# 2017-2018 Assessment Cycle COS_Chemistry BS

## Mission (due 12/4/17)

**University Mission**

**The University of Louisiana at Lafayette offers an exceptional education informed by diverse worldviews grounded in tradition, heritage, and culture. We develop leaders and innovators who advance knowledge, cultivate aesthetic sensibility, and improve the human condition.**

**University Values**

**We strive to create a community of leaders and innovators in an environment that fosters a desire to advance and disseminate knowledge. We support the mission of the university by actualizing our core values of equity, integrity, intellectual curiosity, creativity, tradition, transparency, respect, collaboration, pluralism, and sustainability.**

**University Vision**

**We strive to be included in the top 25% of our peer institutions by 2020, improving our national and international status and recognition.**

**College / VP and Program / Department Mission**

**Mission of College or VP-area**
*Provide the mission for the College or VP-area in the space provided. If none is available, write "None Available in 2017-2018."*
Our mission is to serve our students, the citizens of Louisiana, the nation, and the world, through innovative and stimulating educational experiences and compelling research initiatives that create knowledge, deepen our basic understanding of the world around us, further economic development, and enhance quality of life. In support of our mission, The College of Sciences seeks to:

Develop broad-thinking students into mature, ethical professionals, scientists, and researchers with the necessary creativity, critical thinking, and problem solving skills required to make significant contributions to industry, government, and the academic sector.
Recruit and support top-notch teaching and research faculty engaged in scientific endeavors that are recognized nationally for their relevance and impact.
Enrich scientific research and education through on-campus collaborations, multidisciplinary programs, large-scale multi-institution initiatives, as well as partnerships with government and industry.
Foster scientific literacy within the University, the citizens of Louisiana, and the nation by providing stimulating courses for our students and by partnering with educators at the K-12 and community college level.
Provide leadership in the translation and application of research into practical solutions that will benefit our local community, the state of Louisiana, our natural environment, industries of the Gulf Coast region, and society as a whole.

The Ray P. Authement College of Sciences will emerge as a preeminent college of sciences in the Southeast and Gulf Coast region of the United States. The College will be recognized nationally for its innovative education, scholarly research activities addressing our nation's grand challenges, and for its diverse student body with exemplary academic achievements, leadership abilities, and global perspectives.

**Mission of Program / Department**
*Provide the program / department mission in the space provided. The mission statement should concisely define the purpose, functions, and key constituents. If none is available, write "None Available in 2017-2018."*
The mission of the UL Dept. of Chemistry is to provide instruction of chemistry subjects to students majoring in either Chemistry itself, or in other scientific fields such as physics, biology, etc. The purpose of this instruction is to provide

students with both the fundamentals upon which the field of chemistry is based, and to equip students with the latest techniques, knowledge base and breadth of application of chemistry to both the sciences and society. The Department of Chemistry at UL Lafayette is certified by the American Chemical Society and is committed to advancing the intellectual, technological, cultural and scientific knowledge of its students and faculty following the highest standards of scientific inquiry. The mission of the department is accomplished through the use of several mechanisms including 1) classic and innovative classroom and laboratory instruction, 2) student advising and 3) undergraduate research. The department strives to teach students to be independent scientists and scientifically literate citizens. By partnering with communities both inside and outside the University, the department supports the application of the chemical sciences to address the societal needs for both chemistry and science majors, but also for non-science majors as well.
The Dept. of Chemistry also services in the capacity of a service department offering a range of chemistry courses designed for specific non-chemistry majors to provide needed and useful chemical knowledge to such students.

The overall mission of the Chemistry Department is two-fold: to educate and train its Chemistry Majors for careers as chemists in industry, business and government concerns, and (2) prepare graduates for postgraduate chemistry education leading to masters and doctorates in chemistry, or in some cases, professional education in pharmacy, veterinary and medical fields, all of which rely on a significant knowledge in chemistry extending to biochemistry and medicinal chemistry.

