Basic Program Information

Department Name:

CHEMISTRY

Division Name:

PSME

Program Mission(s):

To provide undergraduate education founded on a rigorous, applied treatment of chemistry fundamentals coupled with modern analytical equipment and techniques; as well as to prepare students for transfer to a four-year university or allied-health programs.

Please list all Program Review team members who participated in this Program Review:

Name	Department	Position
Kathy Armstrong	Chemistry	Instructor
Richard Daley	Chemistry	Instructor
Mary Holland	Chemistry	Instructor
Londa Larson	Chemistry	Instructor
Rosa Nguyen	Chemistry	Instructor
Sandhya Rao	Chemistry	Instructor
Victor Tam	PSME	Division Dean (interim)
Amanda Pitts	Chemistry	Instructor

Total number of Full Time Faculty:	7
Total number of Part Time Faculty:	16

Please list all existing Classified positions:	
Anna Wu	Laboratory Technician
Sherman Lee	Laboratory Technician

List all Programs* covered by this review & check the appropriate column for program type:

Program Name	Certificate of Achievement Program	Associate Degree Program	Pathway Program
CHEMISTRY		X	

* If you have a supporting program or pathway in your area for which you will be making resource requests, please analyze it within this program review (i.e. Integrated Reading and Writing, Math My Way, etc.) You will only need to address those data elements that apply.

Section 1: Data and Trend Analysis

1. Program Data:

Data will be posted on http://foothill.edu/staff/irs/programplans/programreviewdata.php for all measures except non-transcriptable completion. You must manually copy data in the boxes below for every degree or certificate of achievement covered by this program review.

Transcriptable Programs	2011-2012	2012-2013	2013-2014	% Change
CHEMISTRY	---	4	---	----

Please provide any non-transcriptable completion data you have available. Institutional Research does not track this data; you are responsible for tracking this data.

Non-Transcriptable Program	2011-2012	2012-2013	2013-2014	% Change
Example: Career Certificate				
NONE	N/A	N/A	N/A	N/A

If you have a non-transcriptable certificate that serves a workforce need, and/or has external certification, please provide a brief narrative explaining the industry need for this certificate, and attach any supporting data.

DOES NOT APPLY

If it does not have external certification, and/or is not a workforce program, please provide a brief narrative justifying the need for a certificate that is not state approved, and attach any supporting data.

DOES NOT APPLY

2. Department Level Data:

	2011-2012	2012-2013	2013-2014	% Change
Enrollment	3080	3192	3204	+0.4%
Productivity (College Goal 2013-14: 535)	496	476	465	-2.2%
Success	73%	71%	68%	-3%
Full-time FTEF	6.4	6.5	6.0	-7.8%
Part-time FTEF	8.9	10.3	12.2	+18%

3. Associate Degree Transfer (ADT)

There is a fall 2014 legislated deadline for approval of ADTs (AA-T/AS/T degrees). **If there is a Transfer Model Curriculum (TMC) available in your discipline/program, you are *required* to offer an approved AA-T/AS-T.** Indicate the status of your program's ADT:

Check one	Associate Degree Transfer Status
	State Approved
	Submitted to State Chancellor's Office
	Submitted to Office of Instruction
	In Progress with Articulation
X	**Planning Stage with Department**
	Not Applicable

If you are required to offer an approved ADT and it has not been state-approved, please comment on the program's progress/anticipated approval date.

ADT has been delayed pending approval of Final Transfer Model Curriculum (TMC) for the degree. Chemistry is the first and currently only program that has tentatively approved an alternative GE pattern: the "IGETC for STEM".

Using the prompts and the data from the tables above, provide a short, concise narrative analysis for each of the following indicators. If additional data is cited (beyond program review data sheet), please indicate your data source(s).

4. **Enrollment trends**: Over the last three years, is the enrollment in your program holding steady, or is there a noticeable increase or decline? Please comment on the data and analyze the trends.

The enrollment numbers have held remarkably constant over the past few years. From 2012-13 to 2013-14 we had a small increase from 3192 to 3204. The +0.4% change indicates chemistry is in a no growth mode compared to the 25% growth from 2009 to 2012.

5. **Student Demographics:** Please comment on the enrollment data, comparing the program-level data with the college-level data. Discuss any noticeable differences in areas such as ethnicity, gender, age and highest degree.

The demographics of the Chemistry Department deviate slightly from that of the College population. With regards to ethnicity, Asians make up a significantly larger percentage of the student population (40%) versus the college (25%). Less Latinos (16% versus 21%) and White students (26% versus 31%) are enrolled in chemistry courses. The gender balance is comparable to that of the College. Students in the Department tend to be younger, with those in the 19 or less age group (24%) comprising a greater percent than the college population (19%). The same is true for 20-24 year olds (51% versus 42%).

6. **Productivity**: Although the college productivity goal is 535, there are many factors that affect productivity, i.e. seat count/facilities/accreditation restrictions. Please evaluate and discuss the productivity trends in *your program*, relative to the college goal and any additional factors that impact productivity. If your productivity is experiencing a declining trend, please address strategies that your program could adopt to increase productivity.

7.

The Chemistry Department is limited in increasing productivity due to safety regulations from laboratory seat count restrictions, with less hazardous introductory chemistry sections having a limit of 32 students versus 24 students in more complicated organic chemistry labs. Over the last three-year period, the average Department productivity was 479, with only a slight decline of 2.2% in the past year. Although College productivity has increased 3.4% in the same period, productivity has remained relatively stable for multiple years in the Chemistry Department.

8. **Course Offerings:** Review the enrollment trends by course and consider the frequency, variety, demand, pre-requisites, etc. If there are particular courses that are not getting sufficient enrollment or are regularly cancelled due to low enrollment, please discuss how your program is addressing this issue.

Courses in the Chemistry Department are divided into three main sequences:

General Chemistry (1A/B/C). Enrollment in this three-course sequence is increasing overall (9%, 11% -4%, respectively), with each course offered every quarter and tracked to demand. Total enrollment in 1C is smaller compared to 1A and 1B and is more prone to fluctuations depending on success rates in 1B. Overall, enrollment in 1B and 1C has remained steady for a 3-year period, with significant growth in 1A (+22% from 2011).

Organic Chemistry (12A/B/C). Enrollment in this sophomore three-course sequence has also remained steady (2%, 6%, -25%). Chemistry 12C had a large spike in enrollment in 2012-13 but moved back to normal levels in 2013-14. This is most likely due to the loss of a FT faculty member to PDL.

Introductory and Allied Health (25/30A/30B). Although enrollment fluctuates slightly in Chem 25 (-6% year-to-year, but up 3.6% from 2011), it is on a growth trend. Chem 30A has leveled out (0% year-to-year, but up 13.8% from 2011) with enrollment remaining strong. Chem 30B (-10% year-to-year) has also remained steady (-1.4% from 2011) but does face decreasing enrollment pressure due to certain allied health schools not requiring this course as a pre-req.

Overall, no class has consistently been canceled from enrollment issues.

9. **Curriculum and SLOs:** Comment on the currency of your curriculum, i.e. are all CORs reviewed for Title 5 compliance at least every five years and do all prerequisites and co-requisites undergo content review at that time? If not, what is your action plan for bringing your curriculum into compliance (Please use reports from the Curriculum Office

to help you complete this prompt)?

All Course Outlines are reviewed for Title 5 compliance at least every five years. In addition, new Content Review procedures are in place to ensure that any and all requisites are explicitly examined in regard to their validity. New Content Review forms now accompany all courses under review that contain requisites regardless of whether or not the requisites are within the same discipline or out of discipline.

10. **Curriculum and SLOs**: What are you doing to ensure that your curriculum is congruent with the most recent developments in your discipline?

Faculty participate in professional organizations including the American Chemical Society (ACS) and the Two Year College Chemistry Consortium (2YC3). In addition, faculty keep up-to-date by reading peer-reviewed scientific journals (e.g. Journal of Chemical Education, available to faculty through Foothill's library), and also by attending regional professional conferences.

11. **Innovation**: Please comment on any innovative initiatives within your program, this could include areas regarding sustainability, stewardship of resources, collaboration, grants and/or curriculum.

