The department is recognized by the American Chemical Society and offers a BS major that is approved by that organization. Anyone considering a chemistry or biochemistry major or chemistry minor should choose a departmental faculty member as an advisor and consult that advisor often throughout the course of study.

Admission to Major. Admission to a program is necessary before enrolling in 300- and 400-level courses. Admission is granted by the department. To be eligible for admission to the chemistry program, a student must have declared Chemistry or Chemistry Teaching as a first major, completed 32 credits including CHEM 201 and CHEM 202 and achieved a minimum GPA of 2.0. Students should also have an assigned chemistry advisor with whom they have discussed the program. Applications for admission to the chemistry program are available in the department office.

POLICIES/INFORMATION

GPA Policy. Students obtaining a major or minor in chemistry must maintain an overall GPA of 2.2 in all courses required for their selected program with no more than 4 credits of "D" work in chemistry courses.

P/N Grading Policy. Courses leading to a major or minor in chemistry or biochemistry may not be taken on a P/N basis except where P/N grading is mandatory.

The first year of coursework for all chemistry and biochemistry majors should include two semesters of chemistry (CHEM 201, CHEM 202) and two semesters of mathematics (selection of courses depends on mathematics background). During the second year, the recommended courses include organic chemistry, advanced mathematics, physics, analytical chemistry. It is important for BS chemistry majors that the calculus and physics sequences be completed by the end of the second year since they are prerequisites for physical chemistry. Physical chemistry and instrumental analysis should be taken during the third year. The advanced courses in chemistry and biochemistry can be taken in the junior and senior years. Participation in chemistry seminar is required of all majors. The coursework in mathematics and physics that is required for a major may be credited toward a major or minors in these areas. For this reason it is often desirable and convenient to choose a joint major or minor with physics or mathematics.

Transfer students who are considering one of the Chemistry BS options should note that before taking Physical Chemistry in the third (junior) year, students must successfully complete with a grade of "C" (2.0) or higher an Analytical Chemistry course in addition to appropriate mathematics and physics courses either here at Minnesota State Mankato or transferable to Minnesota State Mankato. Completion of an Associate's degree may not meet the Physical Chemistry prerequisites and may add up to one year to the program of study.

CHEMISTRY BA

Required General Education (8 credits)

MATH 121 Calculus I (4)
PHYS 211 Principles of Physics I (4) OR
PHYS 221 General Physics I (4)

Required Support Courses (4 credits)
PHYS 212 Principles of Physics II (4) OR

Required for Major (Core 31 credits)

CHEM 201 General Chemistry I (5)
CHEM 202 General Chemistry II (5)
CHEM 305 Analytical Chemistry (4)
CHEM 312 Intermediate Inorganic (2)
CHEM 320 Organic Chemistry I (with lab) (5)
CHEM 321 Organic Chemistry II (3)
CHEM 331 Organic Chemistry II Lab (1)
CHEM 381 Introduction to Research (2)
CHEM 440 Physical Chemistry (3)
CHEM 495 Senior Seminar (1)

Required Electives for Major (Chemistry, 6 credits)

Choose a minimum of 6 credits from chemistry or biochemistry courses EXCEPT CHEM 479 and CHEM 482. These electives must include at least one of the following courses:

CHEM 360 CHEM 407 CHEM 415 CHEM 423
CHEM 424 CHEM 437 CHEM 450 CHEM 451
CHEM 465 CHEM 466 CHEM 474 CHEM 475
CHEM 300/400 Elective
CHEM 300/400 Elective

Required for Bachelor of Arts (BA) degree ONLY: Language (8 credits)

CHEMISTRY BS

Required Minor: Yes. Any but Chemistry.

CHEMISTRY BS

OPTION I

Option I is for students who want a rigorous preparation in chemistry, but who do not need as comprehensive a program as that prescribed for the A.C.S. option.

