



## CHEM-080 – Chemistry – Advanced Level

### College Preparation and Upgrading

**Effective Term & Year:** Fall 2024

**Course Outline Review Date:** 2029-03-01

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**Program Area:** Upgrading for Academic and Career Entry

#### Description:

This course is an introduction to the science of chemistry including systems of measurement, atomic and molecular structure, the mole, the periodic table, chemical equations, the descriptive chemistry of oxygen, hydrogen and carbon and organic chemistry.

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#### Program Information:

This course is at the ABE Advanced Level and is equivalent to Chemistry 11. It can be used for entrance to the Bachelor of Nursing program and can be used to meet the science requirement for the Certified Dental Assistant program.

**Delivery Methods:** On-campus (Face-to-Face), Directed/Guided Studies

**Credit Type:** ABE Credits

**Credits:** 0

#### Instructional Activity and Hours:

Activity	Hours
Classroom, Directed Studies or Online Instruction	45 for face-to-face students, 88.5 for directed studies students
Seminar/Tutorials	
Laboratory/Studio	45 for face-to-face students, 24 for directed studies students

Practicum/Field Experience	
Co-op/Work Experience	
Other	22.5 – Guided Practice for face-to-face students
Total	112.5

**Course Requisites:**

- Complete 1 of the following
  - Completed or concurrently enrolled in at least 1 of the following:
    - [MATH080](#) – Mathematics – Advanced Level
    - [MATH082](#) – Mathematics, Advanced Level (Developmental Mathematics)
  - Completed or concurrently enrolled in one of Foundation of Math 11, Pre-Calculus 11, Workplace Math 11 or equivalent

**Flexible Assessment:** Yes

Students are able to request formal recognition of their prior learning or experience outside the classroom. Challenge examination, portfolio-assisted assessment, or work-based assessment are used to identify, assess, and recognize prior skills, competencies, and knowledge to achieve course credit. Tuition fees apply, refer to Policy [2.5.5 Prior Learning Assessment and Recognition \(PLAR\)](#) or contact an education advisor for more information.

**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.

**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:

Flowers, Neth, Robinson et al (2019) *Chemistry: Atoms First 2e*, Openstax, 978-1-947172-63-0

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:

College of the Rockies Chemistry 080 is articulated as Advanced Chemistry in the Adult Basic Education system (ABE) in British Columbia and Yukon.

ABE Advanced Chemistry is considered equivalent to Chemistry 11 by the British Columbia Ministry of Education.

All Chemistry 080 – Advanced Chemistry learning outcomes follow those outlined in the current edition of Adult Basic Education: A Guide to Upgrading in British Columbia's Public Post-Secondary Institutions – An Articulation Handbook.

<https://www.bctransferguide.ca/transfer-options/adult-basic-education/past-abe-guides/> (2023-2024 ABE Articulation Guide).

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

- obtain the prerequisite body of knowledge and skills that will provide a basis for further academic and career/vocational education and training;
- demonstrate an awareness of chemistry in everyday life;
- Integrate traditional knowledge focusing on local First People's Content;
- demonstrate an awareness of chemistry in solutions to environmental challenges;
- apply the scientific method to investigate phenomena;
- communicate effectively using the language of chemistry;
- carry out all duties in an ethical, professional manner, including the collection and treatment of data;
- work independently and also as part of a team, where appropriate; and
- handle equipment and chemicals in a safe and effective manner with regard to personal safety and the safety of others.

A minimum of eight labs will be completed covering the core concepts.

