



## CHEM-202 – Organic Chemistry 2

University Arts and Science

**Effective Term & Year:** Fall 2022  
**Course Outline Review Date:** 2028-09-01

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**Program Area:** Math and Sciences

**Description:**

CHEM 202 is a continuation of CHEM 201 involving the structure and reactions of the more complex aliphatic, aromatic, and heterocyclic systems including an introduction to natural product chemistry and industrially important organic compounds. The laboratory stresses synthetic methods and some analytical procedures.

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**Program Information:**

CHEM 201 and CHEM 202 can also be used as components of an Associate of Arts (AA) or an Associate of Science (ASc) degree at COTR.

This course is designed for students seeking a degree or diploma in a field of science or technology. It could also be suitable as an elective course for General Interest or Arts students who have previously completed CHEM 101, CHEM 102 and CHEM 201.

**Delivery Methods:** On-campus (Face-to-Face)

**Credit Type:** College of the Rockies Credits

**Credits:** 3

**Course type/s:** Lab Sciences, Sciences

**Instructional Activity and Hours:**

| Activity | Hours |
|----------|-------|
|----------|-------|

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|---|-----|
| Classroom, Directed Studies or Online Instruction | 45  |
| Seminar/Tutorials                                 |     |
| Laboratory/Studio                                 | 60  |
| Practicum/Field Experience                        |     |
| Co-op/Work Experience                             |     |
| Other   |     |
| Total   | 105 |

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**Course Requisites:**

- Completed the following:
  - CHEM201 – Organic Chemistry 1 (3)

**Flexible Assessment:** Yes

In some cases students may be able to apply for recognition of prior learning outside the classroom. This flexible assessment process provides equivalent course credit. It is a rigorous process that may include external evaluation, worksite assessment, demonstration, standardized test, self-assessment, interview, products/portfolio, and challenge exam, or other measures as appropriate. Tuition fees apply. Contact an education advisor for more information.

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**Course Transfer Credit:**

For information about receiving transfer credit for courses taken at either British Columbia or Alberta institutions, please see <https://www.bctransferguide.ca/> or <https://transferalberta.alberta.ca> . For more transfer credit information, please visit <https://www.cotr.bc.ca/Transfer>

All requests for course transfer credit from institutions in British Columbia or elsewhere should go to the College of the Rockies Enrolment Services office.

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**Textbook Resources:**

Textbook selection varies by instructor and may change from year to year. At the Course Outline Effective Date the following textbooks were in use:

J. McMurry, *Organic Chemistry*, 9th edition, Brooks/Cole.

*Course Manual for Chemistry 202*

Reference material and recommended equipment:

*Molecular Model Set for Organic Chemistry*. Allyn and Bacon.

Please see the instructor's syllabus or check COTR's online text calculator <https://textbook.cotr.bc.ca/> for a complete list of the currently required textbooks.

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### Learning Outcomes:

Upon the successful completion of this course, students will be able to:

- Apply the formal rules of IUPAC (International Union of Pure and Applied Chemistry) nomenclature and stereochemical designators to name a wide variety of organic and biochemical compounds.
- By applying theory and a knowledge of structure, determine whether a species is aromatic or not and predict whether that species is likely to undergo substitution- or addition reactions.
- Display a thorough understanding of the mechanisms of both electrophilic and nucleophilic aromatic substitution reactions and apply this knowledge to the prediction of reaction feasibility and product identities.
- Predict the products of a variety of addition, substitution and condensation reactions involving aldehydes, ketones, amines, carboxylic acids and their derivatives using a knowledge of the properties of the carbonyl group and the associated reaction mechanisms.
- Apply previously learned principles of organic chemistry to the understanding of chemical and physical properties of complex polycyclic and heterocyclic compounds.
- Discuss the biological roles of the nucleic acids, carbohydrates, amino acids, proteins and lipids.
- Using an understanding of organic chemistry principles and a detailed knowledge of the structures of various types of biomolecules, predict the physical and chemical properties of these molecules.
- Apply a knowledge of nuclear magnetic resonance (NMR) spectroscopy to predict the structure of molecules based on their one- and two-dimensional spectra.
- Perform complex problem solving involving a large number of interconnected steps.
- Work with potentially hazardous chemicals in a safe and prudent manner.
- Recognize and efficiently use typical organic chemistry laboratory equipment without instructor assistance.
- Operate delicate and expensive equipment in a confident and careful manner.
- Accurately record and organize information obtained through experimentation so that you or others may utilize the information in the future.
- Summarize the results of laboratory activities in a clear, accurate and professional manner.
- Working independently and without instructor assistance, determine unambiguously the identity of an organic compound from a large number of possibilities by subjecting the

compound to extensive physical and chemical testing.

