

MSU Departmental Assessment Plan 2007-2009

Department: Chemistry and Biochemistry

Department Head: David Singel

Assessment Coordinator: Martin Teintze

Degrees/Majors/Options Offered by Department

B.S. in Chemistry

Chemistry (Professional) Option

Biochemistry Option

Teaching Option

Department of Chemistry and Biochemistry

Undergraduate Assessment Plan

Assessment Contact

Dr. Martin Teintze, Chair
Undergraduate Program Committee
406-994-5390
mteintze@montana.edu

Degree Objectives

To provide students with the disciplinary knowledge, and problem-solving, analytical, and laboratory skills necessary to succeed in the workplace or as graduate students in chemistry, biochemistry, and related fields.

Expected Competencies

Discipline-Specific Knowledge

Graduates in the Professional Option will be expected to have a broad knowledge base in the following areas:

1. Organic chemistry, including nomenclature and molecular structure of organic compounds; stereochemistry; reactivities of the various functional groups; synthetic organic chemistry; physical organic chemistry; application of spectroscopy to organic structure elucidation; and fundamental skills in the organic chemistry laboratory.
2. Inorganic chemistry, including atomic structure and chemical bonding of inorganic compounds; reactions and properties of representative members of the various families of the periodic table.
3. Physical chemistry, including quantum chemistry; statistical thermodynamics; spectroscopy; and classical thermodynamics and kinetics; and fundamental skills and data analysis in the physical chemistry laboratory.
4. Analytical chemistry, including equilibria, and acid-base chemistry; modern instrumental methods in electrochemistry, chromatography and spectroscopy; and fundamental skills in the analytical chemistry laboratory.

5. Biochemistry, including cell organization; carbohydrate and lipid structure; protein and nucleic acid structure; enzyme kinetics; energetics; the major metabolic pathways for carbohydrates, lipids, and amino acids; regulation of gene function; and fundamental skills in the analytical chemistry laboratory.

Graduates in the Biochemistry Option will be expected to have a broad knowledge base in organic, inorganic, physical and analytical chemistry, as well as a solid foundation in all aspects of biochemistry, including: structure and function of macromolecules (proteins, nucleic acids, lipids and carbohydrates), molecular biology, metabolic and signal transduction pathways, and the use of biochemical and biophysical techniques to solve problems in the basic biological sciences and medicine. Graduates will be able to apply mathematical tools (such as calculus and statistics) and computational methods (database searching, sequence alignment algorithms, etc.) to biochemical problems. In addition, students will be expected to have a foundation in one or more of the biological sciences (e.g. microbiology, cell biology, neuroscience, plant or animal science), so that they understand the problems in those disciplines that biochemical techniques help to solve.

Students graduating in the Teaching Option are expected to develop a thorough background in the basic fields of chemistry including organic, inorganic, analytical and physical chemistry. They are also expected to develop instructional and pedagogical competence such that they meet state certification standards.

Communication Skills

Students will demonstrate the ability to clearly communicate chemical concepts and research projects to both peers and non-scientists using verbal and written forms of communication.

Problem-Solving Skills

Students will demonstrate the ability to solve problems of a chemical nature, using both analytical and computational methods. Students should be able to formulate hypotheses and design suitable experiments to test them. They should be able to solve technical problems in the laboratory, as well as apply computational methods to analyze data, when appropriate.

Students are also expected to perform supervised research in chemistry or biochemistry and are strongly encouraged to write a Departmental Honors Thesis describing their work.

Student Learning Assessment

Discipline-Specific Knowledge

The American Chemical Society provides standardized tests that are used nationally to assess student learning in every field of chemistry. These tests will be administered in advanced courses taken primarily by chemistry majors to assess the student's knowledge in relation to national norms. These tests will be used for informational purposes only and will not count toward the student's grades in the respective courses (BCHM 444 for biochemistry, CHEM 417 for organic chemistry, CHEM 334 for inorganic chemistry, CHEM 326 for physical chemistry).

Communication Skills

In the capstone seminar course (BCHM/CHEM 401) students are required to present their undergraduate research project to the faculty and their peers. The instructor in charge will assess their communication skills and give the student feedback and guidance. Toward the end of the semester, 401 students will also participate in a poster session, where their projects and their ability to explain them will be assessed by the Department's faculty.

Problem-Solving Skills

Evaluation of student projects and experiments will include having Department faculty evaluate each student's individual poster presentations as well as their 401 seminar.

Overall Assessment

Each incoming class of students is assigned an advisor depending on their major option (professional, biochemistry, or teaching). The advisor follows these students through the program and monitors their progress. It is the responsibility of the advisor to assist each student in developing a program, tailored if needed, that will provide the student with the expected competencies.

Program Assessment

Feedback from Current Students

Undergraduate Chemical Society: The department works with the Undergraduate Chemical Society to obtain feedback from current students. The Undergraduate Chemistry Society officers are invited to attend open meetings of the Undergraduate Program Committee to discuss student concerns.

Exit Surveys: Graduating seniors will be given an exit survey regarding their undergraduate experiences and soliciting suggestions for programmatic improvements. These surveys are sent to the Administrative Assistant, who compiles the information in a manner that assures anonymity for the students. Students are also asked to state their plans after graduation and to share their contact information for post-graduation surveys.

Feedback from Recent Graduates

The department will monitor our recent graduates' placement in post-graduate education and jobs. A brief questionnaire will be sent out via email or regular post by the Administrative Assistant five to seven months after graduation. This questionnaire will provide an early assessment of how well the department prepared our students for starting their chosen paths. An additional survey will be sent 3 years after graduation, as many students delay graduate education for a year or more. The summarized results of these surveys will be provided to the Undergraduate Program Committee.

Feedback from Outside Constituencies

The Undergraduate Program Committee and staff are responsible for monitoring the college, university, and national honors, scholarships, fellowships, and internships won by our students.

Evaluation of Teaching

All faculty members are required to distribute student evaluations in each of their classes. Each faculty member reads through the evaluations to assess the effectiveness of their teaching. All faculty members submit these evaluations to the Department Head, and these evaluations are part of their annual review. The exit and post-graduate surveys will also ask students to evaluate overall teaching effectiveness.

Curriculum Review

Undergraduate Program Committee: The Undergraduate Program Committee conducts a thorough biennial review of the undergraduate curriculum in light of the most recent assessment information and the changing demands in both graduate school and the workplace.

Student Advisors: The student advisors for each major option get feedback from students on the curriculum. The advisors are members of the Undergraduate Program Committee and are responsible for passing on successes, advice and concerns to the rest of the committee. Once a year, the Undergraduate Program Committee will meet to assess the undergraduate curriculum and discuss possible changes.

Application

All of the assessment data will be used by the Undergraduate Program Committee to formulate recommendations for improvements in the undergraduate curricula and in the

assessment plan, which will then be presented to the Department Head and the faculty for action.