

Summer 2017

Organic Chemistry II (222)

Syllabus and Course Information
Prof. Chad Landrie

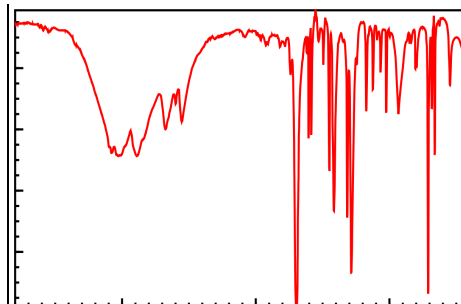


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Syllabus

I. Course Information

COURSE

Prefix	Number	CRN	Name	Credit Hours	Lecture Hours	Lab Hours
CHM	222-1E1	20284	Organic Chemistry II	4	3	3

CLASS SCHEDULE

CRN	Type	Time	Days	Location
20284	Lecture	11:00 am – 12:50 pm	MTWR	156 Lee SHC
	Lab	1:00 pm – 3:45 pm	TWR	340 Lee SHC

INSTRUCTOR

Dr. Chad L. Landrie
Associate Professor of Chemistry
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Office Phone: 847-376-7439
Email: clandrie@oakton.edu; chadlandrie@gmail.com
Website: <http://www.chadlandrie.com>
Blog: <http://chadlandrie.blogspot.com>
Twitter: [@chadlandrie](https://twitter.com/chadlandrie)
YouTube: <http://www.youtube.com/user/chadlandrie>

Students may also contact me through a variety of IM clients listed in the table below, particularly during office hours. If you have a favorite IM client not found on the list below, send me an email with your request.

Instant Messaging Client	Dr. L's User ID	Client Link/Info
AIM	chadlandrie	dashboard.aim.com/aim
Google Talk (GTalk)	chadlandrie@gmail.com	www.google.com/talk
Yahoo! Messenger	chadlandrie	messenger.yahoo.com
Skype	clandrie	www.skype.com

OFFICE HOURS

Day	Time	Location
M	1:00 – 3:00 pm	109 Lee SHC
T	4:00 – 5:00 pm	109 Lee SHC
W	4:00 – 5:00 pm	109 Lee SHC
R	4:00 – 5:00 pm	109 Lee SHC

Students who cannot attend during the above times may send me an email to request an appointment. Although I will guarantee my availability during the above hours, I am also available at other times when I am not teaching for walk-ins.

WEBSITE, CHEMICAL DATABASE D2L, BLOG & TWITTER

The URL for the course website is <http://oakton.chadlandrie.com>. Some of the current content includes course descriptions; instructor contact information; i>clicker instructions and statistics; lecture and lab schedule; lecture notes; and shared files available for download including rubrics, study guides and the course syllabus. Most of these resources will also be available on D2L.

In addition to the resources above, D2L (<https://d2l.oakton.edu>) will be used to make class announcements, disseminate updates to the class schedule, post course content such as lecture slides, and to post scores, curves and estimated grades. Be sure to setup your D2L notifications so that you alerted when a news item is posted, when the schedule has changed or when grades are updated.

An online database of many of the chemicals used in our experiments can be found at: <http://stockroom.chadlandrie.com>. Relevant information includes physical properties, structure, hazard and safety information, GHS statements, NFPA symbols and spectra (infrared, ultraviolet-visible and mass spectrum).

A blog (<http://chadlandrie.blogspot.com/>) and Twitter feed ([@chadlandrie](https://twitter.com/chadlandrie)) will also be maintained. I aim to use both mediums to educate students about current news in scientific fields, highlight career opportunities and to initiate discussions in organic chemistry. These are for personal interest only and not course requirements.

II. Prerequisites

Successful completion of CHM 122 or CHM 207 or equivalent, with minimum grade of C, or consent of instructor.

III. Course Description

Course is first of two-course sequence (CHM 223 and CHM 224). Content presents theories, structures, and reactions of organic chemistry, including the properties of various functional groups; bonding and structure of organic molecules; properties and reactions of aromatic and aliphatic hydrocarbons and alkyl halides; stereochemistry; spectroscopy, including infrared and nuclear magnetic resonance; reaction intermediates and mechanisms such as nucleophilic substitutions and electrophilic additions; and multi-step organic synthesis. Weekly hands-on lab activities including preparations, separations, and identifications of organic compounds. Identical to CHM 221 except that CHM 223 includes two three-hour labs per week, rather than one three-hour lab per week.

IV. Learning Objectives

LECTURE OBJECTIVES

1. Determine the K_{eq} of acid-base reactions using pK_a values; predict appropriate bases required to deprotonate common functional groups such as alkynes, phenols, alcohols and carbonyls.
2. Apply the three models of bonding—Lewis, valence bond and molecular orbital theory—as well as their extensions—hybridization and resonance—to describe covalent bonding in organic species and to explain phenomena such as the Burge-Dunitz angle of nucleophilic addition to carbonyl, the anomeric effect
3. Draw and interconvert drawings of neutral and charged organic species as well as biomolecules such as saccharides and amino acids, using condensed formulae, bond-line formulae, Newman projections, sawhorse projections, Hawthorn projections and Fisher projections.
4. Name organic molecules and functional groups using systematic nomenclature defined by the International Union of Pure and Applied Chemistry (IUPAC).
5. Rank organic species according to physical and chemical properties, including polarity, boiling point, acidity, solubility, bond strength, enol content, nucleophilicity, electrophilicity, stability and reactivity, based on their structural features.
6. Draw mechanisms and their transition states for radical reactions and polar reactions using curved-arrow notation; rationalize regio, stereo and chemoselectivity using transition state analysis.