Chemistry faculty have actively participated in NSF grants to offer scholarships to STEM students as well as those intended to provide support services for at-risk students. In addition, the Chemistry program at Foothill College strives to minimize the impact that hazardous chemicals can pose to the environment and to the health of students and staff. As a result, labs are designed on a microscale whenever possible and consumables are chosen to minimize health and disposal hazards as well as to minimize costs.

I Matter: An introduction to Green Chemistry and the Environment (Chem 20) was taught for the first time in W14. This course, which has obtained approvals for both CSU and UC acceptance as a Natural Sciences course with lab, combines principles of green chemistry and sustainability with key introductory chemistry and environmental concepts. Students complete environmentally focused laboratory experiments that are designed to build technical and critical thinking skills. The course includes a group project and presentation, which is unusual for introductory chemistry courses. Selected experiments from the course were adapted for a very popular Green Chemistry themed week during the 2014 summer STEM camps.

Section 2: Student Equity and Institutional Standards

As part of an accreditation requirement, the college has established institution-set standards across specific indicators that are annual targets to be met and exceeded. Please comment on how these indicators compare at your program level and at the college level. (For a complete description of the institutional standard, please see the instructional cover sheet)

a. Institutional Standard for Course Completion Rate: 55%

Please comment on your program's course success data, including any differences in completion rates by student demographics as well as efforts to address these differences.

Success rates in Chemistry were 68% overall during the 2013-2014 academic year. This represents a 3% drop over last year due primarily to a rise in the number of withdraws (also 3%). These success rates do fluctuate from year to year within a narrow margin, and so the drop seen is not necessarily statistically significant. Targeted ethnic groups show a 5% decline in success rates over last year (54 instead of 59%) as compared to non-targeted groups (73% instead of 75%). It is difficult to ascertain whether or not this decline is statistically significant. Chemistry is a subject that proves challenging to many students, especially those with weak math backgrounds. While the Chemistry program has prerequisites in place in an effort to better "level the playing field" it is true that disadvantaged ethnic groups generally are more likely to have weak math backgrounds beginning very early in their education and these weaknesses can be very challenging to overcome. The Chemistry department has made efforts to address those weaknesses by increasing support services to students through increased office hours and through workshops offered through the PSME center.

Despite these efforts, success rates have not risen in recent years. There are two additional factors which may be contributing to this: 1) an increase in the international student population in chemistry courses and 2) students responding to pressure to achieve top grades. Many international students arrive with poor English skills, coupled with little or no previous hands-on lab experience. These deficiencies directly contribute to a reduction in student success in introductory and general chemistry classes. The pressure to achieve top grades often results in a higher withdrawal rate, as students who do have a passing grade will withdraw and then re-enroll the next quarter to try for a better grade.

b. Institutional Standard for Degree Completion Number: 450

Has the number of students completing degrees in your program held steady or increased/declined in the last three years? Please comment on the data, analyze the trends, including any differences in completion rates by student demographics.

Most PSME students do not complete their AS degree but instead either go on to transfer to a UC or CSU campus, or continue onto an allied health program. No AS in Chemistry degrees were recorded last year with only 4 reported the previous year.

c. Institutional Standard for Certificate Completion Number (Transcriptable): 325

Has the number of students completing certificates in your program held steady, or increased/declines in the last three years? Please comment on the data, analyze the trends, including any differences in completion rates by student demographics.

The Chemistry department does not currently offer any certificates.

d. Institutional Standard for Transfer to four-year colleges/universities: 775

Based on the transfer data provided, what role does your program play in the overall transfer rates? Please comment on any notable trends or data elements related to your program's role in transfer.

A large majority of students taking courses from the Chemistry Department are on a 4-year institution transfer pathway. In 2013-2014, 2348 (duplicated head count) students were enrolled in transfer sequence courses (25/1A/1B/1C/12A/12B/12C) compared to 847 students in allied-health courses (30A/30B). With the steadily increasing enrollment in the transfer sequences, the Chemistry Department is playing a vital role in maintain the transfer mission of the College.

Section 3: Core Mission and Support

Please address all prompts that apply to your program.

1. Basic Skills Programs (English, ESLL and Math): For more information about the Core Mission of Basic Skills, see the Basic Skills Workgroup website: http://foothill.edu/president/basicskills.php

1. **Please comment on progression in sequenced courses, including ladder programs, alternative pathways and supplemental instruction. How successfully do students progress through the course sequence or pathways?**

   The Chemistry department does not currently offer any basic skills courses.

2. **Based on your analysis of student success in these pathways, what initiatives or strategies are being considered to increase student success?**

DOES NOT APPLY.

2. Transfer Programs: For more information about the Core Mission of Transfer, see the Transfer Workgroup website: http://foothill.edu/president/transfer.php

3. **Please analyze and discuss the available Transfer data regarding your programs, and discuss strategies or initiatives to improve transfer rates.**

   Degree Applicable Chemistry courses at Foothill College are without exception articulated at California Universities in both the CSU and UC systems. Efforts are made by faculty in conjunction with Foothill's articulation officer to address any problems with articulation as they arise in order to maintain this status.

4. **Please analyze and discuss Articulation data regarding this program.**

   The Chemistry department at Foothill College offers ten degree applicable courses. According to assist.org, all ten are accepted as content equivalent to existing courses at

every UC and CSU campus in California. In addition, all ten have been approved as equivalent to new C-ID descriptors as needed for Transfer Degree (pending finalized Transfer Model Curriculum).

3. Workforce Programs: For more information about the Core Mission of Workforce, see the Workforce Workgroup website: http://www.foothill.edu/president/workforce.php

5. **Discuss how this program continues to meet a documented labor market demand?**

T*he Chemistry department does not currently offer any workforce programs.*

6. **Analyze your program in relation to other programs in our region**, defined as San Mateo and Santa Clara counties.

DOES NOT APPLY.

7. **Discuss any job placement and/or salary data available for your students after graduation.**

DOES NOT APPLY.

8. Please analyze and comment on average salary/wage data in the region, defined as San Mateo and Santa Clara counties.

DOES NOT APPLY.

9. **Program accreditation:** If applicable, please describe your program accreditation: the agency, the frequency of the process and the current status of the program by the accrediting body.

DOES NOT APPLY.

10. **Service to the community:** Please describe community service, outreach and special projects or initiatives that the program provides.

DOES NOT APPLY.

11. **Outcomes assessments:** If applicable, please describe additional means of outcomes assessment for the program, such as graduate surveys, alumni surveys, employer surveys, national and state licensing board exams, etc.

DOES NOT APPLY.

12. Please attach minutes from your advisory board meeting(s) and discuss key issues, outcomes and action plans as a result of these meetings.

DOES NOT APPLY.

Section 4: Learning Outcomes Assessment Summary

1. **Attach 2013-2014 Course-Level** – Four Column Report for CL-SLO Assessment from TracDat, please contact the Office of Instruction to assist you with this step if needed.

See attached

2. **Attach 2013-2014 Program Level** – Four Column Report for PL-SLO Assessment from TracDat, please contact the Office of Instruction to assist you with this step if needed.

See attached

Section 5: SLO Assessment and Reflection

Based on your assessment data and reflections, please respond to the following prompts:

1. **What curricular, pedagogical or other changes have you made as a result of your CL-SLO assessments?**

For the most part, CL-SLO goals have been met according to metrics defined by responsible faculty. In those instances for which goals were not met (for example students clearly had not mastered a skill defined as a goal in the course level learning outcomes, reflections suggest that faculty have implemented changes to practice problems and to lecture discussions to more explicitly address these goals. For example, in short answer questions given in CHEM 12, students score significantly higher on the multiple choice aspect of a particular topic then they do when the multiple choice is accompanied by a short answer component in which the student is asked to explain "why" they selected their M/C answer. Answering "why" a chemical trend is observed requires analytic reasoning of a higher level than does memorizing the trend itself, yet understanding "why" a chemical trend is observed is what most directly serves the learning outcomes defined. Changes were made to CHEM 12 exams to minimize those questions in which trends were merely identified in favor of questions in which the reason for those trends were delineated.