- Recognize the importance of natural sources for many organic chemicals and design procedures to obtain and purify certain chemicals from natural and synthetic sources.

**Note:** This course places heavy emphasis on the application and integration of chemical knowledge, which should assist you in developing effective problem solving skills for application in other science courses and in your future career.

This course should help students:

- Use written and oral communication skills effectively, employing methods appropriate to message and content.
- Think clearly and critically, fusing experience, knowledge and reasoning into considered judgment.
- Identify, interpret and solve problems, effectively implementing and evaluating proposed strategies.
- Set goals and priorities in academic and personal life.
- Set high performance standards.
- Demonstrate initiative, motivation, and persistence to get the job done.
- Comprehend and interpret detailed scientific and/or technical information from text.
- Search for information in professional literature.
- Critically evaluate information for accuracy, relevance and importance.
- Make generalizations (transfer knowledge and training to new situations).
- Apply a variety of mathematical techniques with the degree of accuracy required to solve problems and make decisions.
- Transfer the use of mathematical strategies from one situation to another.
- Work effectively with others in a laboratory situation.
- Receive, comprehend and interpret a sequence of instructions.
- Plan and efficiently perform a number of overlapping activities.
- Use equipment requiring careful procedures.
- Draw reasonable conclusions from observations.
- Visualize abstract concepts.
- Perform mental manipulations in 3 dimensions.
- Display confidence in a high level of subject mastery, thus enabling you to apply this mastery in new situations.

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### Course Topics:

- Aromaticity, benzene and substituted benzenes
- Aldehydes and ketones
- Enolates and carbanions (aldol condensation)
- Carboxylic acids
- Derivatives of carboxylic acids

- Amines
- Polycyclic and heterocyclic aromatic compounds, nucleic acids
- Carbohydrates
- Amino acids and proteins
- Lipids and related natural products
- N.M.R. spectroscopy

## Evaluation and Assessments

### Assessment Type: On-Campus (face-to-face)

| Assessment Type       | % of Total Grade |
|-----------------------|------------------|
| Assignments           | 5%               |
| Midterm Tests         | 40%              |
| Final Examination     | 30%              |
| Laboratory Reports    | 17%              |
| Laboratory Test       | 5%               |
| Quizzes & Assignments | 3%               |
| Total                 | 100%             |

### Grade Scheme

| A+   | A     | A-    | B+    | B     | B-    | C+    | C     | C-    | D     | F   |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| >=90 | 89-85 | 84-80 | 79-76 | 75-72 | 71-68 | 67-64 | 63-60 | 59-55 | 54-50 | <50 |

**Pass requirements:** A passing average (50% or higher) in both the theory and practical components.

**Evaluation Notes:** A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses.

### Evaluation Notes Comments:

Note: Attendance at all laboratory sessions and exams is required. However, arrangements can be made for documented illness or bereavement. Lecture attendance is strongly recommended and students are responsible for all course material covered in lecture and assigned readings.

### Exam Attendance:

Students must attend all scheduled exams at the appointed time and place. Instructors may approve an alternate exam to accommodate an illness or personal crisis. Department heads will consider other written requests. Any student who misses a scheduled exam without prior approval will receive a "0" on the exam.

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### Academic Policies:

College of the Rockies policies related to courses can be found at <https://cotr.bc.ca/about-us/college-policies/> and include the following:

- Policy 2.4.3 Students with Documented Disabilities
  - Policy 2.4.4 Student Conduct (plagiarism, other cheating, behavioral misconduct)
  - Policy 2.5.8 Academic Performance
  - Policy 2.5.3 Grade Appeal
  - Policy 2.4.9 Student Concerns Re Faculty
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### Course Changes:

The College of the Rockies updates course outlines regularly to meet changing educational, employment and marketing needs. The instructor will notify students in writing of any updates to this outline during the semester. The instructor reserves the right to revise, add or delete material while meeting the learning outcomes of this course outline.