



## Revised Assessment Plan

Date: January 2014

Department: **Chemistry**

**Department Mission:** *Given the central role that chemistry and the sciences as a whole play in the liberal arts tradition, the Chemistry Department provides opportunities for students to learn chemistry and biochemistry through challenging classroom, laboratory, and research experiences. Students participating in our program will master chemical content and laboratory skills, and develop critical thinking and communication skills that will prepare them well as scientists, health professionals, and scientifically literate citizens. The Chemistry Department fosters the professional growth of faculty and staff through participation in research and other scholarly activities that contribute to the field of chemistry.*

**Summary of Goals:** The department has developed these goals for its members:

1. Students will possess a fundamental understanding of chemical phenomena and acquire in-depth knowledge in the areas of physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and biochemistry following the guidelines established by the American Chemical Society Committee on Professional Training.
2. Students will develop enhanced critical thinking and problem solving skills relevant to traditional and emerging areas of chemistry and biochemistry.
3. Students will acquire laboratory expertise necessary to safely and skillfully answer questions of chemical and biochemical relevance.
4. Students will develop information and communication skills to effectively participate in a professional scientific community.
5. Students and alumni will find their training to be contemporary and engaging.
6. Faculty and staff will be actively involved and grow in their disciplines

**Goal 1:** Students will possess a fundamental understanding of chemical phenomena and acquire in-depth knowledge in the areas of physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and biochemistry following the guidelines established by the American Chemical Society Committee on Professional Training.

**Learning Outcomes/ Indicators:** Students will demonstrate an in-depth knowledge in chemistry.

**Methods of Assessment/Timing:** ACS standardized exams in Organic Chemistry and Physical Chemistry (yearly);  
ETS Major Field Test in Chemistry (every 3 – 5 years)

**Responsible Party:** ACS standardized exams: Instructors of respective courses  
ETS Major Field Test in Chemistry: Instructor of Chemistry 300

**Goal 2:** Students will develop enhanced critical thinking and problem solving skills relevant to traditional and emerging areas of chemistry and biochemistry.

**Learning Outcomes / Indicators:** Students will demonstrate an ability to apply problem-solving skills to answer questions/problems and to articulate scientific questions.

**Method of Assessment/Timing:** Faculty assessment of senior capstone presentations (yearly)

**Responsible Party:** Instructor of Chemistry 300

**Goal 3:** Students will acquire laboratory expertise necessary to safely and skillfully answer questions of chemical and biochemical relevance.

**Learning Outcomes / Indicators:** a. Students will recognize and deal properly with hazards in using chemicals and equipment, and know proper ways to dispose of chemical waste.  
b. Students will demonstrate a broad confidence with modern instrumentation and techniques.

**Method of Assessment/Timing:** a. Safety quiz in Chemistry 212L at the start of spring semester (yearly)  
b. Include questions on the senior exit interview to evaluate the use and understanding of the following: NMR spectroscopy, FTIR spectroscopy, Optical spectroscopy (UV-VIS and AA), Separations (GC, GC-MS, HPLC, protein and DNA purification), Electrochemical techniques, X-ray diffraction, Calorimetry, Air-sensitive techniques, Gel electrophoresis, Computational methods (every other year)

**Responsible Party:** a. Instructors of Chemistry 211L; b. Chair of the department

**Goal 4:** Students will develop information and communication skills to effectively participate in a professional scientific community.

**Learning Outcomes / Indicators:** a. Students will demonstrate effective oral communication of chemical concepts and queries.  
b. Students will demonstrate effective written communication of chemical concepts and queries.

**Method of Assessment / Timing:** a. Faculty assessment of senior capstone presentations (yearly); Assessment of oral reports in Chemistry 311L (yearly)  
b. Monitor grades and create portfolio of Chemistry 411 final papers for faculty review. (yearly)

**Responsible party:** a. Instructor of Chemistry 300; b. Instructor of Chemistry 411

**Goal 5:** Faculty and staff will be actively involved and grow in their discipline; students will find their training to be contemporary and engaging.

**Learning Outcomes / Indicators:** a. Departmental review of peer-reviewed research publications by faculty, with special recognition of those with Macalester student coauthors; pedagogical publications, articles and/or textbooks by faculty; presentations by faculty, staff and/or students at scientific conferences or at other institutions; external research grant fund raising.  
b. Alumni will evaluate the relevance and contemporaneity of their chemistry education and/or their undergraduate research experiences at Macalester in light of what they have gone on to do since graduation.

**Method of Assessment / Timing:** a. Compilation and departmental review of a 5-year summary of items listed in a. (every 5 years)  
b. Alumni survey of graduates at 5 – 8 years past graduation. (every 3 – 5 years); senior exit interviews will have questions directly related to research experiences while at Macalester.

**Responsible party:** a and b: Chair of the department.

**Note:** Some of these outcomes focus on expectations for faculty. They substantially affect the depth and richness of the student experience in the department. We therefore view them as tantamount in underpinning our educational program.

**External Review:** The American Chemical Society (ACS) Committee on Professional Training (CPT) develops and disseminates guidelines for high-quality undergraduate education in chemistry. These guidelines contain specific recommendations about the courses, course content, and assessments that chemistry departments should have. Macalester's Chemistry Department has continuously retained certification by the ACS-CPT. In order to retain this certification, the department is required to file yearly reports and to undergo periodic evaluation by the ACS-CPT. The chemistry department's curriculum and curriculum evaluation is therefore largely defined by their recommendations.

**Four Year Timeline to Implement Assessment Strategies:**

**2014:** Administer ACS standardized exams in Chemistry 311, Chemistry 312, and Chemistry 212 (potentially also in Chemistry 112 and 352) (Goal 1)

Faculty assessment of senior capstone presentations (Goal 2)

**2015:** ETS Major Field Test in Chemistry (Goal 1)

Oral reports in Chemistry 311L (Goal 4)

**2016:** Safety quiz in Chemistry 212L (Goal 3); online senior exit interview (Goal 3)

**2017:** Faculty assessment of senior capstone seminars (Goal 4); Assessment of Chemistry 411 final papers and creation of portfolio (Goal 4); Compile 5 year summary of faculty professional activities (Goal 5); Alumni survey (Goal 5)