Within the General Chemistry sequence, topics/skills essential to master in Chemistry 1A for success in Chemistry 1B and 1C have been identified and discussed. Faculty has worked to devote more time to these topics, in particular stoichiometric calculations and the concepts of energy flow/diagrams. In order to do this, we are now spending significantly less time on the first two chapters of the textbook. These two chapters cover basic concepts that students should already know as part of the course prerequisites. Unfortunately, this change has proven difficult for a number of students who enroll in the course, but still do not have adequate prerequisite skills/knowledge. Ongoing discussions and actions focused on ways to improve student equity are warranted.

In Chemistry 1B, the order of topics was modified in order to cover the topic of acid/base behavior and equilibrium mid-quarter instead of at the end of the quarter. Faculty identified this topic as one that students needed more time to assimilate; covering the topic and testing the students on it mid-quarter, and then requiring them to revisit the topic in order to prepare for the final exam, provides students with more time to synthesize the concepts and master the material. The end goal is to better prepare students for Chemistry 1C and for the Organic Chemistry sequence.

2. How do the objectives and outcomes in your courses relate to the program-level student learning outcomes and to the college mission?

Program Level Goal #1:
The first Program Learning Goal listed on the curriculum sheet for Chemistry is "Knowledge of current theories and applications in the field of chemistry"

Nearly every course objective offered in Chemistry is closely tied to this Program goal. Introductory Chemistry courses emphasizes the foundation upon which these theories can be built (ie numerical analysis, measurement, chemical structure), while General Chemistry courses begin a more rigorous discussion of these theories and applications, including discussions of phenomena unique to particular categories of chemistry (like solutions, gases, and acids and bases). Finally, the Organic Chemistry courses build upon the knowledge of equilibrium and chemical structure gained in General Chemistry to explore the relationship between structure and reactivity in simple organic molecules and in bio-active molecules. Assessments in all Chemistry courses are built to address this (and other) learning goals. Our course SLO's are all inextricably tied to this Program goal and the student learning analysis gleaned from analysis of the course SLO's reflect this program goal as well. As mentioned above, this goal is being met for those students that are successful in the course (but not for those who fail, which is generally 10-35% of students).

Program Level Goal #2:
The second Program Learning Goal listed on the curriculum sheet for Chemistry is "An enhanced ability to research, assess and evaluate topics of interest."

The laboratory experiences in Chemistry courses at Foothill College are particularly directed toward this goal. The labs are explicitly written to engage students in active inquiry-based experimentation. Students are asked to consider a question, pose a hypothesis and then obtain relevant data through direct interaction with matter. Students evaluate and assess the results of that data with every single laboratory experiment. They begin with simple questions in the Introductory Laboratories in order to gain an appreciation for the limitations of a given measuring device, then advance in General Chemistry courses to more sophisticated measurements like the energy changes or rates of chemical reactions. They evaluate data to validate existing theories or to develop their own. In Organic Chemistry students build on their knowledge of data analysis and further evaluate the interplay between thermodynamics, kinetics and the outcome of a chemical reaction as applied to familiar compounds like hydrocarbons, alcohols and sugars. These experiences all are directly aimed at enhancing the students' ability to research, assess and evaluate topics of interest.

Program Level Goals 3 and 4:
The third and fourth Program Learning Goalsl listed on the curriculum sheet for Chemistry are
"An enhanced ability to communicate effectively, both orally and in writing"

and, "Facility in the safe handling of chemicals and the execution of common laboratory techniques"

Every course in the Chemistry department contains learning outcomes consistent with these program goals. Expectations are that students prepare and maintain laboratory notebooks in addition to writing laboratory reports which include short-answer, essay questions. In addition, the laboratory component of every Chemistry course is geared explicitly toward allowing students the opportunity to gain skill in the safe handling of chemicals and in the correct use of laboratory equipment.

3. How has assessment of program-level student learning outcomes led to certificate/degree program improvements? Have you made any changes to your program based on the findings?

Faculty have worked to reinforce certain topics/skills taught in General Chemistry that have been identified as vital for students continuing on in the program to Organic Chemistry. In particular, topics taught in Chemistry 1A and 1B such as Lewis Structures, formal charges, thermodynamics, acid/base equilibrium and acid/base structure as related to acid/base strength have been more formally revisited by working them into the existing Chemistry 1C curriculum. It is anticipated that these changes will improve student success in the overall program.

4. If your program has other outcomes assessments at the program level, comment on the findings.

N/A

5. What do faculty in your program do to ensure that meaningful dialogue takes place in both shaping and evaluating/assessing your program's student learning outcomes?

Faculty engaged in teaching the same course generally work together to assess and refine student learning outcomes. However, we do not do enough to ensure that meaningful dialogue takes place within the department as a whole. This is something that we intend to introduce as an agenda item to future Chemistry department meetings. We believe that, among other things, greater discussion of SLO data among all faculty will help us to address our goal of improving the consistency of our course expectations, as described in Section 6 of this document.

6. Reviewing your most recent annual program reviews, discuss any emerging trends related to SLO reflections and any action taken.

SLO reflections reveal that our successful students are achieving many of the learning outcomes essential for their future academic success. However, it is the teaching and learning of higher-level analytic reasoning skills that poses the greatest challenge to us as educators. Shifts in our student population and increasing competition for UC admission has resulted in new challenges to full-time faculty, in that students are consumers looking not just for a good education, but also for high GPA's so that they may compete more effectively for transfer (or professional program) admission. As a

group, our instructors have noted concerns over a perceived decline in initial student preparedness, as well as concerns related to consistent achievement of student learning outcomes across full-time and part-time faculty. We have discussed potential approaches to ensuring minimum competency levels in chemistry concepts and math skills through the introductory and general chemistry sequence, but we continue to encounter students who are ill-prepared even after passing the pre-requisite course. This is an ongoing effort in the chemistry program that is hindered by the low ratio of full-time to part-time instructors and the lack of release time to design assessment instruments and coordinate data collection/analysis. As an example, there is only one full-time chemistry faculty who both teaches and serves as coordinator for the Chem 20 and Chem 25 introductory level courses. In a typical quarter, seven sections (over 200 students) of Chem 25 are taught by 3 or 4 different instructors, who are primarily part-time instructors. Over the course of an academic year, over 650 students will enroll in Chem 25; the majority will be taught by a part-time faculty with no responsibility for SLO assessments/reflections. To develop a meaningful program level assessment with only one full time faculty coordinating the introductory chemistry courses, additional resources, such as release time, will be needed to develop the appropriate data collection methodology, assessment approaches and allow time for analysis. A similar need exists for the General Chemistry sequence: a heavy reliance on part-time instructors puts a disproportionate load on the full time instructors for collecting and reviewing meaningful data on student outcomes across the program.

The Organic Chemistry program is smaller, with up to six sections offered by up to four instructors in any one quarter. SLO reflections show that students that make it through the entire sequence are meeting the Learning Objectives, but attrition rates are high. As with the first year courses, the performance levels are not consistent across all sections of the course. Full-time faculty are working hard to communicate expectations by sharing exams and other resources and by communicating regularly with part-time faculty. The added work load to train, coordinate, and review part-time faculty most definitely puts a strain on full-time faculty, and highlights the need for a paid coordinator position.

7. What summative findings can be gathered from the Program Level Assessments?

Faculty are taking steps to ensure that Program Level Assessments are met. Especially stressed is the goal to achieve "an enhanced ability to research, assess and evaluate." By the time students make it through the entire Chemistry sequence, they most certainly have achieved that goal (as evidenced by program learning outcomes). However, many students are lost along the way due in part to inconsistencies in course expectations and rigor among different instructors. In addition, the high numbers of international students presents the added challenge of English competency, which makes communication (and ultimately, success) more difficult. Full-time faculty are using their learning outcome reflections to affect meaningful and positive change, but are focused primarily on working with their own students and find it exceedingly difficult to control the outcome of another instructor's course. In summary, the Chemistry department is working hard to maintain high standards in both the lecture and laboratory components of their courses. While this presents ongoing challenges, Program Level Assessments provide evidence of the program's success.

Annual Action Plan and Summary: Using the information above, list the program's action steps, the related Core Mission objective, SLO assessment data and the expected impact on student success.