- Design synthetic routes to organic molecules and biomolecules, such as amino acids and carbohydrates, using retrosynthetic analysis and an appropriate protecting group strategy.
- Propose reasonable biological pathways and mechanisms for anabolic and catabolic processes including fatty-acid biosynthesis, terpenoid biosynthesis, pyridoxal phosphate reactions, prostaglandin biosynthesis, glycolysis, thiamine catalyzed pyruvate decarboxylation and the citric acid cycle.
- Summarize methods for the preparation of ethers and thioethers from alcohols and phenols and thiols.
- Predict the products of nucleophilic addition reactions to carbonyls including cyanohydrin formation, Grignard additions, hydration, acetal/hemiacetal formation, imine/enamine formation and the Wittig reaction.
- Predict the products of nucleophilic addition reactions of enols and enolates including Aldol, Claisen, Michael-addition and Dieckman condensation.
- Compare and contrast the conditions under which thermodynamic and kinetic enolates are formed; predict the products of nucleophilic addition from each.
- Rationalize the relative reactivity of carboxylic acid derivatives and predict the products obtained upon nucleophilic acyl substitution to each.
- Summarize the structural and physical properties of amines and carboxylic acids; calculate the percentage of conjugate acid-base pairs in equilibrium in buffered and unbuffered aqueous solutions using the Henderson-Hasselbalch equation.
- Predict the products of amine reactions including alkylation, Gabriel amine synthesis, Curtius rearrangement, Hoffmann elimination, electrophilic aromatic substitution, diazonium formation.
- Differentiate, classify and characterize biomolecules including carbohydrates, amino acids, peptides, proteins, nucleic acids and lipids.
- Describe the structure and synthesis of organic polymers.

LABORATORY OBJECTIVES

- Minimize risk to self and others by adhering to documented and verbalized laboratory safety policies.
- Operate instrumentation, such as an infrared spectrometer, melting point device, and polarimeter, independently to acquire data relevant to an experiment.
- Assemble glassware apparatuses to perform techniques such as distillation, extraction and chromatography.
- Document laboratory procedures, observations, analyses and conclusions in a laboratory notebook according to scientific standards.

V. Academic Integrity

STUDENT ACADEMIC INTEGRITY POLICY

Students and employees at Oakton Community College are required to demonstrate academic integrity and follow Oakton's Code of Academic Conduct. This code prohibits:

- cheating,
- plagiarism (turning in work not written by you, or lacking proper citation),
- falsification and fabrication (lying or distorting the truth),
- helping others to cheat,
- unauthorized changes on official documents,
- pretending to be someone else or having someone else pretend to be you,
- making or accepting bribes, special favors, or threats, and
- any other behavior that violates academic integrity.

There are serious consequences to violations of the academic integrity policy. Oakton's policies and procedures provide students a fair hearing if a complaint is made against you. If you are found to have violated the policy, the minimum penalty is failure on the assignment, and a disciplinary record will be established and kept on file in the office of the Vice President for Student Affairs for a period of 3 years.

Please review the Code of Academic Conduct **and** the Code of Student Conduct, both located online at: <http://www.oakton.edu/studentlife/student-handbook.pdf>

COURSE POLICIES

- a. Academic Dishonesty: All violations of *The Code of Academic Conduct* will be addressed according to the *Student Academic Integrity Policy*.
- b. Lecture Attendance: Students are expected to attend every lecture on-time. On-time is 2-5 minutes early. Attendance is recorded each time the i>clicker is used in class. There will not be opportunities to makeup i>clicker points that are lost due to absences. Lecture attendance will also be used at the end of the semester to evaluate students on the borderline of the course curves.
- c. Laboratory Attendance Attendance at all laboratory sessions is mandatory. Failure to attend a laboratory session will result in a score of zero for that lab's worksheet score. No laboratory experiments can be made up. Students with approved, extenuating circumstances (e.g., severe illness, death in the family) may be allowed to complete a supplementary assignment or worksheet pertaining to the missed experiment.
- d. Laboratory Tardiness Students who are more than 5 minutes late for a laboratory will not be allowed to participate and will receive a score of zero for that lab's worksheet score.
- e. Missed Quizzes: Failure to take a quiz due to absence will result in a score of zero. No quizzes will be made up. If a student misses a quiz and has an approved, and documented, extenuating circumstance, the average score for the remaining quizzes will be used in place of the missing grade.
- f. Missed Exams Failure to take an exam due to absence will result in a score of zero. No makeup exams will be given. If a student misses an exam and has an approved, and documented, extenuating circumstance (e.g., severe illness, death in the family), the final exam percentage will be used in place of the missing exam with a 5% deduction. (Missing exam % = Final exam % - 5%)
- g. Incompletes Incompletes will only be granted for students showing proof of extenuating circumstances that prevented them from completing the course. Incompletes will not be given for students who are simply dissatisfied with their progress in the course or who are unable to handle their total course load. When an incomplete is assigned, the work already completed and its respective scores will be used for evaluation (i.e., no work may be redone).
- h. Grading Errors Students are responsible for keeping all graded exams and quizzes until final grades have been entered. Students are also responsible for periodically checking their own calculated point totals with those reported on the D2L course website. No grades will be changed after the completion of the course because of grading, recording or adding errors.
- i. Exam/Quiz Errors Students that suspect a grading or adding error on any exam or quiz must bring the original to my office for review within one week after the exam or quiz was returned. Exams and quizzes that have been written on or manipulated may not be submitted for review.
- j. Official Scores Dr. Landrie maintains the official scores, point total and grades for each student. The D2L course website is updated often, but may not reflect the official, current record. Students may see Dr. Landrie anytime during office hours to obtain a grade report with their current, official scores and estimated course grade.

