



## Chemistry, B.S. *major*

### Biochemistry/ Biotechnology Emphasis

---

CHEM 3100 may be repeated with 1 credit applying to this area.

A total of 120 semester credits are needed for the **Chemistry, Biochemistry/ Biotechnology emphasis B.S.** degree and include the following:

- 40 upper division credits (level 3000/4000)
- 63 required major core credits
- Completion of Core Curriculum credits (Minnesota Transfer Curriculum [MnTC] Goal Areas 1-10) - required for all baccalaureate degrees
- Completion of BSU Focus and Nisidotaading Course Requirements

Required Credits: 63

Required GPA: 2.25

#### I REQUIRED COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 1111 General Chemistry I (4 credits)
- CHEM 2211 Principles of Chemistry I (4 credits)

COMPLETE THE FOLLOWING COURSES:

- CHEM 2212 Principles of Chemistry II (4 credits)
- CHEM 3100 Journal Club (1 credit)
- CHEM 3311 Organic Chemistry I (3 credits)
- CHEM 3312 Organic Chemistry II (3 credits)
- CHEM 3371 Organic Chemistry Laboratory I (1 credit)
- CHEM 3372 Organic Chemistry Laboratory II (1 credit)
- CHEM 3507 Analytical Chemistry (3 credits)
- CHEM 3570 Analytical Chemistry Laboratory (1 credit)
- CHEM 4510 Instrumental Methods of Analysis (3 credits)
- CHEM 4571 Instrumental Analysis Laboratory I (1 credit)
- CHEM 4572 Instrumental Analysis Laboratory II (1 credit)
- MATH 2471 Calculus I (5 credits)
- PHYS 2101 University Physics I (4 credits)

#### II REQUIRED EMPHASIS

COMPLETE THE FOLLOWING COURSES:

- BIOL 1400 Cellular Principles (4 credits)
- BIOL 1500 Diversity of Life (4 credits)
- CHEM 4411 Biochemistry I (3 credits)
- CHEM 4412 Biochemistry II (3 credits)
- CHEM 4471 Biochemistry Laboratory I (1 credit)

SELECT 1 OF THE FOLLOWING COURSES:

- CHEM 4476 Techniques in Biotechnology and Biochemistry (2 credits)
- BCMB 4476 Techniques in Biotechnology and Biochemistry (2 credits)
- CHEM 4472 Biochemistry Laboratory II (1 credit)

SELECT 2 OF THE FOLLOWING COURSES:

- BIOL 2110 Human Anatomy and Physiology (5 credits)
- BIOL 2360 Genetics (4 credits)
- BIOL 3580 Immunology (3 credits)
- BIOL 3590 Cell Biology (3 credits)
- BIOL 3710 Microbiology (4 credits)

#### II REQUIRED EMPHASIS

Select 6 semester credits from CHEM 3100 or above.

#### Program Learning Outcomes | Chemistry, B.S.

1. Use the structure of atoms and their subatomic particles to explain chemical and physical properties.
2. Explain how atoms interact via chemical bonds and the energy changes associated with making and breaking bonds.
3. Relate the three dimensional geometric structures of chemical compounds to their chemical and physical behaviors.
4. Evaluate how intermolecular forces dictate the physical behavior of matter.
5. Categorize and analyze the chemical reactions involved in transforming matter into products with new chemical and physical properties.
6. Evaluate the energy changes that accompany chemical reactions.
7. Assess the various ways that affect how reaction rates vary with time.
8. Analyze the various factors that affect the equilibrium of chemical reactions.
9. Perform laboratory experiments that involve collecting and analyzing data and practicing chemical safety.
10. Evaluate chemical constructs at the particulate and macroscopic levels using models, graphs to visualize data, and mathematical equations.
11. Develop written reports and oral presentations that effectively communicate scientific principles and processes.