

## Department of Chemistry Assessment Plan

The Assessment Plan follows five Program Goals. For each Program Goal, there are one or more Outcome Measures. Bulleted text is used to show correspondence of subparts of Outcome Measures under different table headings.

**PROGRAM GOAL 1:** Students will understand the fundamental basis of the science of chemistry through mastering key concepts in the specific areas of physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and biochemistry following guidelines established by the American Chemical Society for a B.S. degree in chemistry.

| Outcome Measures   | Data Needed                        | Group   | Assessment:<br>Method   | Reporting   | Assessment<br>Benchmarks  |
|--|------------------------------------|---|---|---|---|
| Understanding of key concepts in: <ul style="list-style-type: none"> <li>• Physical chemistry</li> <li>• Organic chemistry</li> <li>• Inorganic chemistry</li> <li>• Analytical chemistry</li> <li>• Biochemistry</li> </ul> | Demonstration of working knowledge | Students who completed: <ul style="list-style-type: none"> <li>• CHE 360</li> <li>• CHE 232</li> <li>• CHE 350</li> <li>• CHE 215</li> <li>• CHE 342</li> </ul> | 1-Overall course GPA<br><br>2-Standardized tests: ACS final exam for 215, 232, & 350<br><br>3-Exam question tracking* for 342 & 360 | Course GPA; exam tracking results*; ACS exam results; reported to Chair at end of semester by course instructors; | 1-No huge shifts from hist. GPA's<br><br>2- Course average to be within 1 standard deviation of national mean on ACS exams<br><br>3- No huge shifts from hist. exam tracking values |

\* Exam question tracking (to be implemented): Instructors in CHE 342 and 360 will be asked to pick out five exam questions in key, fundamental concepts in their courses. They will put these questions on an exam or exams, perhaps with some variation in details but not substance, and they will keep track of the class average score on these questions each semester. The class average score will be reported to the Chair of the Department. These will be markers for comparison of student understanding from semester to semester.

**PROGRAM GOAL 2:** Students will develop information and communication skills (oral, written, and computer skills) needed to be a professional chemist.

| Outcome Measures   | Data Needed   | Group                          | Assessment:<br>Method   | Reporting   | Assessment<br>Benchmarks  |
|--|---|--------------------------------|---|---|---|
| Ability to find and retrieve electronic data and information                             | Assignments that demonstrate work with electronic data and information  | <i>Students in:</i><br>CHE 251 | Attend library resources lecture and literature search assignment                                 | Instructor reports to Chair the percent who succeed in assignment     | Achieve 70% of enrolled students successfully completing assignment |
| Effective at communicating chemical ideas in writing                                     | Assignments that demonstrate clarity and correctness in written expression of technical ideas   | CHE 351<br>CHE 361<br>CHE 363  | Written lab reports   | Instructor reports cases of deficient writing                         | Less than 15% of enrolled students found deficient in any course    |
| Ability to use computer based tools for data analysis, interpretation, and communication | Assignments that demonstrate student abilities with different kinds of computer based tools (e.g., Excel, chem. structure, graphs, simulations) | CHE 230<br>CHE 361<br>CHE 316  | Homework and laboratory assignments needing specific software tools. ChemDraw-230, Excel-316, 361 | Instructor reports cases of inability to use essential software tools | Less than 15% of enrolled students show a lack of ability           |
| Effective at orally communicating their knowledge of chemistry                           | Participation in Research Symposium or Scientific Conference  | CHE 290/299<br>HON 285/286     | Oral/poster presentation  | Instructor reports number of participating students                   | Achieve 50% of enrolled students successfully presenting            |

**PROGRAM GOAL 3:** Students will develop problem-formulating and problem-solving skills relevant to the field of chemistry

| Outcome Measures  | Data Needed   | Group  | Assessment:<br>Method   | Reporting  | Assessment<br>Benchmarks  |
|---|---|--|---|--|---|
| Ability to formulate questions in problem areas in advanced courses and apply problem-solving skills to answer questions/problems | End-of-term assignments based on data or concept information calling for problem formulation and solution | <p><i>Students in:</i><br/>CHE 233</p><br><p>CHE 251 &amp; 316</p> | <p>Qualitative analysis laboratory</p><br><p>Laboratory practical exam requiring students to formulate experimental plan, conduct experiment, and analyze results</p> | <p>Instructor reports to Chair percent of students who succeed in full</p><br><p>Instructor reports to Chair percent of students who succeed in full</p> | <p>Achieve 70% successfully identifying unknown</p><br><p>Achieve 70% successfully completing laboratory practical exam</p> |

**PROGRAM GOAL 4:** Student will develop safe and effective laboratory skills, including those for chemical handling and use of chemical instrumentation.