Action Step	Related SLO assessment (Note applicable data)	Related ESMP Core Mission Goals (Basic Skills, Transfer, Work Force, Stewardship of Resources)	How will this action improve student learning/success?
Change assessment strategies to require greater analytic reasoning (ie inclusion of more short answer questions)	An enhanced ability to research, assess and evaluate topics of interest	Transfer	Student learning will center on the development of critical thinking rather than simple content
Use SLO reflections to encourage greater consistency among different sections of a course	Knowledge of current theories and applications in the field of Chemistry	Transfer	More students will make it through to the next course in the chemistry sequence

Section 6: Program Goals and Rationale

Program goals address broad issues and concerns that incorporate some sort of measurable action and connect to Foothill's core missions, Educational & Strategic Master Plan (ESMP), the division plan, and SLOs. Goals/Outcomes are not resource requests.

List Previous Program Goals/Outcomes from last academic year: check the appropriate status box & provide explanation in the comment box.

Goal/Outcome (This is NOT a resource request)	Completed? (Y/N)	In Progress? (Y/N)	Comment on Status

Comply with all state and federal hazarouds waste regulations and maintain equipment in good working order.	Ongoing	Y	This is an ongoing goal. We were able to meet this goal last year, and intend to continue to do so
Have a trained Safety Coordinator on Staff	Ongoing	Y	Sherman Lee is currently undergoing training to further his role as Safety Coordinator
Maximize Student Enrollment to improve WSCH	Ongoing	Y	This effort is closely tied to general enrollment, which is currently static, and to success in prerequisite course, which is also currently static despite increased efforts toward student support

New Goals: Goals can be multi-year (in Section 7 you will detail resources needed)

Goal/Outcome (This is NOT a resource request)	**Timeline (long/short-term)**	**How will this goal improve student success or respond to other key college initiatives?**	**How will progress toward this goal be measured?**
Maintain existing high standards of laboratory experience	Long term	As technology expands and the expectations for lower division research-relevant laboratory experiences increase at four-year institutions nationwide, Foothill Chemistry students must gain skill in laboratory techniques commonly learned in the undergraduate chemistry laboratory. We must maintain current laboratory equipment on an ongoing basis.	Maintain articulation throughout the UC and CSU systems. Maintain current enrollment. Renewal of existing internship programs with neighboring four-year institutions
Create Honors course offerings	Short term (implement beginning in Fall 2016)	STEM courses are currently underrepresented in Honors Program. This program is not only valuable to students' learning experience, but is also a key factor in admission to impacted UC programs.	Implementation of new General Chemistry and Organic Chemistry Honors sequences
Introduce Research experience to advanced students prior to transfer	Long term		Implementation of planned research-oriented laboratory-based courses
Improve consistency of course standards and assessment results among full and part-time faculty	Long term	With so many part-time faculty teaching at multiple districts and with faculty time already fully committed, there is insufficient time devoted to the organization and training of new faculty.	Greater consistency in assessment results, more consistent preparation for next course in sequence courses Higher success rates

Section 7: Program Resources and Support

Using the tables below, summarize your program's unfunded resource requests. Refer to the Operations Planning Committee website: http://foothill.edu/president/operations.php for current guiding principles, rubrics and resource allocation information.

Full Time Faculty and/or Staff Positions

Position	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Was position previously approved in last 3 years? (y/n)
Tenure Track Chemistry Instructor	$75k + benefits	Expand Course Offerings and/or replace Victor Tam if he becomes full-time dean. Any future expansion in chemistry will be on the backs of adjunct faculty. Last year FT faculty covered only 33% of our sections. Additional FT faculties are needed to meet current demand and maintain consistency between the FT and PT instruction.	Yes
Full-time sabbatical replacement for K. Armstrong. (1 yr contract)	$55k + benefits	Full-time instructor Kathleen Armstrong is on sabbatical next year. We request a full-time replacement to cover the organic chemistry sequence. This request is especially important if interim dean Victor Tam (our only other organic instructor) becomes dean full-time.	No. Not requested.

Unbudgeted Reassigned Time (calculate by % reassign time x salary/benefits of FT)

Has the program received college funding for reassign time in the last three years? (y/n) NO	If yes, indicate percent of time.
Has the program used division or department B-budget to fund reassign time? (y/n) NO	

Indicate duties covered by requested reassign time:

Responsibility	Estimated $	Related Goal from Table in section 6 and how this resource request supports this goal.	Est hours per month	% Time

One Time B Budget Augmentation

Description	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Previously funded in last 3 years? (y/n)
Provide support and training for Sherman Lee, nighttime stockroom staff to become a certified lab safety trainer.	$2400	Improve consistency of safety training and make sure all new PT faculties are adequately trained prior to entering the laboratory.	Yes

Ongoing B Budget Augmentation

Description	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Previously funded in last 3 years? (y/n)
Service contracts for maintenance and/or monies for repairs of existing Instrumentation	$4500	Maintain Laboratory Standards	Yes
Chemistry Coordinator	$6000	Improve consistency of course standards and assessment results among full and part-time faculty. Provide a Safety Resource for all faculty.	Yes
Safety and Hazmat Training for Staff and Faculty	$1000	Maintain a safe environment for students and staff. Foothill has ceased providing this resource.	No

Facilities and Equipment

Facilities/Equipment Description	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Previously funded in last 3 years? (y/n)

19/22 standard taper glassware to replace broken items	24*$30ea=$720	Maintain Laboratory Standards	No
Polarimeter cells for optical rotation measurements	14*$210=$2940	Maintain Laboratory Standard	No
Vacuum Pumps for CHEM 30B to avoid contamination of house vacuum line	6*$726=$4356	Maintain Laboratory Standards	No
High Precision Calorimeter	$8000	Expand offerings into Honors Curriculum.	No

a. Please review the goals and resource requests that were granted over the last three years and provide evidence that the resource allocations supported your goals and led to student success.

New instrumentation has been introduced that has greatly enhanced the amount of hands-on experience that students are able to achieve. We now have two Nuclear Magnetic Resonance Spectrometers, and two Fourier Transform Infrared Spectrometers instead of just one. Not only do these instruments updated technology, but they enable more students to spend more time with the instrument in a given class period. San Jose State researchers report that our student interns (10 of them in the last two years) demonstrate mastery of these instruments as a result of this exposure.
New software obtained for the existing Gas Chromatographs have greatly simplified the analysis of the student-generated data and improved efficiency by eliminating the need that the old equipment required for repeated measurements.
A microwave induced plasma atomic emission spectrometer was purchased in 2013 and has been employed in the Chem 20 program for the analysis of metals in local environmental samples. Planned expansion of the use of this instrument include incorporation in the lab experience for Chem1C as well as longer term use in the planned research-based laboratory courses.

Section 8: Program Review Summary

Address the concerns or recommendations that were made in prior program review cycles, including any feedback from Dean/VP, Program Review Committee, etc.

Concern	Comments
The student population is changing to less prepared level of student. This refers both the domestic and International students. This will require more support from the PSME Center to fill the gaps.	We are now seeing this in chemistry 25 and chemistry 1A. The success rate seems to be suffering in both classes. Under prepared students are much more common. The societal push towards STEM careers may be pushing some students into educational pathways for which they have not received sufficient preparation at the K-12 level.
There is a decrease in the number of freshman registered for Chem 1A in fall quarter. This has a longitudinal impact on the chemistry transfer sequence as well as Biology that require Chem 1A as a prerequisite.	1A enrollments have stabilized for now. We seem to be in a holding pattern as far as enrollments are concerned. New course offerings, i.e. Chem 20, have not seen the enrollment we expected.
The growth in Chemistry has required a number of new PT faculty to be hired. The number of PT Chemists is at a new high. Because our labs are more advanced than other CC, the PT need additional training. To fill the fall and winter quarter demand, many PT have reached their 67% and will not be able to teach in spring.	No progress in this area. We are still chronically understaffed with full-time faculty.
FT Faculty has little spare time for professional development.	Significant time devoted to continual training of new PT faculty impacts the ability of FT faculty to engage in professional development.
FHDA has discontinued providing annual faculty Hazmat training and certification.	The chemistry coordinator could have picked up this duty but the coordinator position has been defunded. Suggest assigning this to the nighttime stockroom attendant, Sherman Lee.