Required General Education (8 credits)

MATH 121 Calculus I (4)
PHYS 221 General Physics I (4)

Required Support Courses (8 credits)

MATH 122 Calculus II (4)
PHYS 223 General Physics III (3)
PHYS 233 General Physics III Laboratory (1)

Required for Major (41 credits)

CHEM 201 General Chemistry I (5)
CHEM 202 General Chemistry II (5)
CHEM 305 Analytical Chemistry (4)
CHEM 320 Organic Chemistry I (with lab) (5)
CHEM 321 Organic Chemistry II (3)
CHEM 331 Organic Chemistry II Lab (1)
CHEM 381 Introduction to Research (2)
CHEM 413 Advanced Inorganic Chemistry (3)
CHEM 423 Chemical and Spectroscopic Determination of Structure (4)
CHEM 440 Physical Chemistry I (3)
CHEM 441 Physical Chemistry II (3)
CHEM 450 Physical Chemistry Laboratory I (1)
CHEM 451 Physical Chemistry Laboratory II (1)
CHEM 495 Senior Seminar (1)

Required Electives for Major (Chemistry, 4 credits)

Choose a minimum of 4 credits from Chemistry or Biochemistry courses EXCEPT CHEM 479 and CHEM 482:

CHEM XXX 300/400 Elective
CHEM XXX 300/400 Elective
Required Minor: None

OPTION II: A.C.S. APPROVED (72 credits)
The BS Chemistry, A.C.S. option approved by the American Chemical Society is intended for professional chemists and provides an excellent preparation for graduate or professional school, industry or business. Any deviations from this program requires prior approval from the department.

Required General Education (8 credits)
MATH 121 Calculus I (4)
PHYS 221 General Physics I (4)

Required Support Courses (8 credits)
MATH 122 Calculus II (4)
PHYS 223 General Physics III (3)
PHYS 233 General Physics III Lab (1)

Required for Major (Core 50-51 credits)
CHEM 201 General Chemistry I (5)
CHEM 202 General Chemistry II (5)
CHEM 305 Analytical Chemistry (4)
CHEM 320 Organic Chemistry I (with lab) (5)
CHEM 321 Organic Chemistry II (3)
CHEM 331 Organic Chemistry II Lab (1)
CHEM 381 Introduction to Research (2)
CHEM 413 Advanced Inorganic Chemistry (3)
CHEM 415 Inorganic Preparations (2)
CHEM 423 Chemical and Spectroscopic Determination of Structure (4)
CHEM 440 Physical Chemistry I (3)
CHEM 441 Physical Chemistry II (3)
CHEM 450 Physical Chemistry I Lab (1)
CHEM 451 Physical Chemistry II Lab (1)
CHEM 475 Instrumental Analysis (4)
CHEM 495 Senior Seminar (1)
CHEM 360 Principles of Biochemistry (4) OR
CHEM 460 Biochemistry I (3)

Required Electives for Major (Chemistry, 1 credit)
Students opting for CHEM 460 must choose at least 1 credit from the following:
CHEM 407 CHEM 360 CHEM 424 CHEM 434 CHEM 461
CHEM 465 CHEM 474 CHEM 485 CHEM 496 CHEM 497
CHEM 498 CHEM 499

Required Electives (3-4 credits)
Choose a minimum of 3 credits from the following courses:
PHYS 441 PHYS 447 PHYS 453 PHYS 473 MATH 321
MATH 455

Required Minor: None.

CHEMISTRY MINOR

Required for Minor (Core 22 credits)
CHEM 201 General Chemistry I (5)
CHEM 202 General Chemistry II (5)
CHEM 305 Analytical Chemistry (4)
CHEM 320 Organic Chemistry I (with lab) (5)
CHEM 321 Organic Chemistry II (3)

Required Electives for Minor (CHEM, 3 credits)
Choose a minimum of 3 credits from Chemistry or Biochemistry courses except CHEM 381, CHEM 479, CHEM 482 and CHEM 495.
CHEM XXX 300/400 Elective
CHEM XXX 300/400 Elective

These elective credits must be taken at Minnesota State Mankato for the minor.

CHEMISTRY TEACHING BS
Requirements for the Chemistry Teaching BS can be found in the SCIENCE TEACHING section of the bulletin. For information, consult the chemistry education advisor, Jeffrey Pribyl.

COURSE DESCRIPTIONS

CHEM 100 (4) Chemistry in Society
This lecture and laboratory course investigates the world of chemistry, the nature of matter and our interactions with chemicals on a daily basis. Lab included. This course is intended for non-science majors and is not a preparation for CHEM 111 or CHEM 201.
Fall, Spring
GE-3

CHEM 104 (3) Introduction to Chemistry
This course is an introduction to general chemistry. It is a non-laboratory class designed to prepare students for CHEM 201 or to be utilized as a general education course. This course will address more mathematical relationships than CHEM 106.
GE-3

CHEM 106 (3) Introduction to Chemistry (for Allied Health)
This course is an introduction to general and organic chemistry. This is a non-laboratory class designed to prepare students for CHEM 111 or to be utilized as a general education course.
GE-3

