## Chemistry

### Freshman Year

#### Fall Semester
- Math 1371 Calculus I (placement into course, or pre-req)
- Phys 1301W Intro Physics I (placement into course, 1013 & 1065)
- Chem 1065 Chem Princ I Lab (1061)
- Chem 1061 Chem Princ I (placement into course, 1013, &1065)
- CSE 1001 1st Yr Experience
- Liberal Education course or Writ 1301

#### Spring Semester
- Math 1372 Calculus II (1371)
- Phys 1302W Intro Physics II (1301, & Math 1372)
- Chem 1066 Chem Princ II Lab (1061/1065, &1062)
- Chem 1062 Chem Princ II (1061/1065, &1066)
- Writ 1301

### Sophomore Year

#### Fall Semester
- Math 2374 Multivariable Calc (1372)
- Chem 2301 Organic Chem I (1062/66)
- Chem 2101 Intro An Chem (1062/66, &2301)
- Chem 2111 Intro An Chem Lab (12301)
- Liberal Education course

#### Spring Semester
- Math 2373 Lin Alg/Diff Eq (1372)
- Chem 2302 Organic Chem II (2301)
- Chem 2311 Org Chem Lab (12302)
- Liberal Education course

### Junior Year

#### Fall Semester
- Chem 4502 Quantum Mech (1062/66, & Math 2374 or &2373, Phys 1302)
- Advanced Technical Lab Elective
- Advanced Lab Elective
- Liberal Education course
- Open Elective (if needed to reach 120 credits)

#### Spring Semester
- Chem 4501 Intro to Thermo (1062/66, Phys 1302, & Math 2374)
- Advanced Technical Elective
- Liberal Education course
- Open Elective (if needed to reach 120 credits)
- Open Elective (if needed to reach 120 credits)

### Senior Year

#### Fall Semester
- Chem 4701 Inorganic Chem (2311, &4501 or &4502)
- Advanced Lab Elective
- Open Elective (if needed to reach 120 credits)
- Open Elective (if needed to reach 120 credits)
- Open Elective (if needed to reach 120 credits)

#### Spring Semester
- Advanced Lab Elective
- Advanced Chem Lec Elective
- Open Elective
- Open Elective
- Open Elective

### About This Plan
- This plan is not a contract. Curriculum can change. The APAS is the official method for tracking completion of University degree requirements.
- Shaded courses are only offered in the indicated semester.
- Course pre-requisites and co-requisites (designated by &) are listed below the course number and title. Upper Division (UD) requires admission to the major prior to enrollment.
- Students can take either the CSE-only or University-wide versions of the math course (Math 1371/1271, 1372/1272, 2373/2243, 2374/2263).

### Applying to your Major
Students who have completed the required courses for admission to this major (indicated with double boxes on plan) and have a 3.2 UM-TC technical GPA at the end of the fall semester will be guaranteed admission. All other students who have completed the required courses will be considered for admission on a space-available basis. Admission following the spring semester is only based on space availability. The major application database is available at z.umn.edu/csemajorapp.

### University Degree Requirements
All students must complete the following Writing & Liberal Education requirements, as noted on their APAS report. See link for full Core & Theme names: z.umn.edu/liberaleducation

### Department Contact Information
- Website: http://www.chem.umn.edu/undergrad/
- Main Phone: 612-624-6000
- Main Office: 139 Smith Hall
- Director of Undergraduate Studies: Professor David Blank
- Departmental Advisor: Stephanie Stathopoulos; stephs@umn.edu

### Writing Requirements:
- **University Writing:**
  - Writ 1301/1401 or equivalent
- **Writing Intensive (WI):**
  - Two: 1xxx or 2xxx level
  - One: 3/4/5xxx level (in major)
  - One: 3/4/5xxx level (any dept.)*
  - Requirements with an (*) will be fulfilled by taking courses at UM-TC required for this major.

### Liberal Education

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<td>Bio</td>
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**Total Credits Needed for Degree: 120**
What can I do with a major in... Chemistry?

**ACTIVITIES CHEMISTRY MAJORS DO:**

Many chemists and materials scientists work in research and development (R&D). In basic research, they investigate properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances. In applied R&D, they create new products and processes or improve existing ones, often using knowledge gained from basic research. R&D chemists and materials scientists use computers and a wide variety of sophisticated labora-tory instrumentation for modeling and simulation in their work. Chemical research has led to the discovery and develop-ment of new and improved synthetic fibers, paints, adhesives, drugs, cosmetics, electronic components, lubricants, and thousands of other products. Chemists and materials scientists also develop processes that save energy and reduce pollu-tion, such as improved oil refining and petrochemical processing methods. Research on the chemistry of living things spurs advances in medicine, agriculture, food processing, and other fields.

Chemists also work in production and quality control in chemical manufacturing plants. They prepare instructions for plant workers that specify ingredients, mixing times, and temperatures for each stage in the process. They also monitor automat-ed processes to ensure proper product yield, and test samples of raw materials or finished products to make certain that they meet industry and government standards, including the regulations governing pollution. Chemists report and document test results and analyze those results in hopes of further improving existing theories or developing new test methods.

A bachelor’s degree in chemistry is a minimum educational requirement (research assistant, analyst); however, many research jobs require a master’s degree or Ph.D. (teaching, applied research). According to the U.S. Department of Labor, chemists primarily work in manufacturing firms, research and development, engineering, education, sales, pharmaceuticals, and biotechnology.

**INDUSTRIES CHEMISTRY MAJORS WORK IN (SAMPLE LISTING):**

- Pharmaceuticals
- Petroleum
- Biotechnology
- Packaging
- Higher education
- Federal government
- Healthcare
- Industrial products
- Water treatment
- Food production
- Consulting
- Manufacturing

**EMPLOYERS WHO HIRE CHEMISTRY MAJORS (SAMPLE LISTING):**

- Cargill
- 3M
- Xcel Energy
- ALLETE/MN Power
- Land O’Lakes
- Bell Pharmaceuticals
- The Dow Chemical Company
- Ecolab
- Seagate Technology
- Virent Energy Systems
- ExxonMobil
- Intel Corporation
- U.S. Department of Agriculture
- NAVAIR Weapons Division
- Target Corporation
- Brady Corporation
- Schlumberger
- Oak Ridge Laboratory
- HB Fuller Company
- Thermotech Inc.
- BASF
- Pace Analytical Services
- OptiMetrics Inc.
- Applied Materials Inc.
- Beckman Coulter
- Cargill
- Flint Hills Resources
- General Mills

**TYPES OF POSITIONS FOR CHEMISTRY MAJORS (SAMPLE LISTING):**

- **General chemist:** Deals with the basic functions of chemistry. This can include atomic structure, chemical bonding, states of matter, and the nature of solutions.

- **Analytical chemist:** Analyze and troubleshoot the exact composition of substances and the purity of raw materials and finished projects. They may monitor air and water pollution as well as food and drug purity (pharmaceuticals).

- **Toxicologist:** Plans and carries out laboratory and field studies to identify, monitor, and evaluate the impact of toxic materials and radiation on human and animal health, the environment, and the impact of future technology.

- **Polymer Chemist:** Deals with the nature and structure of polymers. A typical application of polymer chemistry might be the synthesis of materials for industrial or commercial applications.