Recommendation	Comments
Foothill needs outreach to local high schools to encourage STEM students to register at Foothill. If this does not occur, 2014 Fall will have a lower enrollment in Chemistry courses.	Collaborated with Eastside High School in East Palo Alto to offer chemistry 25 on their campus last summer. This was a great success and we will continue this next quarter.

Need to have additional FT support to recruit and train new PT Faculty.	A new hire was added this year. But with Victor Tam now Dean we have made no progress in increasing the FT faculty staffing while PT faculty continues to grow.
Provide quarter incentive to identify meaningful PD for the chemists.	No progress in this area.
Need FT Chemist to take responsibility for annual Hazmat training and certification.	With the defunding of the chemistry coordinator position this duty has been neglected. Without a chemistry coordinator, this should be shifted to the nighttime stockroom staff, Sherman Lee.

1. After reviewing the data, what would you like to highlight about your program?

The chemistry program at Foothill College offers students an exceptional experience in undergraduate chemistry instruction. The lab facilities and support staff are the best in the bay area, complementing our instructional pedagogy perfectly. We have room for expansion, administrative support for new technologies, and a superior full-time staff that strives to put the students first.

Section 9: Feedback and Follow Up

This section is for the Dean to provide feedback.

1. Strengths and successes of the program as evidenced by the data and analysis:

The Chemistry Department has a consistent success rate of approximately 75% while enrollment has grown in nearly all courses over a 3-year period. Productivity remains steady and the vested interest in student success causes full-time faculty to spend a significant amount of time and energy training and mentoring adjunct faculty. All of these are evident from the following:

1. Faculty are involved in numerous activities outside of the classroom including the PSME Center, NSF S-STEM Scholarship, Financial Aid Scholarship Screening, PSME Awards Show, ACS Student Affiliate Club, ACS Santa Clara Valley Meetings, and student mentoring.
2. FT faculty responsible for specific discipline areas help train and provide direction to new adjunct faculty teaching those courses.
3. Lab content and experiments are continually updated to incorporate new instrumentation, teaching pedagogy and increase student enthusiasm.
4. Faculty hold additional office hours, final exam reviews and workshops to help with student learning.
5. The Department consistently has high marks in annual hazardous waste inspections from outside and internal auditors.
6. The faculty are involved and enthusiastic in developing additional courses that help with student success in all areas including an honors Chem 1A,

a new Chem 12C instrument and projects-based honors lab, and Chem 9 (Introduction to Chemistry through Cooking) for non-science majors.

2. **Areas of concern, if any:**

1. Faculty expertise and staffing for the Chem 12A/B/C Organic Chemistry sequence is in flux. Depending on if Victor Tam is appointed PSME Dean, during the 2015-2016 academic year, no FT faculty member will be running the Chem 12 series because Kathy Armstrong, the only other FT faculty with organic chemistry experience, will be on PDL.
2. As the Chemistry Department continues steady growth, a number of adjunct faculty need to be hired each year. Due to the advanced instrumentation and labs the Department has established, in comparison to other regional community colleges, adjunct faculty need extensive training, placing a burden on FT faculty.
3. Experienced adjunct faculty reach their 67% maximum load by the end of Winter quarter, requiring a large number of new PT faculty members to be hired in the Spring. This causes many of the Spring quarter courses to be taught by new, inexperienced adjunct faculty members.
4. The lack of a funded Department Chair position limits the amount of coordination between faculty in different areas, communication between lab staff and faculty, and training of faculty on instrumentation, hazardous waste regulations and teaching pedagogy.
5. The maintenance, replacement and upgrading of laboratory equipment and consumables is a relatively large annual cost.

3. Recommendations for improvement:

1. To fill the void left by Kathy Armstrong and Victor Tam, in 2015-2016 AY, a full-time, temporary faculty member should be hired to help manage the organic chemistry series for the year. Current chemistry faculty have limited experience or expertise on the instrumentation and experiments required to run the Chem 12A/B/C sequence. If Victor Tam remains Dean, a FT faculty position is HIGHLY recommended as a replacement hire.
2. Allocate funding for a laboratory coordinator (either as a stipend or new employee) to help with training adjunct faculty on instrumentation. This position can be tied to a Department Chair that helps with developing teaching skills for new adjunct faculty.
3. Hire an additional FT faculty member to enhance course consistency. In 2013-2014, 65% of classes were taught by adjunct faculty (meaning only 35% were taught by FT faculty members).
4. Increased B-Budget to fund a Department Chair to help with coordination of FT faculty, training and mentoring of adjunct faculty, laboratory staff, hazardous materials regulations, and developing quarterly teaching seminars.

5. Increased B-Budget to purchase or replace equipment to match the new, advanced curriculum being developed by faculty. With the development and implementation of CHEM 1AH, CHEM 12CH and CHEM 9 on the horizon, a sizeable amount of funding will be required. Although maintenance contracts are too expensive to sustain, preventive service should still be funded to a smaller extent.

This section is for the Vice President/President to provide feedback.

4. Strengths and successes of the program as evidenced by the data and analysis:

The Chemistry faculty are a dedicated and talented group. Their curriculum is up to date, and they are very innovative in their pedagogy. A Chemistry faculty member serves on the CCC, and has served as a reviewer statewide for CID. The department is actively participating in planning for the ADT.

5. Areas of concern, if any:

The three areas of concern are the disparity in success rates for underrepresented students, the training for the lab technician and the learning outcomes assessments. With regards to the training, I believe this was approved last cycle. Perhaps this was not completed due to the transition of the dean?
With regards to the SLO assessments the discussion in this document is not clear. However, the goals described in this review related to the SLOs are excellent and well focused.

6. Recommendations for improvement:

It would be beneficial to delve more deeply into the disparity in success rates, as it is a significant gap. Perhaps some of the interventions being implemented with the help of Student Equity Funds may be helpful.

7. Recommended Next steps:

_X__ Proceed as planned on program review schedule
___ Further review/Out of cycle in-depth review

Upon completion of section 9, the Program Review should be returned to department faculty and staff for review, then submitted to the Office of Instruction and Institutional Research for public posting. See timeline on Program Review Cover Sheet.

Unit Course Assessment Report - Four Column

Foothill College

Department - Chemistry (CHEM)

