



DEPARTMENT OF SCIENCE

COURSE OUTLINE: CH2630 A2, Organic Chemistry II

INSTRUCTOR: Dr. John P. Sloan **PHONE:** 780-539-2004
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OFFICE HOURS: Tues 10:00 – 11:00; Thurs 10:00 – 11:00 & 13:30 – 15:30; Fri 9:30 – 11:20

PREREQUISITE(S)/COREQUISITE: CH1610 or CH2610

REQUIRED TEXT/RESOURCE MATERIALS:

1. Solomons, T.W.G., C.B. Fryhle, S.A. Snyder, *Organic Chemistry*, 11th Edition, Wiley, 2014, 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, 2013/2014.
2. Molecular Models are highly recommended, namely: Molecular Model Set for Organic Chemistry, Prentice Hall.
3. The Study Guide and Solutions Manual (978-1-118-14790-0) is an optional item; namely:
 - 3.1 Antila, J., Johnson, R., Fryhle, C., Solomons, T.W.G., and S. A. Snyder, *Study Guide and Solutions Manual to Organic Chemistry*, 11th Edition, 2014;

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 to: University of Alberta; University of Calgary; University of Lethbridge; Athabasca University *; Augustana Faculty, University of Alberta; Concordia University College; Canadian University College; Grant MacEwan University; King's University College
* An asterisk (*) beside any transfer institution indicates important transfer information. Consult the Alberta Transfer Guide.

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

DELIVERY MODE(S): Organic Chemistry II, consists of CH2630 A2, S1 & L1 are delivered as 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, 2013-2014, updated August 2, 2013)

GPRC:	CH 2610 (3)	CH 2630 (3)
U of Alberta:	CHEM 261 (3) or AUCHE 250 (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 261 (3)	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 311 (3)	CHEM 351 (3)

** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability

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 ⁺	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	
D+	1.3	55 – 59	Poor*
D	1.0	50 – 54	Minimal Pass*
F	0.0	0 – 49	Failure
WF	0.0	0	Fail, withdraw after the deadline

EVALUATIONS:

Examination Schedule and Composition of the Final Grade:

1.	Midterm Exam # 1, Friday October 11 -----	15%
2.	Midterm Exam # 2, Thursday November 15 -----	20%
2.	Final Exam to be scheduled between December 13 – 20 -----	35%
3.	Laboratory -----	20%
4.	Tutorial Grading Component -----	10%
		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, and questions in the organic chemistry textbook by Solomons, Fryhle and Snyder.
3. A pass grade is essential for the Laboratory Component.
4. The Tutorial Grading Component will contribute to 10% of the final grade and will consist of nine assignments with ten questions per assignment.
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/**

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

COURSE SCHEDULE/TENTATIVE 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:

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. There will be nine assignments with each assignment consisting of ten questions.

COURSE SCHEDULE: The Course Schedule is:

1. Lectures: Days, Time and Place: CH2630 A2 T,R 8:30 - 9:50 in J204
2. Laboratory Component: Day, Time and Place: CH2630 L1 M 14:30 - 17:20 in J116
3. Tutorial Component: Day, Time and Place: CH2630 S1 F 11:30 - 12:20 in J204
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.

TENTATIVE TIMELINE:

The Tentative Timetable for CH 2630 A2, Organic Chemistry II, is as follows:

CH2630 A2, Organic Chemistry II:
Schedule for Reading, Studying and Practice Problems

References are to T.W.G. Solomons, C.B. Fryhle and S.A. Snyder, Organic Chemistry, **11th Edition, Wiley, 2014.**

FALL SEMESTER

Weeks of Sept 5 & 9 & 16: 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 9.21
444	End of Chapter	9.23 to 9.46
455	Challenge Problems	9.47 to 9.52
456	Learning Group Problems	1 to 2
Concept Map's:	455	¹ H NMR Spectroscopy.
	456	¹³ C NMR Spectroscopy.
	456	¹³ C NMR and ¹ H NMR Chemical Shift Ranges

Week of Sept 23: 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
666	Challenge Problems	14.40 to 14.44
666	Learning Group Problems	1 to 5

Concept Map: Aromatic Compounds.

Weeks of Sept 30 & Oct 7: Reactions of Aromatic Compounds.
Read and Study Chapter 15.

