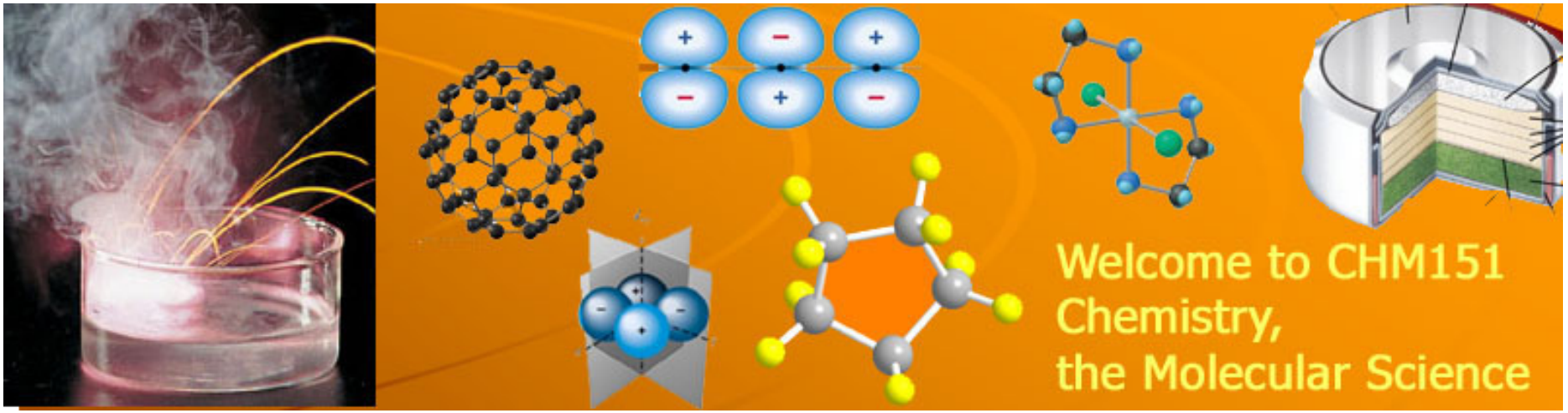


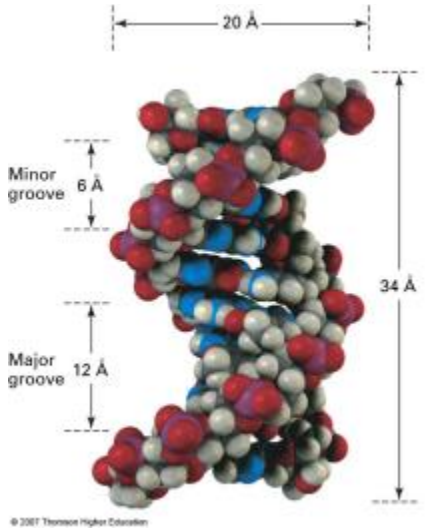
I. **Course Overview**
II. **Introduction to Instructors**
    Professor Mark Lautens (Organic)
    Professor Doug Stephan (Inorganic)
    Professor Al-Amin Dhirani (Physical)

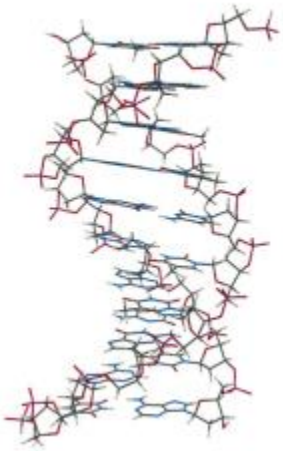
III. **Laboratory: Loise Perruchoud**
IV. **Course Community: Mark Croxall**
V. **Website:** https://portal.utoronto.ca/

CHM 151Y	CHM138H and CHM139H
Physical Science Programs Biological Chemistry Chemical Physics Chemistry Environmental Chemistry Materials Chemistry	**Life and Health Sciences** Biochemistry Human Biology Immunology Molecular Genetics Molecular Biology Pharmaceutical Chemistry Pharmacology and others

CHM151Y 2016–20167Section I: Organic Chemistry

Lecturer
Prof. Mark Lautens
Davenport Building 359
mlautens@chem.utoronto.ca
Office hours: generally M/W, 3–5P
or by appointment