Mission Statement: The mission of the Chemistry Department is to provide undergraduate education founded on a rigorous, applied treatment of chemistry fundamentals coupled with application of modern analytical equipment and techniques to prepare students for transfer to a four-year university or allied-health program.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 100 - CHEMISTRY STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100 - CHEMISTRY STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100X - CHEMISTRY STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100X - CHEMISTRY STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:**			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Active			
Department - Chemistry (CHEM) - CHEM 100Y - CHEMISTRY STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100Y - CHEMISTRY STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Organic Molecule Structure - Predict the thermodynamic stability of Organic Compounds based on their structure (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Rank the stability of six organic compounds. Assign equal credit for each successive pair of compounds (five relative comparisons for six compounds) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 78% average class score		
	Assessment Method: Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Over 70% of the class can correctly rank at least four out of the five intermediates correctly.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Acidity - Utilizing theories that affect product stability, predict the relative acidity/reactivity of organic compounds with similar molecular structure and/or functional groups. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 12/13/2011 **Course-Level SLO Status:** Active	**Assessment Method:** Embedded ranking question on final exam: For a series of five organic compounds, rank their relative acidity in decreasing order. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 50% of student perfectly rank all 5 compounds **Related Documents:** Fall 2011 - Chem 12A SLO 01	12/11/2013 - This question was worth 16 points (4 relative rankings for 5 compounds). Of 38 students, 7 students (18%) received full credit (16/16); 14 students (39%) missed one ranking; 10 students (26%) missed two; 5 students (13%) missed three and 2 students (5%) missed all of them. Average score was 64% **Result:** Target Not Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** None **Resource Request:** None **GE/IL-SLO Reflection:** This learning outcome addresses the Critical thinking Institutional learning outcome. The 64% average reveals that students are less capable in the synthesis and evaluation of complex information than we would hope. **GE/IL-SLO Reflection:** This learning outcome addresses the Critical thinking Institutional learning outcome. The 64% average reveals that students are less capable in the synthesis and evaluation of complex information than we would hope.	
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Reactivity - Predict the products of reactions involving organic compounds (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:**	**Assessment Method:** Embedded series of open-ended questions on final exam: A series of 7 complex organic reactions where students must predict the product, taking into account stereochemistry and other considerations. Each question is worth 5 points (total of 35 points), with simple mistakes (usually with	12/11/2013 - The class average for the "predict the product" portion of the Final exam in F13 was 80% (31.9 out of 40 possible points). Scores ranged from a low of 11(27.5%) to a high of 40 (100%). The overall exam average was 68%, which demonstrates the lower level of difficulty for these kinds of problems.	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
09/24/2012 **Course-Level SLO Status:** Active	stereochemistry) results in only 3 points being awarded. Evidence of no understanding of the reaction or mechanism resulted in 0 points being awarded. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70% overall average (24.5 points out of 35 points). **Related Documents:** Fall 2011 - Chem 12A SLO 02	**Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **Resource Request:** none **Resource Request:** none **GE/IL-SLO Reflection:** This result demonstrates a competency in synthesis and evaluation of information, which is a key component to the institutional learning outcome of COMPUTATION **GE/IL-SLO Reflection:** This result demonstrates a competency in synthesis and evaluation of information, which is a key component to the institutional learning outcome of COMPUTATION **GE/IL-SLO Reflection:** This result demonstrates a competency in synthesis and evaluation of information, which is a key component to the institutional learning outcome of COMPUTATION	
	Assessment Method: Embedded M/C question on Final Exam **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 85%		
	Assessment Method: Embedded question on Final exam: Ask students to rank the reactivity of several organic compounds with reference to a specific reaction (ie acid-base or Nucleophilic Substitution) Assign equal credit to each successive ranking comparison. **Assessment Method Type:** Exam - Course Test/Quiz		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Target for Success: 80% overall score		
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Stereochemical Reaction - Determine the stereochemical outcome of a chemical reaction based on its mechanism. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Multiple Choice question embedded on Final exam Students must identify products formed in a chemical reaction as 2 enantiomers 2 diastereomers 4 stereoisomers a single stereoisomer a single achiral compound **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% of students correctly identify stereochemical outcome of reaction		
	Assessment Method: Imbedded multiple choice question on the final exam asking students to determine if an alkene results in a racemic mixture after being subjected to 5 different reagents. Question; Which of the following reactions would result in a racemic mixture when combined with (E)-3-methylpent-2-ene? (Circle ALL that apply). a. catalytic hydrogenation (H2/Pd catalyst) b. epoxidation followed by acid hydrolysis (i. mCPBA; ii. H+, H2O) c. hydroboration (i. BH3, ii. 3 NaOH, 3 H2O2) d. ozonolysis (i. O3, ii. Zn, AcOH) e. dihydroxylation (i. OsO4, ii. NaHSO3, H2O) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% of the class scores either a perfect or chooses 4 out of 5 reactions correctly.	03/26/2014 - 21/49 students received full credit for this question. 18/49 missed just one. This equates to 79.6%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **GE/IL-SLO Reflection:** This assessment required students to synthesize and apply knowledge to solve a problem. Their success in meeting the goal suggests that we are successfully addressing the critical thinking institutional learning outcome.	09/21/2014 - In future assessment method should include the product identification as well. It is clear that some students did not know the correct product structure, but were still able to guess the correct stereochemistry (racemic or not)

