



## DEPARTMENT OF SCIENCE

### COURSE OUTLINE: CH2630 A3, Organic Chemistry II

**INSTRUCTOR:** Dr. John P. Sloan                      **PHONE:** 780-539-2004  
**OFFICE:** Office # J207                                      **E-MAIL:** jsloan@gprc.ab.ca

**OFFICE HOURS:** Mon & Wed 10:00 – 11:30 & 13:00 – 14:30; Thursday 14:30 – 16:00.

**PREREQUISITE(S)/COREQUISITE:** CH1610 or CH2610

#### REQUIRED TEXT/RESOURCE MATERIALS:

1. Solomons, T.W.G., and C.B. Fryhle, *Organic Chemistry*, 10th Edition, Wiley, 2011, including access to the WileyPlus web site at: <https://edugen.wiley.com/edugen/secure/index.uni>.
1. A Three Ring Binder to Hold: Sloan, J.P., *Organic Chemistry Experiments, Chemistry 2610/2630*, Grande Prairie Regional College, 2011/2012.
2. Molecular Models are highly recommended, namely: Molecular Model Set for Organic Chemistry, Prentice Hall.
3. The Study Guide and Solutions Manual is an optional item; namely:
  - 3.1 Fernandez, J.E., and Solomons, T.W.G., *Study Guide and Solutions Manual to Organic Chemistry*, 10th Edition, 2011;

Note: All required and supplementary books, molecular structure model sets, safety glasses, and lab coats are available at the College Bookstore. *Organic Chemistry Experiments*, by J.P. Sloan, will be given as hand outs in advance of each lab period. These are to be inserted in a three ring binder.

**CALENDAR DESCRIPTION:** CH 2630 3(3-1-3)UT 105 Hours Organic Chemistry II

Continuation of the study of structural and chemical properties of the basic functional groups of organic compounds including aromatic compounds, aldehydes, ketones, carboxylic acids and their derivatives and amines. Illustration of these functional groups in natural products such as carbohydrates, amino acids and proteins, nucleic acids and lipids and discussion of the application of spectroscopic methods for structure determination in simple organic molecules.

Prerequisites: CH1610 or CH 2610

Notes: Credit will be granted for only one of CH1630 or CH2630.

Engineering students who take this course will receive 4.5 credits of transfer to University of Alberta.

Transfer: UA, UC, UL, AU, AF, CU, CUC, KUC

**CREDIT/CONTACT HOURS:** CH 2630 3(3-1-3)UT 105 Hours Organic Chemistry II

**DELIVERY MODE(S):** Organic Chemistry II, consists of CH2630 A3, S1 & L1 and is delivered in Lecture, Tutorial and Laboratory Components.

**OBJECTIVES (OPTIONAL):** The objective of Organic Chemistry II is for students to become proficient in their understanding of the theory of Organic Chemistry as outlined in the Calendar Description and in this Course Outline.

**TRANSFERABILITY:**

**ALBERTA TRANSFER CREDIT**

(Ref: Alberta Council of Admissions and Transfers, 2011-2012)

GPRC:	CH 2610 (3)	CH 2630 (3)
U of Alberta:	CHEM 261 (3)	CHEM 263 (3) or AUCHE 252 (3)
U of Calgary:	CHEM 351 (3)	CHEM 353 (3)
U of Lethbridge:	CHEM 2500 (3)	CHEM 2600 (3)
Grant MacEwan U:		CHEM 263 (3)
Athabasca U:	CHEM 350 (3)	CHEM 360 (3)
Canadian UC:	CHEM 241 (4)	CHEM 242 (4)
Concordia UC:	CHEM 261 (3)	CHEM 263 (3)
King's UC:		CHEM 351 (3)

Also, the transfer guide listing is as follows:

- Athabasca University: CHEM 360 (3)
- Canadian University College: CHEM 242 (4)
- Concordia University College of Alberta: CH 263 (3)
- Grant MacEwan University: CHEM 263 (3)
- King's University College, The: CHEM 351 (3)
- University of Alberta: CHEM 263 (3) OR AUCHE 252 (3)
- University of Calgary: CHEM 353 (3)
- University of Lethbridge, The: CHEM 2600 (3)

## GRADING CRITERIA:

The Grades are based on the alpha grading system. The Registrar's Office will convert alpha grades to four-point equivalence for the calculation of grade point averages. Alpha grades, 4-point equivalence, and grade descriptors are as follows:

Alpha Grade	4-Point Equivalence	Percentage Guidelines	Descriptor
A <sup>+</sup>	4.0	90 – 100	Excellent
A	4.0	85 – 90	
A-	3.7	80 – 84	Very Good First Class Standing
B+	3.3	77 – 79	
B	3.0	73 – 76	Good
B-	2.7	70 – 72	
C+	2.3	67 – 69	Satisfactory
C	2.0	63 – 66	
C-	1.7	60 – 62	Poor*
D+	1.3	55 – 59	
D	1.0	50 – 54	Minimal Pass*
F	0.0	0 – 49	Failure
WF	0.0	0	Fail, withdraw after the deadline

\* Grades of D and D+ may not be acceptable to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institution to ensure transferability.

