

Chemistry 2273a 2010-2011
Organic Chemistry I: STRUCTURE AND SPECTROSCOPY

Instructor:	Dr. Robert Hudson		ChB 226
Class Times	Mon., Wed., Fri.	9:30-10:20	WL 258
Optional Tutorial Time:	Wednesdays	6:00pm	ChB 9
Office Hours:	Open door, or email to arrange a time		

Course Web-Page: <http://instruct.uwo.ca/chemistry/273/>

The web page contains: course outline; laboratory information and notes; assigned problems; information on the term test and exam, AND course news!

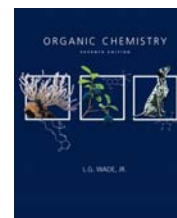
Course E-mail: robert.hudson@uwo.ca

When sending email to this account use "2273" to start the subject line. Emails from registered students emanating from @uwo.ca accounts will be answered as soon as possible. If you are emailing from other servers, you must include your name and student number. How am I to know who sugarbearXOXO@hotmail.com is???

Required Materials, Text and other Purchases: Available in the bookstore

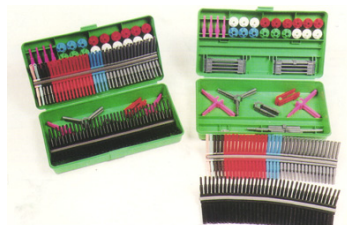
- *TEXT: "Organic Chemistry, 7th Edition" by L.G. Wade Jr with solutions manual.*
- Laboratory notebook with ruled pages. This book may be shared with other lab courses.

This text will be used for Chemistry 2283g.



Chemistry 2273a will cover approximately chapters 1-6, 12, 13, 15 and Chemistry 2283g covers material from intermediate and later chapters. The text will also be a useful resource for future organic chemistry courses.

- Recommended: Darling Molecular Model Set
- Safety Glasses with side-panels and laboratory coat. (**required**, but you should already have them!)
- Laboratory Manual, September 2010, provided on website.



Evaluation:

The final grade for the course will be determined by the following:

Laboratory Mark (Attendance and completion of all laboratory experiments, including reports, is mandatory. See attached schedule)	15% (total of 3 labs)
In class quizzes (each timed 15 minutes) (approximately every second week until the end of term)	10% (no more than 5)
Term Test, Friday October 22, 6:30-8:30 p.m., place: NCB 114	30%
Final Exam, cumulative; 3 hours, time and location set by Registrar	45%

Accessibility Statement

Please contact the instructor if you require information in an alternate format, or if any other arrangements are needed to make this class accessible to you. Advance notice of planned interruptions will be made in class and by e-mail to @uwo.ca accounts.

Important Notes Regarding Your Evaluation and Your Responsibilities in this Course:

1) Prerequisite: A Mandatory Notice from the Registrar:

"Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites."

Prerequisites: Chem 1050 with a minimum mark of 60%.

2) Missed Work: Midterm Test or Exam:

Failure to write the midterm test or final exam will result in a zero grade in the course, unless a valid excuse has been filed with the **Dean's Office**. It is the student's responsibility to ensure that medical slips, etc. are filed with the **Dean's Office** and that a copy is sent to your instructor (not your laboratory demonstrator).

Note 1: If the midterm test is missed for valid reasons, the 30% will be transferred to the final examination. There is NO alternate midterm test.

Note 2: If the final exam is missed for valid reasons, a Special Exam (SPC) may be requested through the Dean's Office. By University regulation, the SPC must be written within 30 days of the original exam date.

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: <http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

A student requiring academic accommodation due to illness (labs, quizzes assignments, tests, exams), should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here: https://studentservices.uwo.ca/secure/medical_document.pdf.

Students wishing accommodation for religious, athletic or other special circumstances should consult with the Instructor well in advance of the date in question.

3) It is the policy of this department that when a student takes a test or examination, they have deemed themselves fit to do so. Claims of distress or medical issues *after the fact* will not be considered for the basis of a grade appeal.