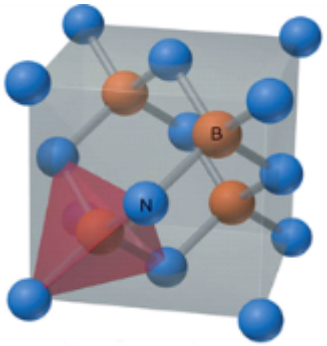
- **Structure and Bonding in Organic Compounds**
- **Conformational Analysis**
- **Organic Reactions and Reaction Mechanisms**
- **Stereochemistry**

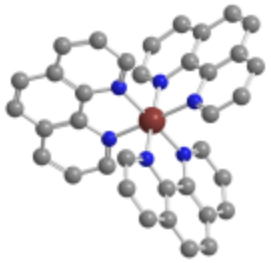
Chapters (or parts thereof) of the text (McMurry 9e):
1, 2, 3, 4, 5, 6, 7, 8, 10, 11

CHM151Y 2015–2016
Section II: Inorganic Chemistry

Lecturer
Prof. Doug Stephan
Davenport 465, 416-946-3294
dstephan@chem.utoronto.ca
Office hours: by appointment

Methods of molecular structure determination
Chapters (or parts thereof) of the text by McMurry: Chpts 12, 13
Chemistry of inorganic elements
with an introduction to the key features and applications of a variety of compounds and materials.
Chapters (or parts thereof) of the text by Silberberg: 9, 10, 11, 12, 14, 17, 18, 23





Section III. Physical Chemistry. Professor Al-Amin Dhirani

This section covers the physical chemical principles that underlie molecular structure, reactivity and energy, including the behaviour of statistical collections of molecules.

Chapters (or parts thereof) of the text by Silberberg that will be covered:

13 The Properties of Mixtures: Solutions and Colloids.

16 Kinetics: Rates and Mechanisms of Chemical Reactions.

19 Ionic Equilibria in Aqueous Systems .

20 Thermodynamics: Entropy, Free Energy, and the Direction of Chemical Reactions.

21 Electrochemistry: Chemical Change and Electrical Work

Textbooks

McMurry *Organic Chemistry* (9th Edition)

- A copy of the 8th Edition is also fine: a document listing the 8e problems corresponding to those from 9e will be posted on Blackboard
- We will start using this textbook so you should acquire a copy as soon as possible

Silberberg *Chemistry. The Molecular Nature of Matter and Change* (Canadian Ed., 6th Ed. or 5th Ed. All OK)

- We will not be using this textbook until the inorganic chemistry section (late Nov or early Dec)

Course Counseling

Mr. Armando Marquez (until December 31, 2017)
undergrd@chem.utoronto.ca
416-978-6484
Lash Miller Room 151

Course Community

What is it all about?

CC Director: Mark Croxall (mark.croxall@mail.utoronto.ca)

Mentors: Menandro Cruz (menandro.cruz@mail.utoronto.ca
Sarah Hill (sarah.hill@mail.utoronto.ca)
Sarah Mathers (sarah.mathers@mail.utoronto.ca)
Max Olson (max.olson@mail.utoronto.ca)
Bi-weekly meetings – alternating with lab / practicals

First session

- for P0101 on Monday Sept 25
- for P0201 on Tuesday Sept 19

Additional details will be provided shortly: schedule and group list will be posted on Blackboard, under “Course Community”

Quizzes during CC sessions: (5% of final grade: best 4 out of 5 from each term)
- latecomers will not be allowed to write the quiz / survey
- if you miss a quiz, please contact Mark Croxall immediately

https://portal.utoronto.ca

Staff Information

Course Information

Laboratory Information

Tutorials

Course Documents

Assignments

Course Community

Grading

Organic Term Test (Oct 16, 2017, noon–1P; Room TBD) 8%

Organic/Inorganic December Exam (Date TBA: during Dec 9–20 exam period) 20%

Inorganic/Physical Term Test (Date TBA) 8%

Laboratory (reports due during lab sessions) 25%

Quizzes (written during course community sessions) 5%

Final Exam (Date TBA: during April exam period) 34%

There are no make-up exams

CHM 151Y

LABORATORY INFORMATION

Purchase your CHM 151Y laboratory manual and other lab supplies well in advance of your **first chemistry lab.** Lab supplies can be obtained from a variety of sources, including from the Chemistry Club.