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Chemical Reaction Outcome - Effectively write an electronic mechanism accounting for the outcome of a chemical reaction. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Final Exam short answer mechanism question : Question should be closely related to the following: "Use curved-arrow formalism to show the mechanism of the following chemical transformation. Show every step in sequence including all proton transfer steps. Include all non-bonded electrons and formal charges." **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Class average of 77% of question points awarded	03/26/2014 - 49 students completed two mechanism questions in W2014. The average score was 25.4/35=73% The high standard deviation (8) for the average reveals that some very low scores influenced the outcome. Low score on this question was 6.5/35.High was 35/35. **Result:** Target Not Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** None **Resource Request:** None **GE/IL-SLO Reflection:** Although the class average fell short of target, this assessment addresses the institutional learning outcome of Creative, Critical and Analytical thinking. This assessment shows that most students are successfully reaching this goal. **GE/IL-SLO Reflection:** Although the class average fell short of target, this assessment addresses the institutional learning outcome of Creative, Critical and Analytical thinking. This assessment shows that most students are successfully reaching this goal.	09/21/2014 - In future median should be measured in addition to mean in order to best assess class performance in cases where there are a few scores far outside of mean.
	Assessment Method: Embedded final exam question; open-ended where the student must provide a detailed, stepwise mechanism to account for the synthesis of BPA from acetone and two equivalents of phenol. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Due to the extreme difficulty of this question,		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	the target for success will be if a student earns at least 50% of the available points (20 points).		
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Themodynamics and Kinetics - Understand the role thermodynamics and kinetics plays in the outcome of a chemical reaction. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Final exam question addressing Kinetic vs Thermodynamic control in 1,2 vs 1,4 addition to conjugated dienes **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% of students correctly answer question		
Department - Chemistry (CHEM) - CHEM 12C - ORGANIC CHEMISTRY - Organic Target Molecules - Design a concise, logical chemical synthesis of an expanded array of organic target molecules from simple precursors. (Created By Department - Chemistry (CHEM)) **Start Date:** 04/04/2011 **End Date:** 06/24/2011 **Course-Level SLO Status:** Active	**Assessment Method:** An open-ended question embedded during the final exam that provides the student a complex target molecule, which must be synthesized from simple starting material. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Out of 20 possible points, and a 3 point deduction for each error in the student's synthetic scheme, students scoring around 17 points would be considered proficient at synthesis. **Related Documents:** Chemistry 12C - Synthesis 01		
	Assessment Method: Students are given a series of reactants and products and asked to propose a reaction sequence that will result in the transformation shown in high yield. Four such questions were grouped together on S14 final exam for a total of 40 points. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:**	06/25/2014 - Class average (36 students) for these four questions was 30.6/40 = 76.5%. Median was 32/40 = 80%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **GE/IL-SLO Reflection:**	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Partial credit is highly subjective and difficult to award given the limited number of strategies available for these particular syntheses. An average of 75% suggests that the class demonstrates a satisfactory proficiency in solving these challenging problems. **Related Documents:** synthesis problems	Success with this assessment method requires a high level of synthesis, evaluation and creativity. The class performance reveals that students have successfully reached the Institutional Learning outcome of Creative, Critical and Analytic thinking.	
Department - Chemistry (CHEM) - CHEM 12C - ORGANIC CHEMISTRY - Organic Molecule Reactivity - Recognize structural features of organic molecules important to their reactivity. (Created By Department - Chemistry (CHEM)) **Start Date:** 04/04/2011 **End Date:** 06/24/2011 **Course-Level SLO Status:** Active	**Assessment Method:** A series of embedded, open-ended question on the final exam where the student must predict the product of multi-step chemical reactions. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Six questions (worth 5 points each, total 30 points) will be assessed. Answer are worth partial credit if slight errors are made (approximate 2 point deduction per error). An average of 21 points would consider the student proficient and knowledgeable of various reactivity theories. **Related Documents:** Chemistry 12C - Reactions 01		
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Graphing and Data Analysis - A student who successfully masters the material in Chemistry 1A at Foothill College will be able to read and interpret graphs and data. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 06/30/2014	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format.Three questions were assessed. Two questions involved differentiating between physical and chemical properties/changes using given experimental descriptions/data. One question required students to read and interpret an Enthalpy Diagram. **Assessment Method Type:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Course-Level SLO Status: Active	Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Two MasteringChemistry online HW questions were used to assess students' ability to interpret data. Question #1 had students reason about a set of experimental data to determine whether a physical or chemical change had taken place. Question #2 had students analyze a set of density data and reason about precision and accuracy of the datasets. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted with a participation rate of 90%.		
	Assessment Method: MasteringChemistry online HW questions were used to assess students' ability to interpret data. Question #1 had students analyze a set of density data and reason about precision and accuracy of the datasets. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted.	10/08/2014 - 59 students completed the Item "Measurements: Accuracy and Precision" on the Chapter 1 Online MasteringChemistry HW assignment. Students were allowed multiple attempts per question, but were deducted for incorrect answer submissions. On this question, students scored an average of 94.9% on the first part, and 98.3% on the second part, and the target was met. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	10/08/2014 - A quiz or exam question on these concepts may be a more accurate assessement of student understanding of this material. It is unknown if some students are sharing answers or working together when answering these questions.
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Applying Scientific Method - A student who successfully masters the material in Chemistry 1A at Foothill College will apply the scientific method in lab experiences to interpret information and draw conclusions.	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Three questions were assessed. Two questions involved differentiating between physical and chemical properties/changes using given experimental descriptions/data.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
(Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 06/30/2014 **Course-Level SLO Status:** Active	One question required students to determine the amount of liquid contained in two different graduated cylinders to the correct precision of the device. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: In one of the laboratory experiments in Chemistry 1A, the density of 7up and Diet 7up was investigated. Students were asked at the beginning of class to write down their hypothesis as to which had the greater density. During the end of the data analysis period on day 2, a class discussion was held to interpret results. Students were subsequently asked to write down on the report sheet how their resulting data matched with their initial hypothesis. **Assessment Method Type:** Discussion/Participation **Target for Success:** The quality of discussion was assessed to gauge student understanding. The written lab work was assessed to see if students successfully evaluated their hypothesis. A success rate of 90% was targeted for the written lab work.		
	Assessment Method: A question from the MasteringChemistry online HW assignment was used to assess understanding of the scientific method. In the question, a scenario is presented and students are asked to apply the scientific method to arrive at some conclusions about the task. (see notes for scenario). **Assessment Method Type:** Exam - Course Test/Quiz	10/08/2014 - 57 students answered the question. For the 3-part question, 100% of the students were able to select the correct answer before their attempts expired. For the 3 multiple choice question parts, there were only 0.4, 0.2 and 0.9 wrong attempts per student. All students were able to eventually ascertain that the experimenter should perform experiments to test the hypothesis, collect data and refine their hypothesis as needed. **Result:** Target Met	10/08/2014 - A quiz or exam question on this same concept may yield more accurate data on student understanding of this topic. It is unknown if some students are sharing answers or working together when solving these questions.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Target for Success: A average score of 80% was targeted.	**Year This Assessment Occurred:** 2013-2014	
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Critical Thinking Skills - A student who successfully masters the material in Chemistry 1A at Foothill College will demonstrate the ability to think critically and employ critical thinking skills. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 06/30/2014 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Seven different questions were used. The questions chosen addressed a variety of critical thinking skills. Students were required to correctly record a measurement and access its precision, to complete a multistep dimensional analysis problem, to interpret and draw conclusions from diagrams, to interpret and draw conclusions from videos/animations and to correctly describe/interpret energy transfer. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Scores on written questions administered during in-class midterm and final exams were used to assess students' critical thinking skills. Questions were chosen that pushed students' analytical reasoning skills. Question #1 was from the second midterm and asked students to reason and calculate all species present in a final solution. This was a complex problem and involved reasoning skills in a limiting reagent problem. Students had to analyze each of four species, and keep track of quantity reacted and state of matter, performing concentration calculations. Question #2 was from the final exam and students applied their knowledge of thermochemistry to an applied context of a scientist designing a		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	new product, a cold pack. Students had to reason with the experimental design limited by the supplied parameters. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** All students participated in the in-class exams. An average score of 80% was targeted for each item.		
	Assessment Method: Scores on written questions administered during in-class midterm and final exams were used to assess students' critical thinking skills. Questions were chosen that pushed students' analytical reasoning skills. Question #1 was from the second midterm and asked students to reason and calculate all species present in a final solution. This was a complex problem and involved reasoning skills in a limiting reagent problem. Students had to analyze each of four species, and keep track of quantity reacted and state of matter, performing concentration calculations. Question #2 was from the final exam and students applied their knowledge of thermochemistry to an applied context of a scientist designing a new product, a cold pack. Students had to reason with the experimental design limited by the supplied parameters.(See attached for exact questions asked) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted. **Related Documents:** Q3_critical_thinking.pdf Qfinal_critical.pdf	10/08/2014 - For Question #1, 55 students answered the question. The average score was 22.3/28, and the 80% target was met. For Question #2, 56 students answered the question. The average score was 28.1/36 = 78%. The target was not met, but the performance was very close to the target value. **Result:** Target Not Met **Year This Assessment Occurred:** 2013-2014	10/08/2014 - Students performed well on the solution stoichiometry question (#1), but an average score of only 78% was achieved for the thermochemistry question. This may indicate a need to spend more time in lecture covering concepts of energy in chemical reactions and heat transfer.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Quantitative/Critical Thinking Skills in General Chemistry - A student who successfully masters the material in Chemistry 1A at Foothill College will demonstrate the quantitative skills needed to succeed in General Chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 06/30/2014 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Seven different questions were used. The questions chosen addressed a variety of skills. The questions included a multistep dimensional analysis problem, unit conversions between mass/molecules/moles, stoichiometric calculations, calculations involving energy and problems related to quantum chemistry. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Scores on written questions administered during in-class midterm and final exams were used to assess students' quantitative and critical thinking skills. These questions were complex and highly mathematical, integrating varied concepts from the course. Question #1 was from the third midterm and dealt with the Bohr model of the Hydrogen atom, electron energy levels, and ionization energy, all parts consisted of varied quantitative calculations. Question #2 was from the final exam and consisted of determining an empirical formula from given combustion data. This involved many conversions and multi-part calculations. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** All students participated in the in-class exams. An average score of 80% was targeted for each item.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Assessment Method: A short pop quiz was given in class to test student understanding of conversion factors and dimensional analysis. See attached file for questions asked. The quiz was scored out of a total of 5 points. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted with a participation rate of 90%. **Related Documents:** Quiz_011614.pdf	10/08/2014 - 45 students took the pop quiz in lecture (out of a total of 56 students who were enrolled at the time of the quiz). Thus the participation rate was 80%. The average score on the quiz was a 3.9/5 = 77% **Result:** Target Not Met **Year This Assessment Occurred:** 2013-2014	10/08/2014 - I think the participation target was probably set too high. An 80% participation during lecture is still a good result, with 77% average on the quiz very close to the target. For future SLO assessments, it may be better to use scheduled exams that students know about ahead of time to improve the participation rate. Overall, the results of the quiz were very close to the target.