- k. Homework Assignments and their due dates can be found on the class schedule. Two points will be deducted from the score for each day an assignment is late, including weekends. Extensions to these deadlines will only be granted when there are extenuating circumstances that can be documented. Students are expected to complete homework individually. While some amount of group work is expected and encouraged, blatantly copying answers from a peer is considered plagiarism and will be addressed according to the *Student Academic Integrity Policy*. Accept in the case of theft, all involved parties will be held responsible for plagiarism.
- l. Laboratory Worksheets Laboratory worksheets must be completed individually. Students will work in groups during the laboratory; however, all laboratory worksheets must be completed individually. Copying any part of a peer's worksheet will be considered plagiarism and will be addressed according to the *Student Academic Integrity Policy*. Accept in the case of theft, all involved parties will be held responsible for plagiarism.
- m. Worksheet Deadlines All worksheets are due the following class period regardless of whether a lab is completed that day. Late worksheets will be assessed a 2 point penalty per day.
- n. i>Clicker Cheating Under no circumstances may a student cast votes for another student. Students caught with more than one i>clicker during lecture will have the i>clickers in their possession confiscated. Users of all clickers confiscated will receive a zero for the i>clicker portion of the course.
- o. Assigned Reading Students are responsible for reading the textbook sections listed in the class schedule *prior* to the lecture covering those sections. Quizzes may cover assigned reading before the material is presented in lecture.
- p. Laboratory Safety Procedures Students must follow all laboratory safety procedures outlined in this syllabus and in Appendix A of the laboratory manual. Failure to follow these safety protocols may result in a loss of laboratory notebook points (2 points per violation) or earned grade of zero for that laboratory and dismissal from the laboratory for severe violations (e.g. eating or drinking in the lab). Additionally, students are expected to read all hazard and safety information for the chemicals they will be using during the laboratory. These details can be found online at <http://stockroom.chadlandrie.com/>
- q. Goggles All students must wear goggles in the lab at all times when chemicals, glassware or instruments are being used or when instructed by the Professor. Students not wearing goggles will be warned once; subsequent violations will result in the loss of two points for each violation.
- r. Email Communication Dr. Landrie will send class announcements to students' Oakton email address, generally through the D2L course website. Students are responsible for checking their D2L News fee email at least once daily.

VI. Outline of Course Topics

LECTURE TOPICS

Textbook: McMurray, J. *Organic Chemistry*, 9th ed., 2016; Cengage: Boston, MA. ISBN: 978-1-305-08048-5 or McMurray, J. *Organic Chemistry Loose Leaf*, 9th ed., 2016; Cengage: Boston, MA. ISBN: 978-1-305-70102-1.

1. Alcohols and Phenols
 - a. Nomenclature and physical properties of alcohols
 - b. Redox reactions of alcohols, ketones and aldehydes
 - i) Swern and Dess-Martin; modern methods

- ii) Chromium oxidations
 - iii) Periodic acid cleavage of diols
 - iv) Hydride reductions of aldehydes and ketones
 - c. Silyl and benzyl protecting groups for alcohols
 - d. Grignard addition to ketones and aldehydes
 - i) Basicity of Grignards
 - ii) Protecting group strategies
 - e. Extraction of phenols, carboxylic acids and amines in aqueous solutions
 - f. Electrophilic aromatic substitution of phenols (O vs. C-acylation and alkylation)
- 2. Ethers and Thioethers
 - a. Nomenclature and physical properties of ethers
 - b. Crown ethers and ethers as solvents (e.g., role in Grignard reagents)
 - c. Conformational analysis of pyran rings
 - d. Crown ethers; role in nucleophilic substitution
 - e. Preparation of Ethers
 - i) Williamson ether synthesis
 - ii) Alcohol condensation
 - iii) Epoxidation by peroxyacids
 - iv) Biological oxidation of arenes; NIH shift
 - v) Claisen rearrangement
 - vi) Alkylation of thiols; S-adenosylmethionine
 - f. Reactions of ethers
 - i) Acidic cleavage
 - ii) Ring opening of epoxides (acidic and alkaline)
- 3. Nucleophilic Addition Reactions to Aldehydes and Ketones
 - a. Nomenclature and physical properties of aldehydes and ketones
 - i) Carbonyl bond strength
 - ii) Carbonyl polarity and its influence on boiling point and solubility
 - b. Reactions of Ketones and Aldehydes
 - i) Hydration equilibrium; rationalize K_{eq} of various substrates
 - ii) Hyperconjugation and inductive effect on ground state carbonyl stability
 - iii) Cyanohydrin formation equilibrium
 - iv) Benzoin condensation; Umpolung
 - v) Condensation with amines: imines and enamines
 - (1) pH dependence
 - (2) stabilized vs. nonstabilized imines
 - (3) Schiff bases from pyridoxal phosphate
 - (4) Reductive amination
 - (5) Wolf-Kishner reduction
 - vi) Acetal and hemiacetal formation
 - (1) As protecting groups
 - (2) Role of azeotropic distillation; Dean-Stark trap
 - vii) Wittig olefination
- 4. Carboxylic Acids
 - a. Nomenclature and physical properties
 - b. Acidity of carboxylic acids
 - i) Substituent effects on pKa
 - ii) Substituent effects through benzene (Hammett plot)
 - c. Synthesis of Carboxylic acids
 - i) Oxidation of alcohols and aldehydes
 - ii) Nitrile synthesis
 - d. Reactions of Carboxylic acids
 - i) Fisher esterification
 - ii) Lactonization
 - iii) Decarboxylation of diacids and ketoacids
 - iv) Biological decarboxylations
- 5. Carboxylic acid derivatives
 - a. Nomenclature and physical properties