(i) laboratory manual

(ii) laboratory notebook

(iii) laboratory coat

(iv) safety goggles

(v) nitrile gloves (*not* latex)

U of T CHEM CLUB

CHEM CLUB STORE
2nd Floor LASH MILLER (LM203)
Inside the Chemistry Learning Centre

STORE HOURS

Sept. 6th – Sept. 8th 10:00 am – 2:00 pm

Sept. 11th 10:00 am – 5:00 pm

Sept. 12th – 15th 10:00 am – 4:00 pm

Sept. 18th – 22nd 10:00 am – 2:00 pm

Sept. 25th – 29th 12:00 pm – 2:00 pm

*****CASH ONLY*****

FALL TERM LABORATORY SCHEDULE

	Monday (Section P0101)		Tuesday (Section P0202)	
September	18	Experiment 1	19	
	25		26	Experiment 1
	2	Experiment 2	3	
October	9	Thanksgiving	10	Experiment 2
	16	Experiment 3	17	
	23		24	Experiment 3
	30	Experiment 4	31	
November	6	Reading week	7	Reading week
	13		14	Experiment 4
	20	Experiment 5	21	
	27		28	Experiment 5

Experiment 1: Computer lab (LM 121) and Safety training (LM117)

Note: you will not need safety goggles and lab coats for exp. 1. You will only need a notebook and laboratory manual

Experiment 2-5: LM117, Undergraduate chemistry lab

First Laboratory:

Computational Chemistry and Safety Training

Read the "Lab Guidelines" posted on Portal, identify your demonstrator group number, and then find your specific Exp. 1 schedule:

- **Experiment 1: Computational Chemistry**

Begins with a quiz at 2:00 p.m. ***or*** 3:30 p.m.

- **Safety Training:**

Begins at 3:00 p.m. ***or*** 3:30 p.m.

Check Portal for your demo number the day before your first lab to ensure that it has not changed!!

Preparing for the First Laboratory:

What is a Pre-Lab Exercise and Pre-Lab Quiz?

Pre-Lab Exercise:

- Experiment 1 pre-lab on page 59 of manual
- Required readings and activities that prepare you for the lab and the quiz

Pre-Lab Quiz:

- Short quiz (10 min) at the beginning of each lab
- 2-3 questions related to the pre-lab readings, procedure, and/or lab techniques.

CHM 151Y Information

Portal – "Laboratory information" tab

- Schedules, demo group information, announcements, etc.

Bulletin board in front of LM117

- Demo group list will be posted here

Lab coordinators

- Fall term: Dr. Perruchoud – loise.perruchoud@mail.utoronto.ca
  LM113 (Mon/Tues 3-5 pm on lab days)
- Winter term: TBA

Tutorial Information

Starts week of September 19

T0101	W13:00–14:00	SS1083
T0201	T10:00–11:00	MP137 (fall); SS1087 (winter)
T0301	F13:00–14:00	LM158

Tutor for organic chemistry section:
Nicolas Zeidan
nicolas.zeidan@mail.utoronto.ca

Use your tutorials to:
- Ask any questions about lecture material or problems;
- Practice doing problems

Need to switch tutorial sections: e-mail Prof. Lautens

Whom Should I Ask?

I missed a lab. What should I do?

- Lab coordinator (Dr. Perruchoud for the fall term).

Do I have course community this week?

- Your CC mentor or Mark Croxall.

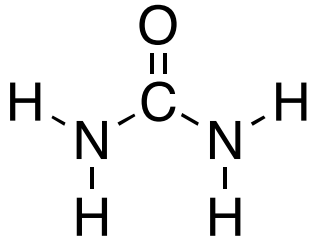
I have a question about the lecture material.

- Course instructor or TA (Mark Lautens for Sept-Nov).

What is Organic Chemistry?

Vitalism: Proposed that living organisms are composed of a form of matter endowed with a "vital force"
Postulated a fundamental difference between organic and inorganic compounds

Wöhler (1828): laboratory synthesis of urea



Current definition: Organic chemistry is the study of carbon compounds
Of the 37 million known chemical compounds, more than 99% contain carbon

What is Organic Chemistry?

What's special about carbon compounds?