CHEM 111 (5) Chemistry of Life Processes
This course is an introduction to organic chemistry and biological chemistry for students in nursing, dental hygiene, dietetics, and athletic training. The laboratory will reinforce lecture concepts.
Pre: CHEM 106 or High School Chemistry
Fall, Spring
GE-2, GE-3

CHEM 131 (3) Forensic Science
This chemistry course explores the scientific methods used in criminal investigations. Course topics will include discussions of different kinds of evidence, how to select and analyze samples, and especially how to interpret results of scientific tests. Specific topics will include the analysis of DNA, drugs, Accelerants and explosives, and other organic and inorganic compounds. Case studies will be used as examples throughout the course. There will also be discussions concerning the ethics analysis, and uses of forensic data.
Variable
GE-3, GE-9

CHEM 132 (3) Chemistry of Energy
This course explores and evaluates energy sources from a chemical perspective. In addition to discussion of chemical processes associated with traditional energy sources such as fossil fuels, alternative sources such as solar energy and “next generation” batteries will be presented. In conjunction with this information the environmental and societal consequences for each alternative will be explored. Variable
GE-3

CHEM 133 (3) Challenges to Our Global Environment
This course will examine two of the most significant environmental challenges facing modern society: stratospheric ozone depletion and global climate change, from an interdisciplinary perspective. The course will start by examining, with a minimum of mathematics, the scientific basis and evidence for these phenomena, and then go on to consider the potential implications of and solutions to these challenges. In order to understand these potential implications and solutions, we must realize and understand the interdisciplinary nature of these challenges.
Variable
GE-2, GE-10
CHEM 134 (3) Mind Altering Substances
This course will explore the scientific, pharmacological, neurochemical and cultural aspects of psychoactive substances. The material is presented intuitively, with no mathematics. Course topics will include discussions of the major classes of pharmaceutical and psychoactive substances, basic neurochemistry, the role of psychoactive substances in medicine, the ritual use of psychoactive substances by traditional cultures, the FDA approval process, the significance and implications of drug testing, the controversy of drug-induced behavioral modification, national and global perspectives of substance abuse and the ethics of legalization.
Pre: "C" (2.0) or higher in CHEM 202
Fall

CHEM 321 (3) Organic Chemistry II
The chemistry of aromatic compounds, free radicals, polynes, macromolecules, heterocyclic compounds, carbohydrates, amino acids, peptides, and proteins will be covered. This will include a study of mechanisms, synthetic transformations, concerted reactions, and spectroscopy.
Pre: "C" (2.0) or higher in CHEM 320
Spring

CHEM 331 (1) Organic Chemistry II Lab
Laboratory illustrating electrophilic aromatic substitutions and other reactions of aromatic compounds, synthetic transformations as well as qualitative organic analysis.
Pre: CHEM 321 previously or concurrently
Spring

CHEM 413 (3) Advanced Inorganic Chemistry
A survey of topics in inorganic chemistry including quantum mechanics, symmetry and group theory, solid state chemistry, molecular structure and geometry, bonding theories, and coordination chemistry, emphasizing the theoretical foundation.
Pre: "C" (2.0) or higher in CHEM 305
Variable

CHEM 415 (2) Inorganic Preparations
The preparation and study of inorganic/organometallic compounds utilizing a variety of synthetic techniques including common Schlenk techniques. The studies will include characterization by common instrumental methods such as IR, NMR and UV-vis spectroscopy. Additional studies using instrumental techniques such as IR, NMR, UV-vis, electrochemistry and magnetic susceptibility will also be conducted.
Pre: "C" (2.0) or higher in CHEM 413
Spring

CHEM 423 (4) Spectroscopic Determination of Structure
Spectroscopic techniques including nuclear magnetic resonance, infrared, and mass spectrometry for determining structural features of molecules will be covered. Spectroscopic methods emphasize interpretation of spectra, and also provide hands-on operation of the corresponding electronic instruments. The laboratory uses these techniques for the determination of the structures of a
CHEMISTRY

CHEM 495 (1) Senior Seminar
Capstone course for majors in Chemistry, Biochemistry and Chemistry Teaching. During this course students will present the results of their research in several different forums including oral presentations and poster sessions.
Pre: CHEM 440, CHEM 460
Spring

CHEM 496 (1-6) Senior Thesis

CHEM 497 (1-16) Internship

CHEM 498 (1-6) Undergraduate Research

CHEM 499 (1-6) Individual Study