- b. Addition/elimination mechanism; tetrahedral intermediate
 - c. Relative reactivity of derivatives
 - d. Interconversion of derivatives
 - e. Thionyl chloride in synthesis
 - f. DCC and mixed anhydride methods for preparing amides
 - g. Amine chemoselectivity vs. alcohol
 - h. Saponification and transesterification; soap and biodiesel
 - i. Grignard addition to esters and nitriles
 - j. Biological reactions of thioesters; rationalizing nature's choice
6. Enols and Enolates
- a. Mechanism of enolation
 - b. Relative acidity of carbonyl compounds
 - c. Kinetic vs. thermodynamic enolates
 - d. Reactions of enols and enolates
 - i) Aldol, Claisen, Dieckman, acylation, alkylation
 - ii) Malonic ester synthesis
 - iii) Conjugate additions: cuprates vs. Grignards
 - iv) Michael addition, Robinson annulation
 - v) Hell-Volhard-Zelinski monohalogenation of enols
 - vi) Haloform reaction of enolates
 - e. Enolization and enol content (equilibrium)
7. Amines
- a. Classification, nomenclature and physical properties
 - b. Basicity of alkyl amines, aryl amines and amidines (imidazole and DBU)
 - c. Amines at physiological pH (Henderson-Hasselbalch)
 - d. Solubility and extraction of amines
 - e. Synthesis of amines
 - i) Lithium aluminum hydride reduction of amides and azides
 - ii) Amine alkylation; quaternary salts
 - iii) Gabriel amine synthesis
 - iv) Curtius rearrangement
 - v) Hoffmann elimination rule/transition states
 - vi) Role as electron donating group in electrophilic aromatic substitution
 - vii) Formation of diazonium ions; Sandmeyer reactions
8. Carbohydrates
- a. Classification and nomenclature
 - b. Fisher projections; D and L monosaccharides
 - c. Anomers of pyranoses and furanoses
 - d. Mutarotation, optical rotation and the anomeric effect
 - e. Redox reactions of carbohydrates
 - f. Chain extension through cyanohydrins
 - g. Chain shortening through Wohl degradation
 - h. Glycoside synthesis by Koenigs-Knorr
 - i. 1,4 and 1,6-disaccharides
9. Amino Acids
- a. Classification
 - b. Using Henderson-Hasselbalch to determine the major form at specific pH
 - c. Calculate isoelectric point (pI)
 - d. Synthesis of amino acids
 - i) Hell-Volhard-Zelinski
 - ii) Reductive amination
 - iii) Acetamidomalonic synthesis
10. Peptides and Proteins
- a. Classification
 - b. Sequencing
 - i) Sanger's reagent
 - ii) Ninhydrin staining
 - iii) Edman degradation

- iv) Enzyme hydrolysis
 - c. Synthesis
 - i) Amino acid protecting groups strategies
 - ii) DCC coupling
- 11. Lipids
 - a. Definition and classification
 - b. Prostaglandins, steroids, triglycerides, waxes, phospholipids, fats and terpenes
- 12. Chemistry of metabolic pathways
 - a. NIH shift
 - b. ATP
 - i) Structural basis for phosphorylation potential
 - ii) Phosphorylation mechanism
 - iii) Role in coupled reactions; shift K_{eq} by 10^8
 - c. Fatty-acid biosynthesis
 - d. Prostaglandin biosynthesis
 - e. Monoterpene biosynthesis
 - f. Glycolysis
 - g. Citric acid cycle
- 13. Polymers

LABORATORY EXPERIMENTS

The laboratory activities and experiments can be found in the laboratory manual for the course.

1. Ethanol from Sucrose
2. Preparation of Triphenylmethanol
3. Dehydration of an Alcohol
4. Alcohol Identification
5. Coenzyme Synthesis of Benzoin
6. Benzil
7. Benzilic Acid
8. Hydrolysis of Benzonitrile
9. Properties of Aldehydes and Ketones
10. Synthesis Drill
11. Benzocaine
12. Nomenclature of Acid Derivatives Drill
13. Tetraphenylcyclopentadienone
14. Tetraphenylnaphthalene
15. Benzocaine
16. Aldol Condensation
17. Michael Reaction
18. Enamine
19. Sulfanilamide
20. Properties of Amines
21. Diazonium Salts
22. Properties of Carbohydrates I and II
23. Isolation of Casein from Milk
24. Amino Acids
25. Sequencing Amino Acids in Peptides
26. Soaps
27. Detergents
28. Preparation of Polymers
29. Photochemistry
30. Luminol and Chemiluminescence