H 2.1																He
Li 1.0	Be 1.6											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
Na 0.9	Mg 1.2											Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.9	Ni 1.9	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe
Cs 0.7	Ba 0.9	La 1.0	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.1	Rn

- Carbon forms covalent bonds with a wide diversity of elements

- Each carbon atom may form up to 4 covalent bonds

- Carbon is capable of "catenation" (can form long chains) and ring formation, generating diverse structures

- Carbon compounds show remarkable variation in structure:

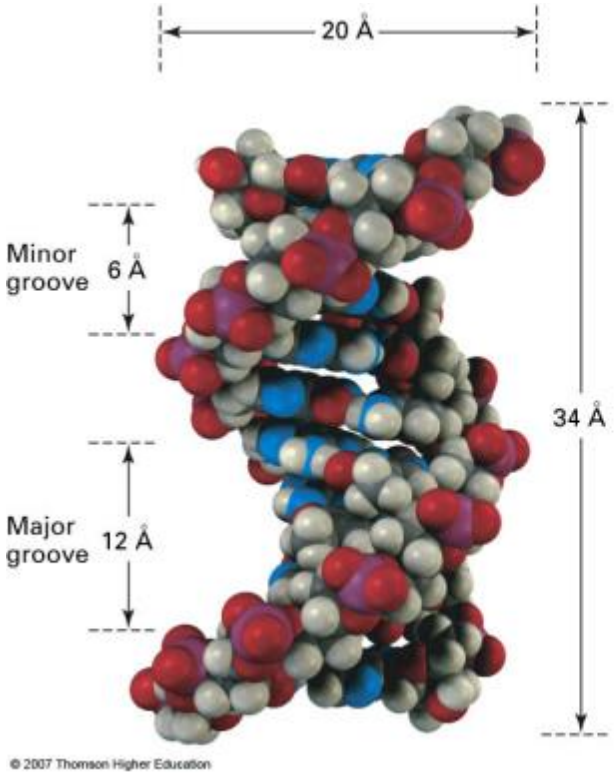
  may be flat or three-dimensional

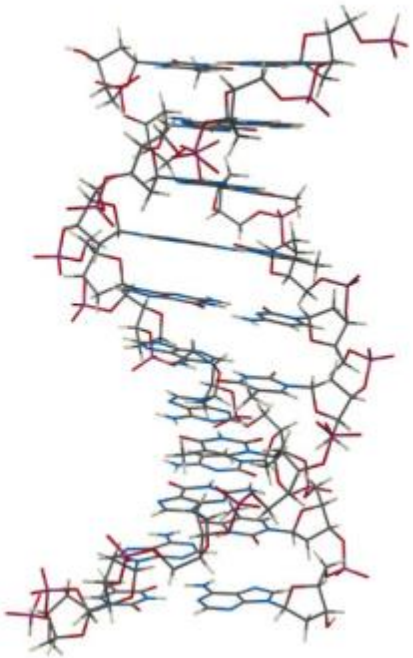
Structure → Function

Why Study Organic Chemistry?

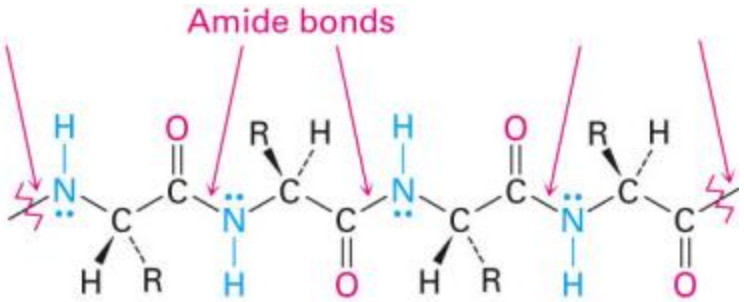
Developing a molecular-level understanding of biological processes requires knowledge of organic chemistry

