COURSE OUTLINE

CHEM 210
Organic Chemistry I

3 CREDITS

PREPARED BY: Ernie Prokopchuk, PhD
DATE: August 13, 2020

APPROVED BY: Joel Cubley, Chair, School of Science
DATE: August 20, 2020

APPROVED BY SENATE: Click or tap to enter a date
RENEWED BY SENATE: Click or tap to enter a date

Division of Applied Science and Management
CHEM 210
Organic Chemistry I
3 Credits
Fall, 2020

CHEM 210 - Organic Chemistry I

INSTRUCTOR: Ernie Prokopchuk
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OFFICE HOURS: online on demand
CLASSROOM: online and A2803 (lab)
TIME: Thursday 6:00 – 7:30 pm (online)
Monday 5:30 – 8:30 (lab)
DATES: Sept 3 – Dec 8, 2020

COURSE DESCRIPTION

Students are introduced to fundamental concepts of structure and bonding in organic molecules, including stereochemistry and chirality while undertaking a systematic study of various classes of organic molecules including alkanes, alkenes, alkynes, haloalkanes, alcohols, ethers, and epoxides. The mechanisms of common reactions are covered with an emphasis on understanding how the movement of electrons is used to rationalize these processes. Students are also introduced to the design of organic syntheses. The mandatory labs introduce students to standard organic laboratory techniques while further illustrating concepts covered in class.

PREREQUISITES

CHEM 110 with a minimum grade of C. CHEM 111 is recommended.

Students are expected to come to this course with an understanding of concepts covered in CHEM 110 including atomic structure, electron configurations, molecular formulas, basic bonding theory (Lewis structure and hybridization), and intermolecular forces. Much of this material will be briefly reviewed in class.

RELATED COURSE REQUIREMENTS

For 2020 the lecture component of the course will be offered online. As such a computer or other suitable device is required, as is access to an internet connection.

EQUIVALENCY OR TRANSFERABILITY

See the website http://bctransferguide.ca/ for a complete list of transfers within British Columbia.
See the website http://alis.alberta.ca/ps/tsp/ta/tbi/onlinesearch.html for information on transfers within Alberta

LEARNING OUTCOMES

After completing this course, students will be able to

- provide the IUPAC name for organic molecules and provide the structure of a molecule based on its name
- recognize common classes of organic molecules and be familiar with their physical and chemical properties
- accurately predict the outcomes of common reactions involving saturated and unsaturated hydrocarbons, alcohols, ethers, and epoxides
- use electron arrows to describe reaction mechanisms for common reactions of saturated and unsaturated hydrocarbons, alcohols, ethers, and epoxides
- design multistep organic syntheses using reactions that students know
- carry out common organic laboratory procedures using common organic laboratory equipment

COURSE FORMAT

Lectures: Three hours per week*. *For 2020, this three hours is divided into 1.5 hours of synchronous online sessions, and the remaining 1.5 hours of content will be posted online as a form of asynchronous instruction.*
Labs: Three hours per week. * *For 2020, labs will be held face to face as usual.*

Course material is delivered through a mix of asynchronous modes, such as posted videos and readings, and synchronous methods, such as Zoom or other web conferencing platforms.

Material is regularly posted on Moodle, the course LMS. This material will include assignments, course announcements, links to content on LibreTexts (https://chem.libretexts.org/) and other online resources, suggested practice problems, an exact copy of everything written on the screen during class, and other useful or interesting material related to the course. Please be aware that any notifications generated by Moodle are sent to your Yukon University email address. It is essential that you regularly check this email account, or set it up to automatically forward to your preferred email account.

Class sessions are recorded and posted on the course website that can only be accessed by students enrolled in the course and a limited number of technical staff and faculty at the university. Occasionally some of these recordings may be used for training purposes. Usually student voices are not captured in the video, but if this is a concern, please let me know and we will take steps to address these concerns. Sessions done by Zoom may include people's voices and faces. Students will not be required to use video cameras if they do not wish to appear on screen. If there are any other concerns, please let me know and they will be addressed. Video recordings must not be a barrier for student participation.