VII. Methods of Instruction

- a. Lectures Lectures will be presented using digital presentation software and an overhead projector. The lecture topics will be taken from the current course textbook as well as from outside sources at the instructor's discretion. Following class, lecture will be posted on the course website for students to download.
- b. i>Clicker i>Clicker questions will be asked during each lecture; students will vote on the correct multiple choice answer using their i>clickers. These questions will also serve to initiate discussion and to measure whether concepts are being understood as they are taught.
- c. Skill Builder Exercises Several times throughout the semester, the lecture period will be used to complete activities designed to help students master problem solving in organic chemistry. The activities will be completed in groups and as a class to give students the opportunity to observe how others, including the instructor, solve organic chemistry problems.
- d. Homework The instructor will develop written homework assignments that compliment the lecture and textbook material. Since all questions are not graded for correctness, it is the student's responsibility to ensure each question is mastered by studying solutions to similar problems, working with colleagues and seeking assistance from the instructor.
- e. Laboratory Experiments Students will conduct several experiments in organic chemistry designed to connect the concepts learned in lecture to practical experiences. These experiments will include learning analytical techniques, such as melting point determination, thin-layer chromatography, gas chromatography, NMR spectroscopy, infrared spectroscopy and gas chromatography. Students will also synthesize organic compounds using classical and contemporary chemical reactions in organic synthesis.
- f. D2L Multimedia Multimedia such as practice worksheets, handouts, instructional videos and practice quizzes will be posted to D2L.

VIII. Course Practices Required

- a. Writing Skills Students are expected to write at the college level on homework, exams and written assignments. College level writing includes adherence to rules of grammar, the ability to organize thoughts into a logical order using cohesive paragraph structures, and legible handwriting for written assignments.
- b. Communication Skills Students are expected to communicate the language and ideas of organic chemistry orally as well through their writing. All students will be asked to answer questions during class and to participate in discussions and oral presentations. Students are also responsible for communicating with their peers and their instructor when they need help. Students are encouraged to ask questions and to seek out answers to help them master the course content.

- c. Computer Skills Students will require basic computer skills to complete homework assignments, to complete written assignments using a word processor, to search the academic literature using online databases, to access the course website and to view their course grades using the D2L online course management system and to communicate with the instructor through email. Students are required to check their email once daily to stay apprised of course announcements.
- d. Organization and Time Management Students are responsible for checking the class schedule to determine when assignments are due, what advanced reading is required prior to each lecture and when exams and quizzes will be given. Students are expected to read the listed sections in the schedule before they are covered in lecture. Students are responsible for using the class schedule to plan their studying activities prior to quizzes and exams. Students are responsible for determining when prelab entries must be completed in their lab notebooks.

IX. Instructional Materials

- Required: McMurray, J. *Organic Chemistry*, 9th ed., 2016; Cengage: Boston, MA. ISBN: 978-1-305-08048-5 or McMurray, J. *Organic Chemistry Loose Leaf*, 9th ed., 2016; Cengage: Boston, MA. ISBN: 978-1-305-70102-1.
- Required: CHM 222/224 – *Organic Chemistry II Laboratory Experiments*.
- Required: Chemical splash goggles (indirectly vented). The goggles must seal completely around the face. Shield-type or glasses-type are not allowed
- Recommended: i>Clicker (1 or 2); MacMillan (www.iclicker.com); ISBN: 1429280476. If students do not wish to purchase their own i>Clicker, one will be loaned to them at the beginning of each class.
- Recommended: Molecular model set. Preferred set is “MOLECULAR VISIONS Organic, Inorganic, Organometallic” in a green plastic box. Sold by Darling Models, INC. ISBN: 978-09648837-1-0.

X. Methods of Evaluating Student Progress

SUMMARY OF POINT DISTRIBUTION

The course will be graded according to individual performance on each of the following assessment items:

Course Activity	Points	No.	Total Points	%
i>Clicker	40	x 1 =	40	4%
Homework	10	x 10 =	100	10%
Quizzes	10	x 10 =	100	10%
Skill Builder	10	x 4 =	40	4%
Semester Exams	100	x 3 =	300	30%
ACS Exam	100	x 1 =	70	7%
Final Exam	200	x 1 =	200	20%
Laboratory Worksheets	100	X 1 =	100	10%
Laboratory Exam	50	x 1 =	50	5%
Course Total			1000	100%

DESCRIPTION OF GRADED COURSE ACTIVITIES

- a. i>Clicker The i>clicker will be used in most of the lectures this semester. Generally, 5-10 questions will be asked during each lecture to reinforce a concept just covered or to determine students' preconceptions and understanding of the required reading. These

questions will appear on the projector screen as part of the lecture slides. One point will be awarded to each student that answers the question; one additional point will be given for the correct answer. The questions may be reviewed later by downloading the lecture slides or by viewing the i>clicker page within the course website.