DNA

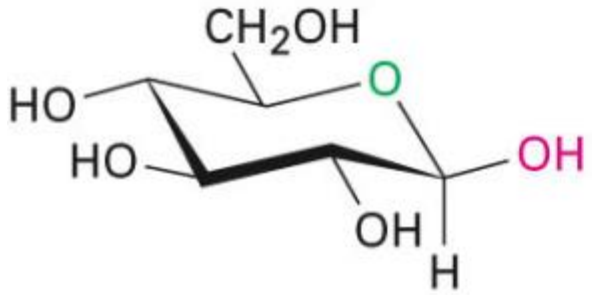




proteins

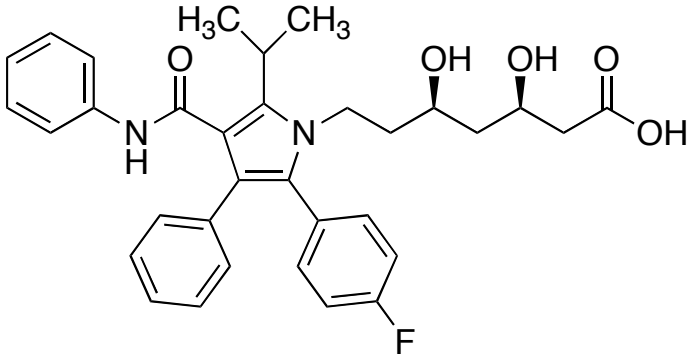


sugars

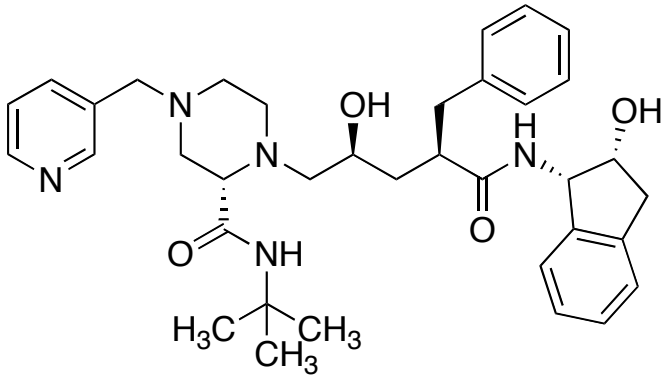


Why Study Organic Chemistry?

"La chimie crée son objet" (Berthelot, 1827–1907)

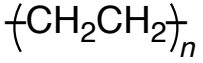


Lipitor™ (cholesterol-lowering agent)

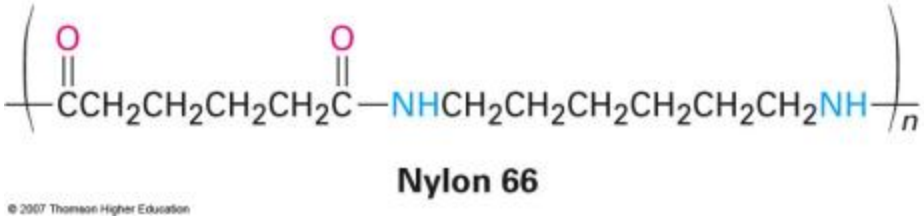


Crixivan™ (HIV protease inhibitor)

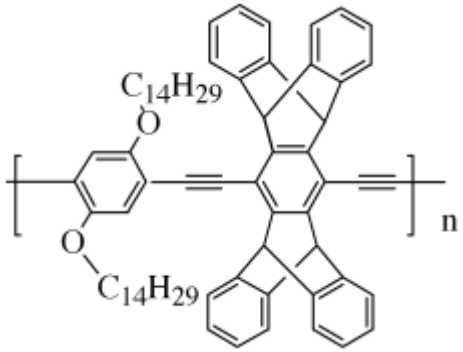
polymers and materials



poly(ethylene)



Nylon 66



fluorescent polymer for TNT detection

Organic Chemistry Section - Overview of Topics

Bonding and Structure

How do atoms come together to form bonds?

Can we make predictions about reactivity based on chemical structure?

Conformation and Stereochemistry

What are the shapes of organic molecules?

Reactions and Mechanisms

How do we prepare useful compounds from accessible starting materials?

How do these reactions take place?

Alkanes, Alkenes, and Alkyl Halides

McMurry 9e, Ch 1-8 and 10-11; see posted syllabus

How to Learn Science

‘Science is a way of thinking much more than it is a body of knowledge’

Carl Sagan

- **The scientific method (formulate, test and modify hypotheses)**

- Organic chemistry is not about memorizing a list of individual chemical reactions. We look for reactivity patterns (hypotheses) that are consistent with as many individual chemical transformations (experiments) as possible.

How to Study for CHM151 (Organic Chemistry Section)

Before Lecture:

Read the chapter in the text. Note topics that you find challenging.

During Lecture: Attend!

Listen and take notes. Note topics that are difficult / confusing. Write questions to ask your TA or me.

After Lecture (and before the next lecture):

Read over previous lecture's notes and relevant section from the text, making sure that you understand sections that were challenging.

Do the recommended problems!

How to Study for CHM151 (Organic Chemistry Section)

Learning organic chemistry requires that you be able to draw chemical structures.

The more time you spend **actively drawing structures** (taking notes in class, summarizing / tabulating reactions and mechanisms after class, doing problems), the better. Simply reading over your notes or looking at the solutions to problems is unlikely to be efficient.

This Week's Reading Assignment

- READ: **CHAPTER ONE**

Structure and Bonding

- Go through the 'worked examples' in the text as you read: once this material has been covered, please do the recommended problems