| Outcome Measures   | Data Needed   | Group  | Assessment:<br>Method                                    | Reporting  | Assessment<br>Benchmarks  |
|--|---|--|--|--|---|
| Laboratory activities that require basic chemical equipment and instrumentation  | Laboratory work and related assignments that demonstrate equipment/instrumentation skills                           | <i>Students in:</i><br>CHE 216<br>CHE 233<br>CHE 361   | Completed assignments from 10 randomly selected students | Instructor turns in copies of assignments to Chair with assessment | Achieve 75% pass rate for lab courses                                     |
| Laboratory work that shows safe and effective practices in laboratory procedures, chemical handling and use of equipment | Percent of TAs completing seminar and on-site safety training<br><br>Number of lab courses with pre-lab safety talk | Teaching Assistants<br><br>CHE 216<br>CHE 231<br>CHE 233<br>CHE 316<br>CHE 351<br>CHE 361<br>CHE 363 | Count of completions<br><br>Pre-lab safety talks         | Reported by Safety Officer<br><br>Talks verified by Chair          | 100% of TAs attending<br><br>100% of courses to have pre-lab safety talks |
|  | Lab ejections for unsafe practices  | Students in all teaching labs  | Count of lab ejections                                   | Reported by instructor at the end of the semester                  | Less than 40 ejections per semester                                       |

**PROGRAM GOAL 5:** Students will learn how to translate their knowledge of chemistry into practice.

| <b>Outcome Measures</b>  | <b>Data Needed</b>  | <b>Group</b>       | <b>Assessment:<br/>Method</b>   | <b>Reporting</b> | <b>Assessment<br/>Benchmarks</b> |
|--|---|--------------------|---|------------------|----------------------------------|
| Completion of supervised, independent work that demonstrates putting knowledge into practice | Number of students in graduating class who successfully complete at least one of the following:<br>CHE 290/ 299 project<br>HON 285/286<br>HON 395 project<br>CHE 398A01<br>CHE 398A50<br>UTA assignment<br>High school student teaching | Graduating seniors | Identify graduating seniors who have completed at least one from the list | By the Chair     | Achieve 80% completion rate      |

## DATA SUMMARY

The table below adds certain details to the “Data Needed” items and indicates the frequency of collection.

| Data Needed  | Already Available? | Timeline         |
|--|--------------------|------------------|
| Overall course GPA: CHE 232, 215, 342, 350 and 360                                       | YES                | Every semester   |
| Standardized ACS Chemistry Subject Exams in CHE 215, 232, 350                            | YES                | Every two years  |
| Tracking five exam questions in CHE 342 and 360  | No                 | Every two years  |
| Success percentage in CHE 351 electronic skills on literature search project             | No                 | Every two years  |
| Deficient writing cases in CHE 351, 361 and 363  | No                 | Every two years  |
| Lack of computer-based tools capability in CHE 230, 316, and 360                         | No                 | Every two years  |
| Participation in ISU University Research Symposium                                       | No                 | Spring semesters |
| Success percentage in lab practical exams from CHE 233, 251, 316                         | No                 | Every two years  |
| Assignments from ten randomly selected students in CHE 216, 233, 361                     | No                 | Every two years  |
| Completions of on-site safety training   | YES                | Every year       |
| Count of courses with pre-lab safety talks from CHE 216, 231, 233, 316, 351, 361 and 363 | YES                | Every two years  |
| Count of students ejected from labs for unsafe practices                                 | No                 | Every two years  |
| Count of students doing independent work   | YES                | Every two years  |

## FEEDBACK

| Stakeholders and Others           | Information Sought  | Collection Methods  |
|-----------------------------------|---|---|
| Current students                  | (1) Course and instructor satisfaction<br>(2) Advising satisfaction and effectiveness | End-of-semester course evaluations<br>Advising survey every other year  |
| Alumni                            | Program satisfaction; strengths; weaknesses   | Annual Alumni Survey  |
| Employers                         | Success of students placed from our program   | Communication with Chair and the Department's corporate liaison         |
| Graduate and professional schools | Success of students pursuing PhDs elsewhere   | Tracking outcome through maintaining contact with students              |
| Professional society              | Compliance of program with national standards   | Outcome of 5-year accreditation review by the American Chemical Society |

## **ANALYSIS AND RESPONSE TIMELINE**

- June 1 Chair reviews submitted data and requests any missing or incomplete items from the prior academic year.
- September 1 Chair submits summary of data and indicates areas of concern to Executive Committee, including any areas of lingering shortfall and/or lack of progress from the prior year's Assessment cycle and action plan.
- October 1 Executive Committee meets and reviews how well Assessment Benchmarks have been met or are approaching the intended performance level for each of the Outcome Measures. Feedback will be incorporated to provide a composite picture of the Department's effort on the five Program Goals. Where there is a substantial shortfall and lack of progress, the Executive Committee will formulate an action plan, which may involve review and change in courses, curricula, facilities, faculty effort, and so on.
- December 1 Any action plans from the Executive Committee will be forwarded to an appropriate faculty committee in the Department (e.g., Courses and Curricula, Facilities, Undergraduate Programs) for further analysis and/or implementation. It is conceivable that some action plans will be directed to the faculty as a whole and will then be discussed at a spring faculty meeting.
- February 1 Committees respond to action plans and submit summary of responses to Chair.
- March 1 Chair and Executive Committee submit Assessment Report to University Assessment Office.
- May 1 Action plan and responses included in the Department's Annual Report which is distributed to faculty.