- b. Homework Homework will be assigned that covers the material presented in the lecture and textbook readings. Each homework assignment is worth 10 points. Students will receive a maximum of six points for completion. One point will be subtracted for each incomplete or missing question for a maximum of a six-point deduction. A random set of questions will be graded out of four points for correctness.
- c. Quizzes Quizzes will be given on the dates listed in the class schedule. At least ten quizzes, each worth 10 points will be assigned. The top ten scores will count toward the final grade. Quizzes will test mastery of topics presented in previous lectures as well as the assigned reading that should be completed prior to each lecture.
- d. Skill Builder Students will work in groups to complete critical thinking problems. The activities will give students the opportunity to observe how others, including the instructor, solve organic chemistry problems. Their primary objective is to help review for upcoming exams.
- e. Semester Exams Exams will cover material presented during lecture as well as assigned readings. Question formats will include drawing reactants or products in reaction schemes, multiple choice, short answer, essay, drawing reaction mechanisms and ranking. Skill Builders, Quizzes, Sapling and i>Clicker should be used as examples of each question type. A study guide listing the topics, questions types and approximate point distribution will be distributed one week prior to each exam.
- f. ACS Exam The American Chemical Society exam is multiple-choice. A study guide developed by the ACS will be distributed one week prior to the exam. The exam will be used mainly to ensure that all sections are meeting minimum standards for proficiency in organic chemistry.
- g. Final Exam The final exam is cumulative. The format of the exam will be similar to the three semester exams. A study guide will be distributed one week prior to the exam.
- h. Laboratory Worksheet For each experiment students will complete a laboratory worksheet in which they will summarize hazard and safety information for the chemicals used, record data and observations during the experiment and answer questions pertaining to the experiment. These worksheets should be used to prepare for the lab exam.
- i. Laboratory Exam A laboratory exam will be administered at the end of the term. It will cover the theory, techniques and results of the experiments performed.

COURSE EVALUATION, "THE CURVE"

The word "curve" means many different things to many different people. This course is not graded on a traditional *Bell curve*. In other words, there is no set number of As, Bs, Cs and Ds that must be earned. However, I will determine the minimum point values required to earn a letter grade for each component of the course. These limits will not be determined in advance since I cannot predict the difficulty of exams and quizzes and do take into account how well I've taught a topic or explained an assignment. Students may gauge their progress by viewing the limits on the course website or D2L for each course component as well as the course total. These limits vary slightly each semester since variations in exam difficulty, teaching quality and grading styles cannot be avoided. Students may also see me during office hours for an up-to-date grade report.

The approximate final course curve:

100-80%	A
79-70%	B

69-55%	C
54-40%	D
39-0%	F

XI. Other Course Information

STUDENTS WITH DISABILITIES

If you have a documented learning, psychological, or physical disability, you may be entitled to reasonable accommodations or services. To request accommodations or services, contact the Access and Disability Resource Center at the Des Plaines or Skokie campus. All students are expected to fulfill essential course requirements. The College will not waive any essential skill or requirement of a course or degree program. For more information or to request accommodations, contact the ADRC at:

URL: http://www.oakton.edu/studentservices/disability_services/

Location: Rm 2400 Des Plaines Bldg

Phone: 847-635-1759

RELIGIOUS HOLIDAYS STATEMENT

Oakton Community College recognizes the broad diversity of religious beliefs of its constituencies. The college has embraced a practice of shared responsibility in the event a religious observance interferes with class work or assignments. Students who inform instructors in advance of an intended absence for a major religious observance will not be penalized. The instructor will make reasonable accommodation for students, which may include providing a make-up test, altering assignment dates, permitting a student to attend another section of the same course for a class period or similar remedies. Instructors are not responsible for teaching material again. Instructors should inform students of this practice at the beginning of the semester so that arrangements can be made accordingly. Similar consideration is accorded to faculty, staff and administrators and is provided for in their respective contracts.

TITLE IX

Oakton Community College is committed to maintaining a safe campus environment emphasizing the dignity and worth of all members of the community and complies with all Title IX requirements.

Resources and support for

- pregnancy-related and parenting accommodations; and
- victims of sexual misconduct

can be found at <http://www.oakton.edu/title9>

CHANGE OF HEALTH STATUS

Students who have a change of health status need to contact me as soon as possible. For accommodations specifically related to pregnancy or post-pregnancy-related parenting, contact me and consult the Title IX policy <http://www.oakton.edu/title9>. If you are pregnant or become pregnant during the semester, you have the option to meet with me to discuss reasonable accommodations that may be necessary. It may not be possible to grant accommodations after the fact, so it is better to prepare in advance for any possible scenarios.

LECTURE AND LABORATORY SCHEDULE

The lecture and laboratory schedules can be found at <http://oakton.chadlandrie.com/>. They will be updated weekly as changes are made. Student will also receive notifications in class and through the D2L News items when changes are made to the schedule.

IMPORTANT DATES

All of the dates below can be found in the College's Academic Calendar. You may view this online at: http://www.oakton.edu/academics/acad_calendar/index.php.