## EVALUATIONS:

Examination Schedule and Composition of the Final Grade:

1.	Midterm Exam # 1, Friday February 18 -----	20%
2.	Midterm Exam # 2, Friday March 23 -----	20%
2.	Final Exam to be scheduled between April 16 - 26 -----	35%
3.	Laboratory -----	20%
4.	Tutorial Grading Component -----	<u>5%</u>
		100%

Notes:

1. The Mid-Term Exams will be of 1.5 hours duration and the Final Exam will be of 3 hours duration.
2. Between 5 and 15% of exam content will be taken from a combination of weekly assignments, Wiley Plus, and questions in the organic chemistry textbook by Solomons and Fryhle.
3. A pass grade is essential for the Laboratory Component.
4. Problem solving and discussion sessions. Weekly assignments may be given in two formats, namely:
  1. Moodle posted assignments consisting of ten questions per assignment, and;
  2. On-line Wiley Plus tests prepared by the Instructor and marked electronically, with feedback to the students.
5. Assistance with assignments will be given upon request.

## STUDENT RESPONSIBILITIES:

Students are responsible for regular attendance in Lecture, Laboratory, and Tutorial Components of the Organic Chemistry II course. They are also responsible for submission of assignments and laboratory reports according to the course policy; and for attending the exams according to the Exam Schedule.

## STATEMENT ON PLAGIARISM AND CHEATING:

Refer to the Student Conduct section of the College Admission Guide at

<http://www.gprc.ab.ca/programs/calendar/> or the College Policy on Student Misconduct: Plagiarism and Cheating at [www.gprc.ab.ca/about/administration/policies/\\*\\*](http://www.gprc.ab.ca/about/administration/policies/**)

\*\*Note: all Academic and Administrative policies are available on the same page.

## **COURSE SCHEDULE AND TIMELINE:**

The Course Schedule consists of Lecture, Laboratory and Tutorial Components. A brief description of these components and the course schedule is as follows:

### **Lecture Component:**

A continuation of the study of the fundamental principles of the chemistry of carbon compounds as commenced in Chemistry 2610. The study is based on a reaction mechanism approach to the functional group chemistry of arenes, aldehydes, ketones, carboxylic acids, esters, amides, amino acids and carbohydrates. Topics include: structure and bonding; physical properties; acidity and basicity; conformations of molecules; stereochemistry; addition, elimination and substitution reactions; structure-reactivity relationships; aromaticity and aromatic substitution; and spectroscopic methods for structure determination.

A representative selection of molecules found in agricultural, biological, environmental, industrial, medical, and pharmaceutical applications of organic chemistry will be discussed, e.g., molecules found in agrochemicals, fibres, food additives, perfumes, polymers, and prescription drugs.

### **Laboratory Component:**

Techniques in organic chemistry; preparation of some organic compounds, and; methods of qualitative organic analysis.

### **Tutorial Component:**

Problem solving and discussion sessions with weekly problem sets. Regular assignments will be given and marked; and may include WileyPlus Interactive-On-Line, including on-line grading,

The Course Schedule is:

1. Lectures: Days, Time and Place: CH2630 A3 M,W 8:30 - 9:50 in J229
2. Laboratory Component: Day, Time and Place: CH2630 L1 W 14:30 - 17:20 in J116
3. Tutorial Component: Day, Time and Place: CH2630 S1 F 11:30 - 12:20 in J201
4. Office Hours: Individual and group assistance will normally be available in office J207 during regular college business hours outside of formal class lecture, laboratory and tutorial hours.

**TIMELINE:** The Timetable for CH 2630 A3, Organic Chemistry II, is as follows:

## **CH2630 A3, Organic Chemistry II: Schedule for Reading, Studying & Practice Problems**

References are to T.W.G. Solomons and C.B. Fryhle, Organic Chemistry, 10th Edition, Wiley, 2011.

