



**COURSE OUTLINE**

**CHEM 110**

**THE STRUCTURE OF MATTER**

**45 HOURS  
3 CREDITS**

**PREPARED BY** Ernie Prokopchuk, Instructor **DATE:** April 28, 2016

**APPROVED BY:** Margaret Dumkee, Dean **DATE:** April 29, 2016

**APPROVED BY ACADEMIC COUNCIL**



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CHEM 110 THE STRUCTURE OF MATTER

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**INSTRUCTOR:** Ernie Prokopchuk, PhD

**OFFICE HOURS:** Wed. 10 am - 1 pm  
*\*Open door policy is in effect*

**OFFICE LOCATION:** A2513

**CLASSROOM:** A2603

**E-MAIL:** [eprokopchuk@yukoncollege.yk.ca](mailto:eprokopchuk@yukoncollege.yk.ca)

**TIME:** Tues & Thurs 10:00 - 11:59 (class)  
Mondays 1:00 - 4:00 (lab)

**TELEPHONE:** (867) 668-8865

**DATES:** Sept. 8 - Dec. 20, 2016

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### COURSE DESCRIPTION

This course covers both the common practical aspects of chemistry as well as the theoretical principles that describe this science. Topics of study include the structure of the atom, electron configuration, the nature of chemical bonding and a look at liquids, solids and gases at a molecular level. Other topics of study include reaction stoichiometry and an introduction to organic chemistry and biochemistry. Lab sessions illustrate and reinforce most of the topics presented in the lectures.

Successful completion of this course and its companion CHEM 111 will satisfy the requirement for 6 credits of first year chemistry in the science programs at most Canadian and US universities.

### PREREQUISITES

Chemistry 11 (CHEM 050). Chemistry 12 (CHEM 060) is strongly recommended.

Mathematics 12 (MATH 060) is co-requisite.

Students are expected to come to this course with an understanding of basic nomenclature (chemical naming and formula writing), stoichiometry (equation balancing and chemical calculations) and simple atomic structure. This material will be briefly reviewed during the first week of class. If you feel a bit rusty on these subjects you are strongly advised to see the instructor prior to the start of the course.

## EQUIVALENCY OR TRANSFERABILITY

Yukon College CHEM 110(3):

SFU	Chem 121 (3) - Q/B-Sci	UAF	Chem 105X (3)
UAS	Chem 105 (3)	URegina	Chem 102 (3)
UNBC	Chem 100(3) + Chem 120(1)	TRU	Chem 1100 (3)

Yukon College CHEM 110(3) + CHEM 111(3):

UVic Chem 101 (1.5 units) + Chem 102 (1.5 units)

UBC Chem 111(4) + Chem 113(4) - both UBC and UBCO

See the website <http://bctransferguide.ca/> for a more complete list of transfers within British Columbia.

See the website <http://alis.alberta.ca/ps/tsp/ta/tbi/onlineresearch.html> for information on transfers within Alberta.

On the strength of these transfer agreements the course will likely transfer to many other universities with which we do not maintain formal transfer agreements. For more information about transferability contact the Applied Science office.

## LEARNING OUTCOMES

Upon successful completion of this course, students will:

- be able to understand and apply fundamental chemistry concepts.
- have developed critical thinking skills.
- have developed basic laboratory skills.

## DELIVERY METHODS

Classes are a blend of lecture and tutorial allowing for an opportunity to practice solving calculation-based problems related to the material being covered in class.

Classes will be recorded with the intent to provide students with a way to revisit material covered in class. This may be helpful while studying or to review a topic covered in class. This will provide greater flexibility to students who are unable to make classes due to work commitments (or any other reason for absence that comes up).

Links to these videos will be posted online but the videos will only be viewable by people with the password which will only be provided to students enrolled in the class. Portions of the videos may be used for professional development purposes, meaning that they may be shown to staff and faculty within the College for the purposes of workshops and demonstrations, and possibly to instructors outside of the College as part of a conference presentation.

Most students in the class will not be visible on the videos, but voices may be heard during class discussions. Seats that are visible will be indicated on the first day of class.

Material is regularly posted on the course LMS, Moodle. This material will include links to lecture capture videos, assignments, course announcements, links to content on ChemWiki (<http://chemwiki.ucdavis.edu>), 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 College email address. It is essential that you regularly check this email account, or set it up to automatically forward to your preferred email account.

Labs are a mandatory component of the course. In order to receive a passing grade in the lab, a student must complete the experiments and submit the required reports. If a lab period is missed, the report for that experiment cannot be submitted unless arrangements are made with the instructor. Expectations for the labs are outlined in the lab manual.

