

**Chemistry 2273a 2009-2010**  
**Organic Chemistry I: STRUCTURE AND SPECTROSCOPY**

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<b>Instructor:</b>	<b>Dr. Robert Hudson</b>	ChB 226
<b>Class Times</b>	Mon., Wed., Fri.	8:30-9:20 BGS 0165
<b>Optional Tutorial Time:</b>	Thursdays (starting Sept. 24)	6:00-7:00 p.m. ChB 9
<b>Office Hours:</b>	Open door, or email to arrange a time	

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**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!

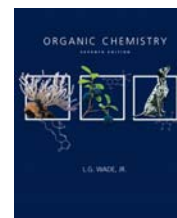
**Course E-mail:** [robert.hudson@uwo.ca](mailto:robert.hudson@uwo.ca)

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???

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

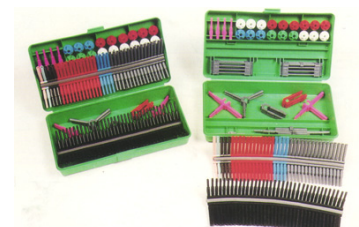
- **TEXT BOOK PACKAGE \$196.45:** "Organic Chemistry, 7th Edition" by L.G. Wade  
Solutions Manual to accompany Wade  
ACE Organic 18 month online subscription



***This text and ACE Organic will be used for Chemistry 2283g.***

If you wish to purchase only ACE organic (\$42.00), there are standalone copies available in the bookstore. The text alone (\$163.70), E-book text (\$128.10) and separate solutions manual (\$82.00) can be ordered through the bookstore.

- Laboratory Experiments for Chemistry 2273a – **FREE!** This year the lab experiments will be provided on the course website as a pdf file at least one week prior to when it is scheduled. The laboratory experiments are being improved to your benefit so your patience is appreciated!
- Optional, but HIGHLY recommended. Molecular Model Set: Darling. These are the same models as used in C2213 and first year chemistry – they are available in the bookstore.
- Safety Glasses with side-panels and laboratory coat. (**required**, but you should already have them!)



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**Evaluation:**

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

<b>Laboratory Mark</b> (Attendance and completion of all laboratory experiments, including reports, is mandatory. See attached schedule)	<b>15%</b> (total of 3 labs)
<b>Online ACE Organic quizzes and problem sets</b> (expect weekly assignments until the end of term)	<b>15%</b> (no more than 10)
<b>Term Test, Friday October 23, 6:30-8:30 p.m.</b> , place: TBA	<b>25%</b>
<b>Final Exam, cumulative</b> ; 3 hours, time and location set by Registrar	<b>45%</b>

## **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 020 with a minimum mark of 60% or Chem 023 with a minimum mark of 70% or Chem 1050.*

### **2) Missed Work: 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 25% 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](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.

### **5) Missed Work: In-class quizzes, take home assignments, online exercises**

Students are required to present their Dean's office with their reason for missing quizzes or assignments (see note 2, above), for reassignment of the value of the missed work, within 2 weeks, 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, assignments 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 interactive 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.

<http://www.westerncalendar.uwo.ca/2009/pg130.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/2009/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 21	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 Sept. 28.</i>
September 28	Lab1: Part B: Thin-Layer Chromatography and Column Chromatography: Extraction and Separation and Plant Pigments	Laboratory Report <i>Due: in class by Friday, Oct. 9</i>
October 5	<i>No organic labs</i>	Lab 1, part B due
October 12	<i>No organic labs</i>	
October 19	<i>No organic labs</i>	
<b>MIDTERM IN C2273 – FRIDAY, OCTOBER 23, 2007</b>		
October 26	Lab 2: Liquid-Liquid Extraction – Separation of Organic Acid, Organic Base and Neutral Components of a Mixture	Laboratory Report
November 2	Lab 2 continued: Recrystallization as a means of purification of organic solids	<i>Due: in class by Friday, Nov. 13</i>
November 9	<i>No organic labs</i>	Lab report 2 due
November 16	<i>No organic labs</i>	
November 23	Lab 3: Practical NMR and IR Spectroscopy and Mass Spectrometry	Laboratory Report
November 30	Lab 3: Continued	<i>Due: in class by Monday, Dec. 7</i>
<b>December 9 – LAST DAY OF CLASS</b>		

## Lecture Topic Outline (approximate timing)

- Week 1:** *Introduction and review of structure and bonding that we should know from Chem 020*
- 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

### Ace Online Assignment 1

- Weeks 2:** *Conformations of acyclic alkanes and constitutional/structural Isomerism*
- alkanes – bonding, conformations, Newman projections, dash-line-wedge-Fisher projections
  - constitutional isomerism
  - conformations of acyclic alkanes; torsional and steric strain; equilibrium ratios gauche, eclipsed, anti
- Conformations of cycloalkanes*
- 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

### Ace Online Assignment 2

- Weeks 3/4:** *Stereochemistry*
- 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
- Alkenes*
- Structure and bonding- pi bonds
  - Configurations, E/Z
  - Contributions to stereochemistry

### Ace Online Assignment 3 & 4

- Week 5/6:** *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

### Ace Online Assignment 5

- Week 7:** *Infrared-Spectroscopy (and Exam take-up)*
- background
  - the spectrum
  - IR absorptions
  - functional groups (and a detour to molecular interactions: ionic, Van der Waals, Dipole-dipole and hydrogen-bonding)

### Ace Online Assignment 6

**Week 8:** *Mass Spectrometry*

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

**Ace Online Assignment 7**

**Week 9:** *Nuclear Magnetic Spectroscopy*

- NMR background
- $^{13}\text{C}$  spectroscopy
- chemical shift

**Week 10:** *Nuclear Magnetic Spectroscopy*

- $^1\text{H}$  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 splitting only)
- putting all the spectroscopy together

**Ace Online Assignment 8 & 9**

**Week 11:** *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 12/13:** Fundamental Reactions Types

- $\text{S}_{\text{N}}1$ ,  $\text{S}_{\text{N}}2$ ,  $\text{E}1$ ,  $\text{E}2$

**Ace Online Assignment 10**