Weekly in-person labs provide students with hands-on experience of standard laboratory techniques as well as providing examples of some of the reactions discussed in class. Lab expectations are outlined in the lab manual.

ASSESSMENTS:

Attendance
While lecture attendance is not graded, it is strongly recommended. There is a strong correlation between regular attendance and academic performance.

Assignments
There will be at least 5 assignments due on an approximately bi-weekly basis worth a total of 10% of the final grade. Assignments will consist of various questions or problems related to the course material. Students will have at least one week to complete each assignment. Late assignments will receive a mark of 0 after graded assignments have been returned to the class.

Tests and Examinations
There will be two term tests (October 1, 2020 and October 29, 2020) worth 15% each. The final examination is currently scheduled to occur in-person (9:00 – 12:00 on Wednesday, December 16, 2020) and is worth 30%. Any change to these dates or method of examination, will be communicated to the class as far in advance as possible.

Laboratory component
Labs will take place in-person in the chemistry lab (A2803) with COVID-19 safe-distancing protocols in effect. The labs are a mandatory component of the course. Unless excused by the instructor, absence from a lab will result in a mark of zero for that lab. In order to receive a passing grade in the lab, a student must attend lab sessions and complete the experiments. If a lab period is missed, the report cannot be submitted unless arrangements are made with the instructor. Expectations for the labs are detailed in the lab manual.

EVALUATION:

Assignments	10
Midterm Test 1	15
Midterm Test 2	15
Final Exam	30
Lab	30
Total	**100%**

REQUIRED TEXTBOOKS AND MATERIAL

As a step to making education more affordable, we will be using LibreTexts as our textbook. Traditional textbooks will be placed on reserve in the library.

The Laboratory Manual for Chemistry 210 will be provided.

ACADEMIC AND STUDENT CONDUCT

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the University.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon University recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon University program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukonu.ca/yfnccr.

ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, they should contact the Learning Assistance Centre (LAC): lac@yukonu.ca.

TOPIC OUTLINE

Week	Unit	Topic
1	1	**Review of fundamental concepts** - bonding - formal charges - resonance - polar bonds
2	2	**Functional groups** - haloalkanes - alcohols and phenols - ethers - amines - aldehydes & ketons - carboxylic acids, esters, amides - nitriles Physical properties and structure - intermolecular forces IR spectroscopy
3	3	**Acids and bases** - Bronsted acids/bases - acid base equilibria - structure and acidity - solvent and acidity - organic bases - Lewis acids/bases - carbocations and carbanions

4,5	4	**Alkanes and cycloalkanes** - nomenclature - properties - conformational analysis - ring stability - substituted cycloalkanes – cis/trans isomerism - polycyclic alkanes - reactions - halogenation and radical mechanisms - alkyl radicals
6, 7	5	**Stereochemistry** - chirality and entantiomers - biological importance - identifying/naming enantiomers - molecules with multiple chiral centres - Fischer projections - D and L designations for monosaccharides - resolution of enantiomers

8, 9	6	**Nucleophilic substitutions and elimination reactions**
		- alkyl halides
		- nucleophiles
		- leaving groups
		- SN2 reactions
		  - kinetics and mechanism
		  - stereochemistry
		- SN1 reactions
		  - mechanism
		  - stereochemistry
		- Elimination reactions of alkyl halides
		  - E2 reaction
		  - E1 reaction

10, 11	7	**Alkenes and Alkynes** - (E)/(Z) diastereomers - relative stabilities - synthesis of alkenes and alkynes - carbocation stability and rearrangements - terminal alkyne acidity - conversion of alkynes to nucleophiles - hydrogenation reactions - organic synthesis

		Electrophilic addition reactions - regiochemistry – Markovnikov's rule - stereochemistry of addition - alcohol formation - haloalkane formation - halohydrin formation carbenes oxidation and oxidative cleavage of alkenes and alkynes radical additions to alkenes
12	8	**Alcohols** - structure and nomenclature - properties - synthesis - from alkenes - from carbonyls - by reduction - reactions - conversion of alcohols to alkyl halides
13	9	**Ethers and Epoxides** - synthesis - reactions

**Specific dates of topic coverage may be subject to change. Some topics may not be covered depending on time constraints.*