



School of Science
CHEM 110
Chemistry 110 - The Structure of Matter
Term: Fall 2022 (202201)
Number of Credits: 3

Course Outline

INSTRUCTOR: Kailey Wright

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OFFICE LOCATION: A2410

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.

COURSE REQUIREMENTS

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

Corequisite(s): Mathematics 12 (MATH 060)

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 NOT be reviewed. 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 University CHEM 110(3):

SFU Chem 121 (3) – Q/B-Sci

UAS Chem 105 (3)

UNBC Chem 100(3) + Chem 120(1)

UAF Chem 105X (3)

URegina Chem 102 (3)

TRU Chem 1100 (3)

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

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

UBC Chem 111(4) + Chem 123 (4)

Receiving institutions determine course transferability. Find further information at:

<https://www.yukonu.ca/admissions/transfer-credit>

LEARNING OUTCOMES

Upon successful completion of the course, students will:

- have further developed their critical thinking skills
- be able to discuss chemical concepts, theories, and examples of fundamental chemistry
- have developed basic hands-on laboratory skills in experimental investigation of chemical questions

COURSE FORMAT

Weekly breakdown of instructional hours

Lectures: 3 hours. Tutorials: 1 hour (incorporated into the lecture times). Labs: 3 hours. It is expected that this course will require 3-5 hours of homework, studying, report writing, and additional reading outside of these times. It is important to note that the time required will vary substantially by individual.

Delivery format

Lectures and Tutorial: This portion of the course will be delivered **in person** during the scheduled time. Material is regularly posted on Moodle, the course LMS. This material will include assignments, course announcements, links to content in the (free) online textbook, suggested practice problems, and other online resources or interesting material related to the course. Partial notes will be made available in advance of the lessons, and it is expected that students come to class prepared with any questions they may have about the material to be covered. If a student misses class they are expected to contact the instructor or their colleagues with questions about any material they have missed.

Laboratory: Three hours per week of face-to-face instruction, delivered in the Chemistry lab at Ayamdigut campus (A2803). Students will be expected to hand in a report after each laboratory session. More details are available in the Laboratory Manual, which will be provided at your first session.

EVALUATION

Assignments	15%
Test 1	15%
Test 2	15%
Final Exam	25%
Laboratory Work	30%
Total	100%

Students must receive a pass (50%) in BOTH the lecture and laboratory components in order to receive a pass in the course. Additionally, students must have attended, completed, and graded at least 75% of the laboratory work, regardless of circumstance. This ensures that a passing mark also reflects a competency on the bulk of the course material.

Assignments: There will be 10 assignments due on an approximately weekly basis. The best 8 out of 10 assignments will count toward the final grade. Assignments will involve a variety of questions or problems related to the course material. You will have at least one week to complete each assignment. Late assignments will not be accepted under any circumstances (receiving a mark of 0).

Tests and Examinations: There will be two 60-minute term tests held during scheduled class time. Each test is worth 15% of the final grade. The final exam, worth 25% of the final grade, will take place during the University's exam period. The final format, date, and venue 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.

COURSE WITHDRAWAL INFORMATION

Refer to the YukonU website for important dates.

TEXTBOOKS & LEARNING MATERIALS

As a step to making education more affordable, we will be using LibreText and BC Open Textbooks as our textbooks. Some copies of traditional textbooks will be placed on reserve in the library. All other resources on Moodle are provided digitally under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License and can be printed as you see fit. You will need access to a computer or other suitable device, as internet access is required for this course.

The Laboratory Manual for Chemistry 110 will be provided. You will need to provide your own notebook for use as a Lab Notebook. This must be a separate notebook, not the one you are using for course notes. More information will be provided in the first lab session.

Students will need to provide their own safety glasses. These MUST be clear (not tinted) and ANSI Z87.1 (or later) or CAS 94.1 (or later) certified; this information will be on the packaging. These are the same kind of safety glasses required in the Trades and can be purchased wherever such safety equipment is sold. Laboratory coats are mandatory, and students can purchase these online ahead of time, or from the campus bookstore. Masks must be worn at all times and should be brought with you. Ensure it is a mask that is comfortable for you to wear correctly for the full 3 hour lab session.

ACADEMIC INTEGRITY

Students are expected to contribute toward a positive and supportive environment and are required to conduct themselves in a responsible manner. Academic misconduct includes all forms of academic dishonesty such as cheating, plagiarism, fabrication, fraud, deceit, using the work of others without their permission, aiding other students in committing academic offences, misrepresenting academic assignments prepared by others as one's own, or any other forms of academic dishonesty including falsification of any information on any Yukon University document.

Please refer to Academic Regulations & Procedures for further details about academic standing and student rights and responsibilities.

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 by contacting the Learning Assistance Centre (LAC): LearningAssistanceCentre@yukonu.ca.

TOPIC OUTLINE (specific dates of topic coverage are subject to change)

Week	Unit	Topic
1 2	1	Fundamental Concepts (Review) - Atoms, molecules, compounds, empirical formulas - Measurements, moles, solution concentration and dilution - Chemical equations, stoichiometry, yields <i>Experiment - Physical Properties, Meaningful Measurements, and Chemical Reactions</i>
2 3	2	Atoms and Light - Absorption and emission spectra - Properties of electrons, quantization and quantum numbers - Shapes of atomic orbitals
4	3	Atomic Energies and Periodicity - Electron configurations - Periodicity of atomic properties - Ions and ionic compounds <i>Experiment – Recycling an Aluminum Can</i>
4 5	4	Fundamentals of Chemical Bonding - Bond length, electron sharing, polarity - Lewis structures and molecular shapes - Covalent bond properties <i>Experiment - Analysis of Cations in a Water Sample</i>
6	5	Theories of Chemical Bonding - Localized models, hybridized orbitals, multiple bonds - Molecular orbital theory - Resonance, delocalized π systems <i>Experiment – Shapes of Molecules (Dry Lab)</i>
7	6	Organic Chemistry Structures - Hydrocarbon structures, nomenclature, stereochemistry
8 9	7	Organic Chemistry Reactions - Nucleophiles, electrophiles, mechanisms - Substitution, elimination, and addition reactions <i>Experiment - Synthesis of Aspirin and Oil of Wintergreen</i>
10 11	8	Behaviour of Gases - Ideal gas law, gas mixtures, stoichiometry - Molecular view of gases - Molar mass determination, gas density, rates of movement - Real gases <i>Experiment - The Atomic Mass of a Metal</i>
12 13	11	Properties of Solutions and solids - Intermolecular forces - Some properties of liquids and solids - Colligative properties - Colloids, suspensions, surfactants <i>Experiment – Biosorbants for Removal of Metal Ions from Water (2 weeks)</i>