**Attachment (optional)**
*Upload any documents which support the program / department assessment process.*

## Assessment Plan (due 12/4/17)

**Assessment Plan (Goals / Objectives, Assessment Measures and Criteria for Success)**

**Assessment List**

| | |
|---|---|
| Goal/Objective | The goal of Chemistry 107, General Chemistry I, is to achieve the mission and outcomes noted in the Expected Outcomes List below. It is the aim of the course to impart not just knowledge embodied within the Chemistry 107 course, but a competency on the part of the student in possessing that knowledge and an executable ability to use that knowledge not only in future chemistry courses depending upon that fundamental knowledge, but in everyday life as well.<br><br>As an example, the student is intended to understand such issues as: why over pressurizing a car tire can lead to over heating and perhaps catastrophic blowout at highway speeds; what the difference is between mixtures, pure substances and compounds; and why some materials react so quickly, even violently when mixed, and on a more mundane level, why bleach does what it does and how? They should understand the difference between temperature and heat (many common people think those two are the same “thing”). In short, with these previous citations, they should be able to understand and explain (to others as the case may be) why common chemical processes around the home, household chemical events, such as the action of drain cleaners, work and why based upon what they learned in Chemistry 107. The depth and breadth of understanding and application go well beyond these specifics cited, but they embody some of the most fundamental principles of chemistry of which the student is hoped has learned, understands, and can use and apply.<br><br>EXPECTED OUTCOMES LIST:<br><br>Students will know the basic laws, principles and concepts of chemistry and be able to recognize examples of chemical processes or reactions as falling under one or more laws and principles of chemistry and cite the law or principle applicable. They will be able to define and explain the various laws and principles of chemistry as well as analyze, calculate and solve problems.<br><br>Students will be able to classify various chemical reactions and calculate mass relationships |

<table>
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<tr><td>Legends</td><td>SLO - Student Learning Outcome/Objective (academic units); PO - Program Objective (academic units);</td></tr>
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**Program / Department Assessment Narrative**

**The primary purpose of assessment is to use data to inform decisions and improve programs (student learning) and departments (operations); this is an on-going process of defining goals and expectations, collecting results, analyzing data, comparing current and past results and initiatives, and making decisions based on these reflections. In the space below, describe the program's or department's overall plan for improving student learning and/or operations (the "assessment plan"). Consider the following:**
**1) What strategies exist to assess the outcomes?**
**2) What does the program/department expect to achieve with the goals and objectives identified above?**
**3) How might prior or current initiatives (improvements) influence the anticipated outcomes this year?**
**4) What is the plan for using data to improve student learning and/or operations?**
**5) How will data be shared within the Program/Department (and, where appropriate, the College/VP-area)?**

**Assessment Process**

BACKGROUND & HISTORICAL ISSUES with ASSESSMENT

(A) In examining past assessment cycle reports, one finds a common problem of considerable concern to the Department SACS Committee. The first problem and concern is the very low numbers of students particularly in our upper level courses (analytical, physical, inorganic, and biochemistries). With anywhere from three or four to about ten Chemistry Majors in an upper level course, the assessment has relied on very small samplings upon which to base what are arguably sweeping generalizations as well as serving as a basis upon which an instructor is to make decisions concerning instruction. As physical scientists, we are very reluctant to base any conclusions, generalizations, and especially decisions of any kind on such poor data. It is contrary to our scientific training and approach to any research project undertaken.

(B) A second issue that arises is that as a service department, we provide course material in chemistry for other disciplines such as biology, various engineering fields, etc. A third issue, we must comply with subject material, depth and breadth as required by our certifying and accrediting agency, The American Chemical Society (ACS). Consequently, any “issue” allegedly arising out of Chemistry Major student performance on our use of standardized national exams in a given chemistry subdiscipline in assessing them cannot lead to “capricious” changes in curricula to suit any one group of students, however minor and certainly major, without confronting difficulties with either the ACS, or other departments for whom we provide a specified chemistry course or two for their nonchemistry majors.