### **WINTER SEMESTER**

#### **Weeks of Jan 5 & 9: SPECTROSCOPIC METHODS OF STRUCTURE DETERMINATION. NUCLEAR MAGNETIC RESONANCE (NMR) and MASS SPECTROSCOPY (MS):**

**Tools for Structure Determination. Read and Study Chapter 9.**

Problems/Page #'s:	In-Chapter	9.1 to 9.22
444	End of Chapter	9.23 to 9.47
455	Challenge Problems	9.48 to 9.53
456	Learning Group Problems	1 to 2

#### **Week of Jan 16: AROMATIC COMPOUNDS. Read and Study Chapter 14.**

Problems/Page #'s:	In-Chapter	14.1 to 14.15
665	End of Chapter	14.16 to 14.39
673	Challenge Problems	14.40 to 14.44
674	Learning Group Problems	1 to 5

#### **Weeks of Jan 23: REACTIONS OF AROMATIC COMPOUNDS. Read & Study Chapter 15.**

Problems/Page #	In-Chapter	15.1 to 15.23
721	End of Chapter	15.24 to 15.53
725	Challenge Problems	15.54 to 15.57
726	Learning Group Problems	1 to 3

#### **Week of Jan 30: ALDEHYDES AND KETONES I: NUCLEOPHILIC ADDITION TO THE CARBONYL GROUP. Read and Study Chapter 16.**

Problems/page #'s:	In-Chapter	16.1 to 16.18
766	End of Chapter	16.19 to 16.49
773	Challenge Problems	16.50 to 16.51
774	Learning Group Problems	a to f

#### **Weeks of Feb 6: ALDEHYDES AND KETONES II: ENOLS AND ENOLATES. Read & Study Chapter 17.**

Problems/page #'s:	In-Chapter	17.1 to 17.27
769	End of Chapter	17.28 to 17.44
774	Learning Group Problems.	

**Week of Feb 19 & 27: CARBOXYLIC ACIDS AND THEIR DERIVATIVES:  
NUCLEOPHILIC ADDITION-ELIMINATION AT THE ACYL CARBON.  
Read and Study Chapter 17.**

Problems/page #'s: In-Chapter 17.1 to 17.17  
822 End of Chapter 17.18 to 17.48  
829 Challenge Problems 17.49 to 17.54  
830 Learning Group Problems 1 to 4

**Week of Feb 20-24: No Classes: Family Day is Feb 20 and Winter Break is Feb 21 – 24.**

**Week of March 5: REACTIONS at the  $\alpha$ -CARBON of CARBONYL COMPOUNDS:  
ENOLS and ENOLATES. Read and Study Chapter 18.**

Problems/page #'s: In-Chapter 18.1 to 18.14  
859 End of Chapter 18.15 to 18.34  
865 Challenge Problem 18.35  
865 Learning Group Problems 1 to 2

**CONDENSATION and CONJUGATE ADDITION REACTIONS of  
CARBONYL COMPOUNDS: More Chemistry of Enolates. Read and Study  
Chapter 19.**

Problems/page #'s: In-Chapter 19.1 to 19.22  
899 End of Chapter 19.23 to 19.57  
907 Challenge Problem 19.58 to 19.60  
908 Learning Group Problems 1 to 2

**Week of March 12: AMINES. Read and Study Chapter 20.**

Problems/Page #'s: In-Chapter 20.1 to 20.18  
953 End of Chapter 20.19 to 20.49  
960 Challenge Problems 20.50 to 20.54  
962 Learning Group Problems 1 to 2

**Week of March 19: PHENOLS AND ARYL HALIDES: NUCLEOPHILIC AROMATIC  
SUBSTITUTION. Read and Study Chapter 21.  
Read Special Topics G between page 999 and 1000.**

Problems/Page #'s: In-Chapter 21.1 to 21.12  
991 End of Chapter 21.13 to 21.33  
995 Challenge Problems 21.34 to 21.43  
997 Learning Group Problems 1 to 2

**Week of March 26: CARBOHYDRATES AND LIPIDS (OPTIONAL). Read Chapters 22 & 23.**

Problems/Page #'s:	In-Chapter 22	22.1 to 22.19
1043	End of Chapter	22.20 to 21.42
1046	Challenge Problems	22.43 to 22.45
1047	Learning Group Problems	1 to 2

Problem/Page #'s:	In-Chapter 23	23.1 to 23.11
1079	End of Chapter	23.12 to 23.23
1082	Challenge Problems	22.24 to 22.25
1082	Learning Group Problems	1 to 4

**Week of April 2: AMINO ACIDS AND PROTEINS & NUCLEIC ACIDS AND PROTEIN SYNTHESIS (OPTIONAL).**

**Read Chapters 24 & 25: Amino Acids and Proteins & Nucleic Acids and Protein Synthesis**

Chapter 24

Problems/Page #'s:	In-Chapter	24.1 to 24.16
1129	End of Chapter	24.17 to 24.23
1130	Challenge Problem	24.24
1130	Learning Group Problems	1 to 2

Chapter 25

Problems/Page #'s:	In-Chapter	25.1 to 25.11
1162	End of Chapter	25.12 to 25.16
1164	Learning Group Problem	

**Week of April 9: Review Class, e.g. review of a Practice Final Exam.**

## CH2630 A3, Organic Chemistry II: Schedule for Reading, Studying and Practice Problems

References are to T.W.G. Solomons and C.B. Fryhle, Organic Chemistry, 9th Edition, Wiley, 2008.