## **COURSE FORMAT**

**Lectures:** Three hours per week.

**Labs:** Three hours per week.

**Tutorials:** One hour per week, incorporated into the lecture times.

## **ASSESSMENTS**

### **Attendance**

While 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 8 assignments due on an approximately weekly basis. Assignments as a whole are worth 10% of the final grade which is determined based on the total mark obtained on all assignments. Assignments will involve a number of questions or problems related to the course material. You will have at least one week to complete each assignment. Late assignments will be penalized 5% for each day late. Late assignments will not be accepted (receiving a mark of 0) once graded assignments have been returned to the class, which usually happens at the next class.

### **Tests and Examinations**

There will be two 60-minute term tests (October 6, 2016 and November 3, 2016) held during scheduled class time. Each test is worth 15% of the final grade. Please note that after the term tests the remaining class time will be used for a lesson. The final examination, worth 30% of the final grade, will take place during Final Exam period (Dec 7 - Dec 20). The exam date will be announced as soon as it is known.

## Laboratory component

As a whole, the laboratory component is worth 30% of the final grade. This will be based on lab performance (10%), pre-lab questions (10%), lab quizzes (5%), and lab reports (75%) The specific evaluation criteria for the lab are detailed in the lab manual.

## EVALUATION

Term test 1 (60 minutes)	15%
Term test 2 (60 minutes)	15%
Assignments	10%
Exam (3 hours)	30%
Laboratory	<u>30%</u>
<b>Total</b>	<b>100%</b>

Students must pass (get at least 50%) both the laboratory and the lecture component in order to pass the course.

## REQUIRED TEXTBOOKS AND MATERIALS

As a step to making education more affordable, we will be using ChemWiki as our textbook. Some copies of traditional textbooks will be placed on reserve in the library. If you wish to purchase a textbook for your own reference, I can suggest some good options.

The Laboratory Manual for Chemistry 110 will be provided.

## ACADEMIC AND STUDENT CONDUCT

Information on academic standing and student rights and responsibilities can be found in the Academic Regulations located in Appendix A of the College Academic Calendar: [https://www.yukoncollege.yk.ca/downloads/Yukon\\_College\\_2016-17\\_Academic\\_Calendar\\_and\\_Regulations.pdf](https://www.yukoncollege.yk.ca/downloads/Yukon_College_2016-17_Academic_Calendar_and_Regulations.pdf)

## PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Resubmitting a paper 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 College.

## YUKON FIRST NATIONS CORE COMPETENCY

Yukon College 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 College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see [www.yukoncollege.yk.ca/yfnccr](http://www.yukoncollege.yk.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 College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC) at (867) 668-8785 or [lassist@yukoncollege.yk.ca](mailto:lassist@yukoncollege.yk.ca).

## TOPIC OUTLINE

Week	Unit	Topic
0.5 1 2	1	Fundamental concepts (review) <ul style="list-style-type: none"><li>- Atoms, molecules, compounds, empirical formulas</li><li>- Measurements, moles, solution concentration and dilution</li><li>- Chemical equations, stoichiometry, yields</li></ul>
2 3	2	Behaviour of gases <ul style="list-style-type: none"><li>- Ideal gas law, gas mixtures, stoichiometry</li><li>- Molecular view of gases</li><li>- Molar mass determination, gas density, rates of movement</li><li>- Real gases</li><li>- Atmospheric chemistry</li></ul>
4	3	Atoms and light <ul style="list-style-type: none"><li>- Characteristics of atoms and light</li><li>- Absorption and emission spectra</li><li>- Properties of electrons, quantization and quantum numbers</li><li>- Shapes of atomic orbitals</li></ul>
5	4	Atomic energies and periodicity <ul style="list-style-type: none"><li>- Orbital energies</li><li>- Electron configurations</li><li>- Periodicity of atomic properties</li><li>- Ions and ionic compounds</li></ul>
6	5	Fundamentals of chemical bonding <ul style="list-style-type: none"><li>- Bond length, electron sharing, polarity</li><li>- Lewis structures and molecular shapes</li><li>- Covalent bond properties</li></ul>

7	6	Theories of chemical bonding - Localized models, hybridized orbitals, multiple bonds - Molecular orbital theory - Resonance, delocalized $\pi$ systems
8 9	7	Organic chemistry structures - hydrocarbon structures, nomenclature - aromatic compounds - alkyl halides, alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides, nitriles - stereochemistry
9 10	8	Organic chemistry reactions - nucleophiles, electrophiles, mechanisms - substitution reactions - elimination reactions - addition reactions
11	9 10	Band theory of solids Intermolecular forces - melting and boiling points - types of forces - properties of liquids - order in solids - phase changes
12 12.5	11	Properties of solutions - solubility - colligative properties - colloids, suspensions, surfactants

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