

DIVISION OF APPLIED SCIENCE AND MANAGEMENT

CHEM 111

Chemical Energetics and Dynamics

3 Credits

Winter, 2021



COURSE OUTLINE

CHEM 111 CHEMICAL ENERGETICS AND DYNAMICS

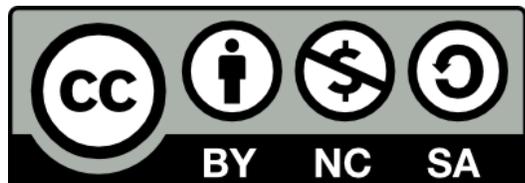
3 CREDITS

PREPARED BY: Kailey Wright, Instructor

DATE: October 17, 2020

APPROVED BY: Joel Cubley, Chair, School of Science

DATE: November 6, 2020



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CHEM 111 - Chemical Energetics and Dynamics

INSTRUCTOR: Kailey Wright

OFFICE LOCATION: A2410

E-MAIL: kwright@yukonu.ca

DATES: January 4 - April 28, 2021

OFFICE HOURS: Virtual, by appointment

CLASSROOM: TBD

TIME: Lectures: MW (10 - 12)

Lab: T (2:30-5:30)

COURSE DESCRIPTION

This course is a continuation of the study of the fundamental principles of chemistry with an emphasis physical chemistry. Topics of study include chemical equilibrium, acid/base chemistry, chemical kinetics, nuclear chemistry, thermodynamics, and electrochemistry. The course also includes some descriptive chemistry of a selection of main group elements and transition metals. The mandatory laboratory component of the course will illustrate and reinforce most topics presented in the lectures.

Successful completion of this course and its companion CHEM 110 will satisfy the requirement for 6 credits of first year chemistry in the science and engineering degree programs at most Canadian and US universities.

PREREQUISITES

Chemistry 110, or permission of the instructor. Students are expected to come to this course with an understanding of the topics covered in Chemistry 110 as many of these basic concepts will serve as the foundation for this course.

RELATED COURSE REQUIREMENTS

This course is being offered as a primarily asynchronous online course with a face-to-face lab component. This course will necessitate access to a computer with internet access and some word processing software (can be open source or otherwise).

EQUIVALENCY OR TRANSFERABILITY

Yukon University CHEM 111(3):

SFU Chem 122 (2) - Q + Chem 126 (1) - Q

TRU Chem 1200 (3)

UNBC Chem 101 (3) + Chem 121 (1)

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)

UBCO Chem 111 (4) + Chem 123 (4)

LEARNING OUTCOMES

Upon successful completion of this course, students will:

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

COURSE FORMAT

Lectures: Three hours per week.

Labs: Three hours per week.

Tutorials: One hour per week.

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.

Material is regularly posted on the course LMS, Moodle. This material will include links to assignments, course announcements, links to content on LibreTexts (<https://chem.libretexts.org/>), suggested practice problems, 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.

Labs are a mandatory component of the course. In order to receive a passing grade in the lab, a student must complete 70% of 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. More than one unexcused absence from a lab will normally result in a failing grade for the lab. Expectations for the labs are outlined in the lab manual.

ASSESSMENTS:

Participation - This will require your continued participation (and completion) in the weekly activities on Moodle. Completion of the weekly checklists must be completed before Sunday at 11pm. The lessons must be completed before the last day of class.

Assignments - There will be *at least* 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 lab time. Each test is worth 15% of the final grade. The final exam, worth 20% of the final grade, will take place in April. 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%), and lab reports (80%). The specific evaluation criteria for the lab are detailed in the lab manual. Laboratory Reports handed in late will be assessed a penalty of 25% per day, and no report will be accepted more than two calendar days late.

EVALUATION:

Assignments	15%
Test 1	15%
Test 2	15%
Laboratory Component	30%
Participation	5%
Final Exam	20%
Total	100%

To receive a passing grade, students must receive at least 50% in both the laboratory and the lecture component of this course.

REQUIRED TEXTBOOKS AND MATERIAL

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 under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

The Lab Manual will be provided as loose leaf pages, and should be placed in a binder. You will need to provide your own notebook for use as a Lab Notebook. You must also provide your own safety glasses (these must be ANSI Z87.1/CSA Z94.3 approved).

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	Chemical Equilibria - equilibrium condition, equilibrium constant, applications, Le Chatelier's Principle
2, 3	2	Acid-Base Equilibria - definitions, strength, pH, polyprotic acids, ionic acids and bases, Lewis acids and bases
3 - 5	3	Applications of Aqueous Equilibria - buffers, titrations and pH curves, solubility, complexation
6	4	Chemical Kinetics - rates, rate laws, reaction mechanism, catalysis
7, 8	5	Thermochemistry - energy, thermodynamics, enthalpy, Hess' Law enthalpies, energy sources. Bond energy. Phase changes.
9, 10	6	Spontaneity, Entropy and Free Energy - spontaneous processes, 2 nd law of thermodynamics, entropy changes in reaction, free energy and reactions. Thermodynamics and equilibrium
11, 12	7	Electron-transfer Reactions - balancing redox reactions, galvanic cells, standard reduction potentials, cell potential, applications
12, 13	8	Descriptive main group chemistry

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