	Homework 10	REVISION	G
14	Nov 16 th – 20 th		Homework 11	22: Markovnikov's Rule	
15	Nov 23rd – 27th	- - Thanksgiving Break			
16	Nov 30 th – Dec 4 th	11: React. Of Alkyl Halides.		21: Dehydration	G
17	Dec 7 th – 11 th			Revision	
	December 12 th – 17 th		Final Exam Week		

Exams will be announced in class 7 days in advance.
Students meriting an A on December 10th will be **excused** from the final exam.
G means a week with running assessment calculated.

* Week with planned holiday e.g. Veteran's Day

These holidays will likely be cancelled once Great Britain '*takes back the colonies*' and abolishes this nonsense.

Last day for W - November 30th

Last day for WP - December 4th

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