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## Course Topics:

### A. Measurement

- Demonstrate the concepts of precision and accuracy and how they differ, utilizing significant figures
- Perform calculations using scientific notation

- Perform conversions with the SI system

## B. Properties of Substances

- Differentiate between the phases of matter
- Identify chemical or physical properties of substances
- Describe early atomic theory and related laws

## C. Periodic Trends

- Use the periodic table to determine atomic composition of isotopes
- Use the periodic table to predict electron arrangement of chemical families in order to predict trends in ion charge, reactivity, ionization energy, electronegativity, atomic radii and ionic radii

## D. Atomic Structure

- Analyze the historical development of atomic theory
- Describe the Bohr and Wave Mechanical model of the atom and cite evidence for these models including absorption and emission spectra and their use in modern technology

## E. Mole Concept

- Define a mole and its significance
- Perform calculations including molar and formula mass, mole to mass conversions, and percent composition by mass of compounds

## F. Bonding

- Define covalent and ionic bonding
- Construct the formulas of compounds
- Use electronegativity to predict bond types
- Draw Lewis structures, predict molecular shapes, and determine polarity

## G. Nomenclature

- Write names for compounds given the formulae and write formulae for compounds given the names for the following types of compounds:
  - Covalent compounds
  - Ionic compounds
  - Compounds containing polyatomic ions
  - Compounds containing transition metals
  - Acids

## H. Chemical Reactions

- Balance equations
- Classify and predict single and double replacement reactions, combustion reactions and acid-base neutralizations

- Classify synthesis, decomposition, exothermic and endothermic reactions
- Perform stoichiometric calculations including mass-to-mass, limiting reagent, and percent yield

## I. Solutions

- Predict solubility and conductivity of polar and non-polar compounds
- Define Arrhenius acids and bases
- Relate the pH scale to acids and bases
- Perform calculations involving dilutions
- Perform stoichiometric calculations involving solutions including titrations

## J. Organic Chemistry

- Classify substances as organic
- Differentiate the various types of bonding between carbon atoms
- Write names and draw structures of hydrocarbons
- Categorize organic compounds based on their functional groups

Options may include additional organic chemistry, nuclear chemistry, gas laws, and environmental ethics.

## Laboratories

Chemistry laboratories are an essential component of the study of chemistry. During laboratories, students reinforce theory through practice. Laboratories develop skills in safety, procedures, techniques, data collection, analysis, and communication.

All chemistry courses must include a minimum of eight labs covering the core concepts, wherein chemistry learners will:

- List the safety and protective equipment available in a laboratory setting
- Demonstrate the appropriate procedures and techniques for dealing with particular hazards and hazardous materials
- Follow instructions and procedures
- Handle appropriate equipment for measuring mass, volume, and temperature
- Prepare solutions
- Perform titrations
- Collect and record data effectively
- Analyze and interpret data
- Communicate results and conclusions

Laboratory learning is an essential component of the study of chemistry, a minimum of 8 labs will be completed to cover the core concepts in both face-to-face and directed study formats.

See instructor's *syllabus* for the detailed outline of weekly readings, activities and assignments.

## Evaluation and Assessments

### Assessment Type: Directed/Guided Studies

Assessment Type	% of Total Grade
Assignments, Quizzes	15%
Lab Reports and Lab Exam	25%
Midterms	30%
Final Exam	30%
Total	100%

### Grade Scheme

A+	A	A-	B+	B	B-	C+	C	C-	D	F
>=95	94-90	89-85	84-80	79-75	74-70	69-65	64-60	59-55	54-50	<50

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

### Evaluation Notes Comments:

Note: A minimum grade of 60% on the laboratory section of the course is required. A minimum average of 50% is required on the Midterms and the Final Examination in order to pass CHEM 080.

Please see the instructor syllabus for specific classroom policies related to this course, such as details of evaluation, penalties for late assignments, and use of electronic aids.

### 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.

### 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 2.1.4 Course Audit
  - Policy 2.4.1 Credential Framework
  - Policy 2.4.3 Students with Documented Disabilities
  - Policy 2.4.4 Student Rights, Responsibilities and Conduct
  - Policy 2.4.8 Academic Performance
  - Policy 2.4.9 Student Feedback and Concerns
  - Policy 2.4.11 Storage of Academic Works
  - Policy 2.5.3 Student Appeal
  - Policy 2.5.5 Prior Learning Assessment and Recognition (PLAR)
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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.