Problems/Page #	In-Chapter	15.1 to 15.21
713	End of Chapter	15.22 to 15.51
716	Challenge Problems	15.52 to 15.55
717	Learning Group Problems	1 to 3

Concept Map's:
718 Summary of Mechanisms -Electrophilic Aromatic Substitution.
719 Some Synthetic Connections of Benzene and Aryl Derivatives.

Week of Oct 14: Aldehydes and Ketones: Nucleophilic Addition to the Carbonyl Carbon.
Read and Study Chapter 16.

Problems/page #'s:	In-Chapter	16.1 to 16.21
759	End of Chapter	16.22 to 16.52

- 773 Challenge Problems 16.53 to 16.54
774 Learning Group Problems a to f.

Summary of Aldehyde and Ketone Addition Reactions: p 756, Section 16.15.

Summary of Mechanisms:

- 767 Acetals, Imines, and Enamines: Common Mechanistic Themes in
Their Acid-catalyzed Formation from Aldehydes and Ketones.
768-769 Nucleophilic Addition to Aldehydes and Ketones Under Basic Conditions.
770 Some Synthetic Connections of Aldehydes, Ketones, and Other Functional Groups.

Week of Oct 21 & 28: 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
813 End of Chapter 17.18 to 17.48
819 Challenge Problems 17.49 to 17.54
820 Learning Group Problems 1 to 4

Summary of Reactions of Carboxylic Acids and Their Derivatives, Page 809, Section 17.13.

Week of Nov 4: Reactions at the α -Carbon of Carbonyl Compounds: Enols and Enolates.
Read and Study Chapter 18.

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

Summary of Reactions of Enolate Chemistry, Page 847, Section 18.10.

857 Summary of Mechanisms: Enolates: α -Substitution.

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
887 End of Chapter 19.23 to 19.57
894 Challenge Problem 19.58 to 19.60
894 Learning Group Problems 1 to 2

884 Summary of Important Reactions, Page 884, Section 19.9.

896 Synthetic Connections: Some Synthetic Connections Involving Enolates.

895 857 Summary of Mechanisms: Enolate Reactions with Carbonyl Electrophiles.

Week of Nov 11: Amines. Read and Study Chapter 20.

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

932 Summary of Preparation and Reactions of Amines, Page 932, Section 20.13

Week of Nov 18: Phenols and Aryl Halides: Nucleophilic Aromatic Substitution.

Read and Study Chapter 21.

Read Special Topics G between page 978 and 979, Pages G-1 to G-16.

Carbon-Carbon Bond-Forming and Other Reactions of Transition Metal Organometallic Compounds.

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

978 Some Synthetic Connections of Phenols and Related Aromatic Compounds.

Week of Nov 25: Carbohydrates and Lipids (Optional). Read Chapters 22 & 23.

Problems/Page #'s:	In-Chapter 22	22.1 to 22.19
1021	End of Chapter	22.20 to 21.42
1024	Challenge Problems	22.43 to 22.45
1025	Learning Group Problems	1 to 2

1026 Summary and Review Tools: A Summary of Reactions Involving Monosaccharide's.

Problem/Page #'s:	In-Chapter 23	23.1 to 23.11
1055	End of Chapter	23.12 to 23.23
1058	Challenge Problems	22.24 to 22.25
1058	Learning Group Problems	1 to 4

Week of Dec 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
1103 End of Chapter 24.17 to 24.23
1104 Challenge Problem 24.24
1104 Learning Group Problems 1 to 2

Chapter 25

Problems/Page #'s: In-Chapter 25.1 to 25.11
1137 End of Chapter 25.12 to 25.16
1139 Learning Group Problem

Week of Dec 9: Review.

Note: This Reading Schedule is Based on the 10th Edition of the Textbook.

CH2630 A2, Organic Chemistry II:

Schedule for Reading, Studying and Practice Problems

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

FALL SEMESTER of September to December 2013.

Weeks of Sept 6 & 10 & 17: 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 Sept 17: 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 Sept 24 & Oct 1: REACTIONS OF AROMATIC COMPOUNDS.
Read and 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 Oct 8: 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 Oct 15: 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 Oct 22 & 29: 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 Nov 5: REACTIONS at the α -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 Nov 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 Nov 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 Nov 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 Dec 3: 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 Dec 10: Review.