### WINTER SEMESTER

**Weeks of Jan 5 & 9: SPECTROSCOPIC METHODS OF STRUCTURE DETERMINATION. NUCLEAR MAGNETIC RESONANCE (NMR) and MASS SPECTROSCOPY (MS): Tools for Structure Determination. Read and Study Chapter 9.**

Problems/Page #'s: In-Chapter 9.1 to 9.23  
420 End of Chapter 9.24 to 9.44  
425 Learning Group Problems.

**Week of Jan 16: AROMATIC COMPOUNDS. Read and Study Chapter 14.**

Problems/Page #'s: In-Chapter 14.1 to 14.16  
627 End of Chapter 14.17 to 14.39  
634 Learning Group Problems.

**Weeks of Jan 23: REACTIONS OF AROMATIC COMPOUNDS. Read and Study Chapter 15.**

Problems/Page # In-Chapter 15.1 to 15.25  
680 End of Chapter 15.26 to 15.56  
685 Learning Group Problems.

**Week of Jan 30: ALDEHYDES AND KETONES I: NUCLEOPHILIC ADDITION TO THE CARBONYL GROUP. Read and Study Chapter 16.**

Problems/page #'s: In-Chapter 16.1 to 16.18  
725 End of Chapter 16.19 to 16.46  
730 Learning Group Problems.

**Week of Feb 6 & 13: CARBOXYLIC ACIDS AND THEIR DERIVATIVES: NUCLEOPHILIC ADDITION-ELIMINATION AT THE ACYL CARBON. Read and Study Chapter 18, and Special Topic B.**

Problems/page #'s: In-Chapter 18.1 to 18.18  
821 End of Chapter 18.19 to 18.55  
829 Learning Group Problems.

**Week of Feb 20-24: No Classes: Family Day is Feb 20 and Winter Break is Feb 21 – 24.**

**Week of Feb 27: ALDEHYDES & KETONES II: ENOLS & ENOLATES. Read & Study Chapter 17.**

Problems/page #'s: In-Chapter 17.1 to 17.27  
769 End of Chapter 17.28 to 17.44  
774 Learning Group Problems.

**Week of March 5: SYNTHESIS AND REACTIONS OF  $\beta$ -DICARBONYL COMPOUNDS: MORE CHEMISTRY OF ENOLATE IONS. Read and Study Chapter 19, and Special Topics C and D.**

Problems/page #'s: In-Chapter 19.1 to 19.24;  
872 End of Chapter 19.25 to 19.51  
878 Learning Group Problems.

**Week of March 12: AMINES. Read and Study Chapter 2., and Special Topic E.**

Problems/Page #'s: In-Chapter 20.1 to 20.20;  
940 End of Chapter 20.21 to 20.53;  
947 Learning Group Problems;

**Week of March 19: PHENOLS AND ARYL HALIDES: NUCLEOPHILIC AROMATIC SUBSTITUTION. Read and Study Chapter 21. Read Special Topics F, G, and H, pages 992-1019.**

Problems/Page #'s: In-Chapter 21.1 to 21.12  
979 End of Chapter 21.13 to 21.38  
984 Learning Group Problems  
986 Second Review Problem Set 1 to 24.

**Week of March 26: CARBOHYDRATES AND LIPIDS (OPTIONAL). Read Chapters 22 & 23.**

Problems/Page #'s: In-Chapter 22 22.1 to 22.19  
1067 End of Chapter 22.20 to 21.45  
1071 Learning Group Problems  
Problem/Page #'s: In-Chapter 23 23.1 to 23.11  
1101 End of Chapter 23.12 to 23.26  
1107 Learning Group Problems.

**Week of April 2: AMINO ACIDS AND PROTEINS & NUCLEIC ACIDS AND PROTEIN SYNTHESIS (OPTIONAL). Read Chapters 24 & 25: Amino Acids and Proteins & Nucleic Acids and Protein Synthesis.**

Problems/Page #'s: In-Chapter 24.1 to 24.16  
1154 End of Chapter 24.17 to 24.27  
1157 Learning Group Problems  
Problems/Page #'s: In-Chapter 25.1 to 25.13  
1189 End of Chapter 25.14 to 25.16  
1191 Learning Group Problem

**Week of April 9: Review Class, e.g. review of a Practice Final Exam.**