(C) Thus, the past means of assessment has generally been uninformative and superficially illuminating, and preexisting curriculum requirements have placed significant constraints on just what we can do, and how far can we go in doing it, without running afoul of ACS requirements, or reopening consultations with several other departments and attempting to devise an adjustment in content emphasis and attain an agreement among disparate departments with dissimilar interests and needs.

(D) Finally, a fourth issue we have run head long into, is extracurricular issues with our students (not likely unique to chemistry), that coupled with our very low number of majors in major courses over the four years of baccalaureate study, affect study time, habits, outside work requirements, etc. These variables cannot be measured or accounted for, yet superimpose themselves on the overall assessment results, having significant impact on the statistics across very small sampling numbers.

(E) Dissatisfaction with the state of affairs of historical evaluation methods, we have been discussing and searching for another approach.

NEW APPROACH

(F) The Department SACS Committee plans to implement with this new assessment cycle, tracking each entering freshman Chemistry major beginning with Chemistry 107 and throughout their future chemistry courses. In the Chemistry 107, across all the sections thereof, the same set of standardized (modified for copyright issues) national exam questions in General Chemistry and the same number of questions will be included on the final exams of the various sections so we reduce the variables to the same for each section. A joint meeting of the Department SACS Committee and the Department General Chemistry Committee have examined and selected the questions from the Standardized National Exam in General Chemistry authored by the American Chemical Society (ACS), the governing and accrediting agency for the UL chemistry Department’s certification in Undergraduate Chemistry Education. The same two committees, in joint

session, have made the modifications to the questions so they retain the focus and subject tested by the standardized questions, but are not the same exact questions in keeping with copyright protections of the issuing organization (ACS).

(G) By employing the exact same set of standardized national exam questions across all sections of Chemistry 107, we eliminate such variables as different section instructors, different methods of instruction, different emphases, etc. and thus different questions from one final to another. In addition to overall performance of the freshman Chemistry 107 students as a whole, individual instructors also will acquire an insight into weaknesses of students of specific sections. As noted in a previous assessment cycle plan with other chemistry courses, we wish to not emphasize any one semester or section, but rather to sum the results from the various sections of Chemistry 107 for a given semester as well as each subsequent semesters to track all initial entering freshman Chemistry Majors. In so doing, we hope that other immeasurable variables will be “smoothed out” and a better statistical assessment will be realized from such an approach. Realistically, past experience has shown the Chemistry Department, that many entering freshman Chemistry Majors will drop out (change major) over time beginning with Chemistry 107 and progressing through Chemistry 108 (General Chemistry II– more difficult than Chemistry 107), and through Chemistry 231 and 232 (Organic Chemistry I & II). Thus, with time, the size of the overall pool will decrease as such students progress through the first four major courses required of Chemistry Majors.

(H) Any reports generated in compliance with assessment protocols will not provide student names, but will note students by number (1, 2, 3, etc.) in such listings so as to comply with any issues of student privacy and adherence with applicable State and Federal Laws pertaining thereto. The identity of students will be known solely to the Department SACS Committee and remain secured for the same reasons.

(I) There is a bit of a “logistical” problem with the new approach introduced this assessment cycle as who teaches Chem 107 changes some from semester to semester, and with faculty changes due to retirements, other departure reasons, and new hires, this will require several different levels of involvement such as the Department Head and Department Class Assignment Committee, the Department General Chemistry Committee, and the Department SACS Committee, and of course, finding times for all committee members concerned to meet for the planning, selection, and plan of dissemination (secure) of questions. The initial effort for this new assessment cycle has shown workable and is the likely model for future employments.

FALLBACK OPTION

(J) Despite the issues of low numbers of majors and the problems that accrue therefrom as set forth in paragraphs (A)-(C), the Department SACS Committee recognizes that we will lose some majors over the freshman year. It is entirely possible that the numbers, though still thought to be better than experienced in our upper level chemistry Major courses, could turn out to be marginally better. Though we expect to continue tracking the retained Chemistry Majors throughout their advance into and through upper level courses, current Chemistry Majors already in the upper level courses need to be assessed in order to spot any issues that may arise and need examination by respective subdiscipline committees.