Date	Item
6/22/2017	Classes Begin
7/3/2016	Independence Day Holiday, No Classes, College Closed
Check my.oakton.edu	Last day to withdraw and have courses dropped from record.
Check my.oakton.edu	Last day to withdraw with a "W" from 16-week courses.
8/2/2016	Last day of student attendance

Laboratory Safety Procedures and Policies

1. GENERAL – APPLIES TO ALL OAKTON LABORATORIES

- 1.1. Students are not allowed in lab rooms unless an instructor is present
- 1.2. No eating or drinking is allowed in the lab at any time.
- 1.3. No application of cosmetics.
- 1.4. All laboratory supplies must be treated with respect. This includes but is not limited to: glassware, models, cadavers, slides, microscopes, laboratory equipment, and chemicals.
- 1.5. Proper attire must be maintained in the labs at all times
 - 1.5.1. No open-toed shoes of any kind including sandals and flip flops
 - 1.5.2. No shorts or skirts above the knee – exposure of skin surfaces should be minimized
 - 1.5.3. No dangling jewelry or baggy clothing
 - 1.5.4. Long hair should be pulled back or confined
- 1.6. Mouth pipetting is not permitted. Mechanical pipetting devices should be provided
- 1.7. Wash hands thoroughly with soap and water after handling chemicals of any kind or live or preserved specimen.
- 1.8. Wash hands thoroughly with soap and water before leaving the lab. Keep hands away from eyes and face.
- 1.9. Wear the appropriate PPE (goggles, gloves, lab coats, etc.) as deemed necessary for that particular laboratory exercise or as directed by the instructor.
- 1.10. All reagent bottles or containers should be kept tightly closed to minimize accidental spills.
- 1.11. All spills and accidents should be reported immediately to the instructor. Waste and broken material should be disposed of according to the specific guidelines developed for that laboratory exercise. Broken glass must be disposed of with a dustpan and broom.
- 1.12. Faculty, staff and students should know the location of: emergency exits and evacuation plans, fire extinguishers, eye wash stations, fire blanket, safety showers, first aid kit, phone and emergency numbers. Students should not be allowed into the prep area unless supervised.
- 1.13. Students who may be pregnant or may have a significant health issue should inform the instructor of such issues so that appropriate decisions can be made regarding student safety.

2. SAFETY PROCEDURES FOR CHEMISTRY STUDENTS

- 2.1. Be Prepared Before Coming to Lab
 - 2.1.1. Read over the assigned laboratory procedures. Respond to any pre-class questions and/or complete any assigned pre-laboratory work.
 - 2.1.2. Be aware of any hazards associated with the chemicals you will be using and the proper method of disposal for any wastes you will be generating.
 - 2.1.3. Dress appropriately. You should be well covered - no shorts above the knees, sandals or bare midriffs (even when you stoop over) preferably with older, cotton clothes (jeans and a cotton shirt or tee are fine). Avoid bulky clothes or hanging necklaces. Hair longer than shoulder length – on both men and women – should be tied back or confined. Do not wear valuable jewelry to lab.
- 2.2. Familiarize Yourself With the Laboratory Facilities During the Check-in Lab
 - 2.2.1. Learn the location and how to properly use the laboratory safety equipment including safety goggles, eye washes, shower, fire blanket, and fire extinguisher.
 - 2.2.2. Identify the lab exits and locate the closest fire alarm box.
 - 2.2.3. Check out the posted laboratory evacuation plan.
 - 2.2.4. Become familiar with laboratory references, including chemical labels, for checking on chemical hazards.
 - 2.2.5. Become familiar with the appearance and proper name of the equipment in your assigned drawer(s) and other commonly used equipment in the cupboards and drawers around the laboratory.
- 2.3. Conduct yourself in a responsible and safe manner during all laboratory periods.
 - 2.3.1. Wear SAFETY GOGGLES at all times when you are in the laboratory.

- 2.3.2. Be on time to the lab so that you hear the safety review and other introductory material.
 - 2.3.3. Place book bags and winter coats, scarves, etc. in the designated areas.
 - 2.3.4. Follow written and verbal instructions carefully. If you are required to develop your own procedure (i.e. during a lab practical or for a special project), please have your procedure checked and approved by your instructor before implementing.
 - 2.3.5. Perform only the assigned activities/procedures. Use only the prescribed equipment and chemicals. Check labels and instructions carefully.
 - 2.3.6. Keep work areas clean. Keep floors, aisles, and passageways clear of obstructions. Avoid leaving drawers and cupboards open.
 - 2.3.7. Do not eat, drink, or smoke in the laboratory.
 - 2.3.8. Conduct yourself in an appropriate manner – no horseplay. Walk and don't run. Be respectful toward your fellow students, instructor and the facilities.
 - 2.3.9. While conducting an experiment in the laboratory, keep your hands away from your eyes and face. Wash your hands thoroughly after completing the laboratory experiment.
 - 2.3.10. Replace tops on containers of chemicals immediately after use. Keep coasters under the acid reagent bottles
 - 2.3.11. Most of all, be alert and proceed with caution in all laboratory activities.
 - 2.3.12. Students should not be in the stock area unless accompanied by their instructor.
- 2.4. Execute laboratory techniques knowledgeably and safely
 - 2.4.1. Never taste any chemicals.
 - 2.4.2. Never inhale any chemical directly. On occasion you may be directed to check an odor, but this is done by wafting the material toward you, not by placing your nose directly over the container and inhaling.
 - 2.4.3. Never carry hot equipment or hazardous chemicals through a cluster of students.
 - 2.4.4. Never add water to acids; you should add acid (slowly. Carefully, and with stirring) to water.
 - 2.4.5. Use Bunsen burners only when directed by your instructor to do so.
 - 2.4.6. When heating any chemicals (in a test tube or flask), be sure that it is an open system and that the opening is not directed toward yourself or other students.
 - 2.4.7. Chemicals are generally transferred in the approximate amount needed and taken to the student's lab bench. Only use transfer techniques that have been demonstrated by your instructor. Never return chemicals to the original container because they could be contaminated. Instead, dispose of any excess or waste chemicals in the prescribed manner.
 - 2.4.8. Moving chemicals from one place to another in the lab should generally not be necessary. If it is, it must be done very carefully.
 - 2.4.9. NEVER PIPETTE BY MOUTH. Instead use a bulb or an automatic pipette.
 - 2.4.10. Ordinarily you will not need to bend, break or insert glass tubing into rubber stoppers. If you do have occasion to do any of these activities, be sure to use the techniques demonstrated by your instructor.
 - 2.4.11. If you have need to insert or remove an electrical plug, be sure that your hands are dry and apply pressure directly to the plug, not the cord.
 - 2.5. Minimize risk and danger to self and others in case of an accident and when disposing of chemical waste.
 - 2.5.1. Any chemical spills need to be reported to your instructor and cleaned up immediately using the appropriate neutralizing agents and/or disposal procedures.
 - 2.5.2. If you get chemicals on your skin (hands, face or elsewhere) or clothes, wash immediately with copious amounts of water, and report the incident to your instructor.
 - 2.5.3. Chemicals in your eye are very serious. Use an eye wash in the lab to irrigate the eye with water for several minutes; report the incident to your instructor.
 - 2.5.4. If a glass piece of equipment is broken, use the brush and trash scoop in the lab (with the green/white container for broken glass) to clean up any glass. Dispose of broken glass in the box designated for that purpose.
 - 2.5.5. If a person's hair or clothing catches fire, drop and roll to smother the fire. Another near-by person should immediately get the fire blanket and assist with smothering the fire. The fire extinguisher can also be used. Report the incident to your instructor.
 - 2.5.6. If chemicals or papers on your lab bench catch on fire, remain calm and attempt to smother the fire by placing a larger object (preferably inflammable) over it. A watch glass put over the top of a