4) Missed Work: Laboratory

Failure to complete a laboratory experiment, including the report, will result in a zero grade for the laboratory and potentially jeopardize completion of the course, unless a valid excuse has been filed with the **Dean's Office**. It is the student's responsibility to ensure that medical slips, etc. are filed with the **Dean's Office** and that a copy is sent to your instructor (not your laboratory demonstrator). Once notified by the Dean's office the instructor will make the appropriate accommodation, such accommodation must be sought in a timely manner by the student. Accommodation is typically the opportunity to repeat the same lab later in the week. Thus, it is important that the student not wait to make arrangements and miss this important opportunity.

Only one laboratory may be excused, if more than one complete lab is missed with or without proper legitimate reasons, the course will be deemed incomplete.

5) Missed Work: In-class quizzes

Students are required to present their Dean's office with their reason for missing quizzes (see note 2, above), for reassignment of the value of the missed work, within 1 week, else a grade of zero will be assigned.

6) Policy on late work: Laboratory reports and other assignments have set due dates. A piece of work will not be accepted (that is, it will be given a grade of zero) if it is more than one week late or if graded work has already been returned to the class, whichever is first. Otherwise, laboratory reports and other graded work will lose 5% per day past the due time/date.

7) Plagiarism and Cheating: Chemistry 2273a has a ZERO tolerance for plagiarism and cheating. Cases of cheating or plagiarism may result in a zero grade for Chemistry 2273a and the individual will be reported to the Chair and the Dean who may administer further sanctions.

Plagiarism is a major academic offence: see Scholastic Offence Policy in the Western Academic Calendar.

Students must write their laboratory reports, quizzes and tests on their own and in their own words and without collaboration unless explicitly allowed by the Instructor. Whenever students take an idea, or a passage from another author or student, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations.

Whenever possible, tests and exams may be checked with software that checks for unusual coincidences in answer patterns that may indicate cheating.

8) Attendance: Students are expected to attend course lectures and participation in the class is considered to be an integral and essential component of the course. Poor attendance can result in a student being barred from writing the exam following procedures provided in the academic calendar:

<http://www.westerncalendar.uwo.ca/2010/pg129.html>

A complete listing of your Academic rights and responsibilities may be found on the Registrar's and associated websites, starting at:

<http://www.westerncalendar.uwo.ca/2010/pg111.html>

Laboratory Schedule

All Labs are carried out in the Chemistry Building Room 074 (lower ground floor). You must attend the laboratory section to which you are registered. If you miss a laboratory, you must see the TA who is the lab coordinator (TBA), or Prof. Hudson for alternative arrangements as soon as possible after missing the lab.

Laboratory Technicians:

Robin Hall and Ron Maslen ChB 089

Laboratory Teaching Assistants (TAs)

TA assignments were not formalized at the time of printing – announcements will be made during class and on the website when the information becomes available.

Section 005: Tuesday 9:30 a.m. – 12:30 p.m. TAs: TBA

Section 002: Tuesday 2:30 p.m. – 5:30 p.m. TAs: TBA

Section 004: Monday 2:30 p.m. – 5:30 p.m. TAs: TBA

Section 003: Thursday 9:30 a.m. – 12:30 p.m. TAs: TBA

NOTE: If you go looking for your TA, you are not permitted to enter research labs unless you are properly attired and are wearing safety glasses. These are working labs and with hazardous environments, use caution!

Week Starting	Experiment	Report Style
September 27	Check-in and Lab 1: Part A: Thin-Layer Chromatography (TLC) Analysis of Analgesics	Data Sheet <i>Due: at the beginning of the next lab during the week of Oct. 4.</i>
October 4	Lab1: Part B: Thin-Layer Chromatography and Column Chromatography: Extraction and Separation and Plant Pigments	Laboratory Report <i>Due: in class by Friday, Oct. 15</i>
October 11	<i>No organic labs</i>	Lab 1, part B due
October 18	<i>No organic labs</i>	
MIDTERM IN C2273 – FRIDAY, OCTOBER 22, 2010		
October 25	Lab 2: Liquid-Liquid Extraction – Separation of Organic Acid, Organic Base and Neutral Components of a Mixture	Laboratory Report
November 1	Lab 2 continued: Recrystallization as a means of purification of organic solids	<i>Due: in class by Friday, Nov. 12</i>
November 8	<i>No organic labs</i>	Lab report 2 due
November 15	<i>No organic labs</i>	
November 22	Lab 3: Practical NMR and IR Spectroscopy and Mass Spectrometry	Laboratory Report
November 29	Lab 3, continued: Structure Solving Session	<i>Due: in class by Wednesday, Dec. 8</i>
December 8 – LAST DAY OF CLASS		