(K) Consequently we will continue an assessment of upper level course majors performance in the interim. It is anticipated that as current and subsequent year freshman Chemistry Majors enter the University, their assessment in upper level courses will simply be a continuum, and “spot” assessment of individual upper level courses will cease as historically practiced. The Department SACS Committee expects this new assessment system (as envisioned and configured) to be in full implementation with the Assessment year 2020-2021.

## Results & Improvements (due 9/15/18)

**Results and Improvement Narratives**

**Assessment List Findings for the Assessment Measure level for The goal of Chemistry 107, General Chemistry I, is to achieve the mission and outcomes noted in the Expected Outcomes List below. It is the aim of the course to impart not just knowledge embodied within the Chemistry 107 course, but a competency on the part of the student in possessing that knowledge and an executable ability to use that knowledge not only in future chemistry courses depending upon that fundamental knowledge, but in everyday life as well. As an example, the student is intended to understand such issues as: why over pressurizing a car tire can lead to over heating and perhaps catastrophic blowout at highway speeds; what the difference is between mixtures, pure substances and**

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Assessment Findings

| Assessment Measure | Criterion | Summary | Attachments of the Assessments | Improvement Narratives |
|---|---|---|---|---|
| Direct - Standardized Test | Has the criterion Selected, modified questions from ACS National Standard Exam included in course final exam and performance tracked for each Chemistry Major enrolled in course. been met yet? Met | CHEM 107 students did attain the minimum performance standards expected, as discussed in detail in the attached narrative | Table_107_FA17_Narrative.doc<br>Table_301_401_Narrative.doc | - Assessment Process: Measures changed: As discussed in the attached narratives, the assessment process had to be changed due to unrepresentative results. |

## Reflection (Due 9/15/18)

**Reflection**

**The primary purpose of assessment is to use data to inform decisions and improve programs and operations; this is an on-going process of defining goals and expectations, collecting results, analyzing data, comparing current and past results and initiatives, and making decisions based on these reflections. Recalling this purpose, respond to the questions below.**

**1) How were assessment results shared in the program / department?**
*Please select all that apply. If "other", please use the text box to elaborate.*
Distributed via email
Presented formally at staff / department / committee meetings
Discussed informally
Other (explain in text box below) (selected)

Results posted via Moodle access as well as discussions in faculty meetings and among faculty outside formal meetings

**2) How frequently were assessment results shared?**

Frequently (>4 times per cycle)
Periodically (2-4 times per cycle)
Once per cycle (selected)
Results were not shared this cycle

**3) With whom were assessment results shared?**
*Please select all that apply.*
Department Head (selected)
Dean / Asst. or Assoc. Dean
Departmental assessment committee
Other faculty / staff (selected)

**4) Consider the impact of prior applied changes. Specifically, compare current results to previous results to evaluate the impact of a previously reported change. Demonstrate how the use of results improved student learning and/or operations.**

As effects of changes, see Results and improvement pertaining to Table 301-401 (Table as attachment). As the attachment shows there has been a marked improvement in the results obtained for CHEM 301 in the time period from 2015 to 2017. The next cycles will tell whether these changes are statistically significant.

**5) Over the past three assessment cycles, what has been the overall impact of "closing the loop"? Provide examples of improvements in student learning, program quality, or department operations that are directly linked to assessment data and follow-up analysis.**

We are not exactly "closing the loop" because the originally selected evaluation system was flawed due to small (unrepresentative) numbers of students. Consequently, an improved evaluation system was developed in 2016 (see narrative submitted in 2016, explaining the need for change) and implemented in 2017. Discussions of impediments confronting students make this section problematic in addressing. See narrative of Results and Improvements for issues confronting assessments and changes.

**Attachments (optional)**
*Upload any documents which support the program / department assessment process.*
Table_107_FA17_Entering_Chem_Majors_Performance.doc
Table_301_401_ACS_Q_A.doc