



Chemistry – Advanced Level - CHEM 080

Upgrading for Academic and Career Entry

Course Outline

COURSE IMPLEMENTATION DATE: Pre 1998
OUTLINE EFFECTIVE DATE: September 2024
COURSE OUTLINE REVIEW DATE: March 2029

GENERAL COURSE 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.

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: This course is delivered face-to-face and directed studies.

Hours for this course: 112.5 hours

Typical Structure of Instructional Hours for Face-To-Face:

Instructional Activity	Duration
Lecture Hours	45
Seminars / Tutorials	
Laboratory / Studio Hours	45
Practicum / Field Experience Hours	
Other Contact Hours	22.5
Total	112.5

Typical Structure of Instructional Hours for Directed Studies:

Instructional Activity	Duration
In Class Directed Study	88.5
Laboratory / Studio Hours	24
Other Contact Hours	
Total	112.5

Other Contact Hours:

- Guided Practice

Course Outline Author or Contact:

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Signature**APPROVAL SIGNATURES:**

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Department Head Signature

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EDCO

Valid from: September 2024 –March 2029

Education Council Approval Date**COURSE PREREQUISITES AND TRANSFER CREDIT:**

Prerequisites: MATH 080 or MATH 082, or one of Foundation of Math 11, Pre-Calculus 11, Workplace Math 11 or equivalent may be taken previously or concurrently.

Flexible Assessment (FA):

Credit can be awarded for this course through FA

 Yes No

Learners may request formal recognition for flexible assessment at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio, Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit <http://www.cotr.bc.ca/Transfer>.

Students should also contact an academic advisor at the institution where they want transfer credit.

Prior Course Number: N/A

Textbooks and Required 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.

LEARNING OUTCOMES:

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.

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

Option

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

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).

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 ASSESSMENT:

Assignments	% Of Total Grade
Assignments, Quizzes	15%
Lab Reports and Lab Exam	25%
Midterms	30%
Final Exam	<u>30%</u>
Total	100%

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.

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.

EXAM POLICY:

Students must attend all required scheduled exams that make up a final grade at the appointed time and place.

Individual instructors may accommodate for illness or personal crisis. Additional accommodation will not be made unless a written request is sent to and approved by the appropriate Department Head prior to the scheduled exam.

Any student who misses a scheduled exam without approval will be given a grade of "0" for the exam.

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark (Percent)	≥ 95	94-90	89-85	84-80	79-75	74-70	69-65	64-60	59-55	54-50	< 50

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

ACADEMIC POLICIES:

See www.cotr.bc.ca/policies for general college policies related to course activities, including grade appeals, cheating and plagiarism.

COURSE CHANGES:

Information contained in course outlines is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational, employment, and marketing needs. The instructor will endeavor to provide notice of changes to students as soon as possible. The instructor reserves the right to add or delete material from courses.