Lecture Topic Outline (approximate timing of lecture material and quizzes)

Week 1: Chapters 1 & 2

Introduction and review of structure and bonding that we should know from Chem 1050

- molecular formula, assigning hybridization, describe bonding (geometry, bond angles, sigma/pi bonds)
- formal charges
- ionic vs covalent bonding
- polar vs non-polar bonding; electronegativity; polarity of molecules
- resonance theory, resonance hybrids, major-minor contributors
- representation of molecules

Week 2&3: Chapter 3 & 5

Conformations of acyclic alkanes and constitutional/structural Isomerism, Stereochemistry

- alkanes – bonding, conformations, Newman projections, dash-line-wedge-Fisher projections
- constitutional isomerism
- conformations of acyclic alkanes; torsional and steric strain
- conformations of cycloalkanes; steric/torsional strain, eclipsing interactions
- chair/boat of cyclohexane; energy profiles of cyclohexane
- conformations of substituted mono-cyclohexanes
- conformations and geometric isomerism in di-substituted cycloalkanes (cyclohexane); cis-trans
- Alkenes, configurations, E/Z
- Stereogenic centers, stereoisomers, chirality
- Enantiomers, naming R,S
- Molecules with two or more stereocenters: enantiomers, diastereomers and meso compounds
- Fisher projections
- Stereochemistry at centers other than C (quaternary N, phosphines and sulfoxides)
- Optical activity
- Properties of stereoisomers
- Contributions to stereochemistry

QUIZ 1 (sometime before the end of week 3)

Week 4: Chapter 1

Acids and Bases

- Bronsted and Lowry definitions
- Chemical Structure and Acid Strength (base strength)
- Electronegativity, size, resonance, inductive effects, solvation, hybridization
- ranking by relative pKa/acid strength; ranking by relative base strength; nucleophilicity

QUIZ 2 (tentatively covering weeks 3&4)

Week 5: Chapter 12

Infrared-Spectroscopy

- background
- the spectrum
- IR absorptions
- functional groups (and a detour to molecular interactions: ionic, Van der Waals, Dipole-dipole and hydrogen-bonding)

Week 6: Chapter 12

Mass Spectrometry

- background
- molecular ion and molecular formula determination
- isotopes
- fragmentations
- exact mass

QUIZ 3

Week 7&8: Chapter 13
Nuclear Magnetic Spectroscopy

- NMR background
- ^{13}C spectroscopy
- chemical shift
- ^1H NMR Spectroscopy
- number of signals, chemical shift (shielding, deshielding, ring currents), integration, simple splitting, diastereotopic and enantiotopic groups
- aromatic – mono, ortho, meta, para substituted)
- (simple one bond spitting only)
- putting all the spectroscopy together

QUIZ 4

Week 9: Chapter 4
Principles of Chemical Reactivity/Understanding Organic Reactions

- how to write reaction mechanisms
- bond-making and breaking
- energy diagrams (reaction coordinate diagrams) – unimolecular, bimolecular, etc.
- writing equations for organic reactions
- thermodynamics (enthalpy, entropy (intro) and free energy)

Week 10-end: Selections from Chapter 6 and time permitting Chapters 8, 17, 18
Fundamental Reactions Types

- $\text{S}_{\text{N}}1$, $\text{S}_{\text{N}}2$, E1, E2
- Addition to alkenes, EAS, addition and substitution at carbonyl functional groups

QUIZ 5