small beaker containing burning liquid works wonders. The fire extinguisher may also be used. Report the incident to your instructor.

- 2.5.7. Report any accident such as burns, chemical contact with skin or clothes, cuts, or scratches, no matter how minor, immediately to your instructor.
- 2.5.8. If you notice smoke or fire, notify your instructor.
- 2.5.9. Follow your instructor's directions in the case of any accident and/or need to evacuate the lab.
- 2.5.10. For the disposal of chemical waste, follow directions given in the laboratory text and/or by your instructor. Some chemical wastes may be safely washed down the drain. However, many solid and liquid chemical wastes must be discarded into designated containers maintained in one of the hoods of each laboratory. Chemical wastes are not discarded in the regular waste containers. The latter are used exclusively for paper and plastic dry waste.

3. SAFETY POLICIES FOR DR. LANDRIE'S STUDENTS

- 3.1. No coats, book bags or personal belonging, other than a lab notebook and writing utensil, may be stored on lab benches or floors. All personal belonging must be stored in cabinets to prevent chemical contamination.
- 3.2. Keep track of your combination lock and ensure it is locked before leaving the lab. Combinations will be posted to D2L during the second week of classes.
- 3.3. Do not sit in stools when conducting an experiment. Stools are provided for non-laboratory activities only.
- 3.4. Ensure you are properly trained before using an instrument in the instrument lab (341). Ask your instructor if you unfamiliar with operating procedures.
- 3.5. Do not enter the research lab (342) unless accompanied by your instructor.
- 3.6. Each student must read the Hazard and Safety Information for every chemical they will use in experiments. This information is found online at <http://www.chadlandrie.com/OCCcheminventory>. This information must be summarized in the *Pre-Lab* section of their notebook entry.

I have received, reviewed, understand, and agree to follow these safety procedures for the chemistry laboratories.

CHM-COURSE:	222-Organic Chemistry II
SECTION-CRN:	1E1-20335
INSTRUCTOR:	Dr. Chad Landrie
DRAWER #:	
COMBINATION LOCK SERIAL #:	
COMBINATION:	
PRINTED NAME:	
SIGNATURE:	
DATE:	

i>Clicker

I. Introduction

i>Clicker is a response system that allows you to respond to questions that are posed during lecture. Generally, 5-10 questions will be asked during each lecture to reinforce a concept just covered or to determine student's preconceptions and understanding of reading assignments. These questions will appear on the projector screen as part of the lecture slides. One point will be awarded to each student that answers the question; one additional point will be given for the correct answer. The questions may be reviewed later by downloading the lecture slides from the course website or by viewing the i>clicker page within the course website. In order to receive credit, you will need to register your i>clicker remote online according to the instructions in the following section.

II. Obtaining an i>Clicker

PURCHASE

You may purchase an i>clicker from the vendor's website (www.iclicker.com) or through Amazon.com. Either i>clicker 1 or i>clicker 2 may be purchased for this course. Once purchased, you may use your i>clicker in any of your classes requiring them that semester or in the future. Simply follow each instructor's registration instructions separately. You may also loan your i>clicker to peers for use in their classes; however, only one individual can use an i>clicker in a single class at a time. In other words, two students in the same class cannot share one i>clicker.

LOAN

Students that do not wish to purchase an i>clicker will obtain a loaned i>clicker from their instructor at the beginning of each class. The same i>clicker must be used throughout the semester. Be sure to make a note of the identification tag on the front of the i>clicker during your first use so that you are always using the same i>clicker for each class. At the end of class, the i>clicker must be returned to the instructor. If you purchase an i>clicker later in the semester and would like to use it instead of your loaned i>clicker, you must bring the purchased i>clicker to your instructor so it can be registered to your name.