Department - Chemistry (CHEM) - CHEM 1B - GENERAL CHEMISTRY - Quantitative Skills in General Chemistry - Global: Demonstrate the quantitative skills needed to succeed in General Chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Online homework through Mastering General Chemistry, by Pearson. **Assessment Method Type:** Departmental Questions **Target for Success:** Succes would be B-, 78% percentage score. This reflects the ability of an average 1B student.	10/10/2014 - The use of mastering Chemistry to asses students Quantitative skills seems to be very reflective of the student population. We use a series of mathematical based questions that involve several steps and analysis. We used 104 questions from the online homework. There was 71.3% completion with an average score of 93.4%. This meets our target success of 78%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** Noe at this time.	
Department - Chemistry (CHEM) - CHEM 1B			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
- GENERAL CHEMISTRY - Graphing and Data Analysis - Global: Read and interpret graphs and data. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Online homework through Mastering General Chemistry, by Pearson. **Assessment Method Type:** Departmental Questions **Target for Success:** Succes would be B-, 78% percentage score. This reflects the ability of an average 1B student.	10/10/2014 - We used 24 questions from the homework data base. The average score was 93.4% with 69.7% participation. Participation is low so the average score may be skewed to a higher than normal value. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** None at this time.	
Department - Chemistry (CHEM) - CHEM 1B - GENERAL CHEMISTRY - Critical Thinking Skills - Global: Demonstrate the ability to think critically and employ critical thinking skills. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Online homework through Mastering General Chemistry, by Pearson. **Assessment Method Type:** Departmental Questions **Target for Success:** Succes would be B-, 78% percentage score. This reflects the ability of an average 1B student.	10/10/2014 - We used a homework set of 46 problems coverall all chapters and subjects. Th average score was 88.2 with 64.6% completion rate. This is the most difficult of the assessments for the students as reflected in the low participation rate. We are pleased with the results as this 1B class performed below average compared to previous quarters. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		Resource Request: None at this time.	
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Electrochemistry - Computation - A successful student will demonstrate the ability to think critically and employ computational skills in the analysis of redox reactions and chemistry. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Online course homework. **Assessment Method Type:** Departmental Questions **Target for Success:** An average of 75% for the class.		
	Assessment Method: Chemistry 1C Final Exam - Multiple Choice Question. The standard emf for the cell using the overall cell reaction below is +2.20 V: 2Al(s)+3I2(s) ?> 2Al3+(aq)+6I-(aq) The emf generated by the cell when [Al3+] = 4.5 ! 10-3 M and [I-] = 0.15 M is ? V. A) 2.23 B) 2.39 C) 2.20 D) 2.10 E) 2.30 **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** This is a difficult problem. A 70% success rate would be terrific!		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Solubility of Salts - Critical Thinking - A successful student will demonstrate the ability to make connections between concepts across several areas of General Chemistry as applied to salt solutions. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Online course homework. **Assessment Method Type:** Departmental Questions **Target for Success:** An average of 75% for the class.		
	Assessment Method: Chemistry 1C Final Exam - Multiple Choice Question. The Ksp for Zn(OH)2 is 5.0x10-17. Determine the molar solubility of this salt in		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	a buffer solution with a pH of 11.50. A) 5.0x10-12 B) 5.0x10-17 C) 2.3x10?6 D) 1.6x10-14 E) 1.2x10-13 **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** An average of 70% correct for the class.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Nuclear Chemistry - A successful student will demonstrate an understanding of the impact of science on society in the area of nuclear chemsitry. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Online homework. **Assessment Method Type:** Departmental Questions **Target for Success:** An average of 75% for the class.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Colligative Properties - Critical Thinking - A successful student must be able to recognize the types of salts presented as strong or non-electrolytes. Secondly, perform the required critical thinking/mathematical analysis of the experimental data to select the one salt that satisfies the conditions given. (Created By Department - Chemistry (CHEM)) **Start Date:** 06/26/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Chemistry 1C Final Exam - Multiple Choice Question. A 1.35 m aqueous solution of compound X had a boiling point of 101.4°C. Which one of the following could be compound X? The boiling point elevation constant for water is 0.52°C/m. A) C6H12O6 B) CH3CH2OH C) KCl D) CaCl2 E) Na3PO4 **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 75% correct would be considered acceptable given the difficulty of the problem.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE	**Assessment Method:** Students were asked the following question		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
ANALYSIS - Laboratory Techniques - Students will demonstrate an understanding of how to execute common laboratory techniques. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active	on an open lab notebook lab exam: You need to prepare 100 ±1 mL of a buffer that is 0.15 M acetic acid and 0.40 M sodium acetate. The reagents that you have available are 1.00-M HCl, and solid sodium acetate trihydrate. Write step by step instructions on how to prepare the buffer using appropriate lab equipment. (Note that students calculated the reagent amounts in a previous part of the question. Incorrectly calculated amounts of reagents did not impact grading of this part of the question.) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** This question was assessed out of 4 points. Individual students were considered successful if they earned at least 3 out of the 4 points, or 75%. Target for success was 80% of the class earning a minimum of 3 out of the 4 points possible.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Identification of ions in solution-Scientific inquiry and lab techniques - Successful students will illustrate separation and identification schemes using flow diagrams and apply principles of aqueous solubility equilibria to separate and identify the ions in a solution. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active	**Assessment Method:** One of the most demanding requirements in Foothill's Chemistry 1C laboratory program is the qualitative analysis of a small sample of a solution containing six different unknown cations, an individual project that spans the last four weeks of the course. Student results for correct identification of the ions in their sample solution during spring quarter of 2014 were tabulated and summarized. **Assessment Method Type:** Class/Lab Project **Target for Success:** Students who earn a passing grade in Chemistry 1C should have developed the skills needed to identify at least 5 out of the 6 ions correctly. Target for success is set at	10/10/2014 - A total of 38 students passed the class; 22 of the passing students correctly identified all 6 ions and 15 of the passing students correctly identified 5 out of the 6 ions in their sample solution. Thus, 97.4% of passing students correctly identified at least 5 out of the 6 ions. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** Preparation of the individual unknown samples and the reagents needed for analysis is labor intensive for the stockroom personnel. Continued support of the stockroom with the current level of at least 2 technicians is needed.	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	90% of passing students achieving this goal.		
Department - Chemistry (CHEM) - CHEM 20 - I MATTER: AN INTRODUCTION TO GREEN CHEMISTRY - The chemistry of water and the environment - Students will be able to describe the key chemical properties of water and critically discuss environmental issues related to humanity's use of water (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/23/2013 **End Date:** 06/27/2014 **Course-Level SLO Status:** Inactive	**Assessment Method:** Data from selected homework or exam questions will be analyzed **Assessment Method Type:** Departmental Questions **Target for Success:** 80% achievement of satisfactory scores.	09/27/2014 - Student progress in mastering chemical and environmental aspects of water was monitored via their results in the adaptive learning portion of the online homework (LearnSmart) for the text. Overall achievement for the class was 73 and 73% for the two water related chapters in the book. This is below the 80% target, however a closer examination of the results reveals that a number of students did not attempt or did not complete the online homework. For students that completed the modules, scores were well above the target. **Result:** Target Not Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **GE/IL-SLO Reflection:** This is below the 80% target, however a closer examination of the results reveals that a number of students did not attempt or did not complete the online homework, which reduced the overall class score. For students that completed the modules, scores were well above the target. This was a very small class (17 students) with generally weak preparation in science and math. Several students were active contributors in class and laboratory work, but did not display the discipline to complete the homework assignments.	
Department - Chemistry (CHEM) - CHEM 20 - I MATTER: AN INTRODUCTION TO GREEN CHEMISTRY - Principles of Green Chemistry - Students will be able to describe the principles of sustainability as they relate	**Assessment Method:** Student progress will be assessed using an online adaptive learning homework system or selected exam questions. **Assessment Method Type:**	09/27/2014 - Student progress in the principles of sustainability as they relate to green chemistry via their results in the adaptive learning portion of the online homework (LearnSmart) for the text. Green	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
to green chemistry and assess their application in environmentally significant chemical processes. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/23/2013 **End Date:** 06/27/2014 **Course-Level SLO Status:** Inactive	Data **Target for Success:** Overall class scores of 75 to 80% on relevant learning modules.	chemistry concepts were covered in the initial text chapter and online homework module. Overall achievement for the class was quite high: 15/17 students completed the module with scores of 100%. The remaining two students did not attempt or did not complete the assignment **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **GE/IL-SLO Reflection:** Student interest in the concepts of green chemistry was quite high n the beginning of the course, but a substantial proportion of students had very weak quantitative and problem solving skills. Although homework completion rates were quite high initially, participation dropped as the quarter progressed, possibly reflecting a lack of disciplined study skills or a loss of engagement with the online system. Class participation and engagement in both lecture and lab sessions was consistently high, but the benefit gained via the online homework component was disappointing.	
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Physical and Chemical Properties and Change - The students will be able to identify physical and chemical properties and change (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Results from selected assignments in the online homework system will be compiled and reviewed. **Assessment Method Type:** Departmental Questions **Target for Success:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Dimensional Analysis - The students will be able to use dimensional analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Results from selected assignments in the online homework system will be compiled and reviewed. **Assessment Method Type:** Departmental Questions **Target for Success:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.		
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Mole and Avogadro's Number - The students will understand the meaning and uses of the mole and of Avogadro's number. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Results from selected assignments in the online homework system will be compiled and reviewed. **Assessment Method Type:** Departmental Questions **Target for Success:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.	09/27/2014 - A multi-part exercise (Conversions involving moles) designed to assess the student's understanding of the concept of the law of conservation of mass and the mole to mass conversions necessary to use this law was selected for the assessment. The correct response rate for Foothill Chem 25 students continued to be 96% for this exercise, compared with 90% for the Mastering Chemistry database. This suggests most students are able to develop a solid understanding of this concept and are able to perform the simple unit conversions necessary to complete the exercise. Based on a review of incorrect answers submitted during the assignment, most errors involved incorrect calculations of numbers with exponents and a failure to predict/recognize an answer that is too large or small to make physical sense. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **GE/IL-SLO Reflection:** Students in Chem 25 have a wide range of math competencies, which impacts their	09/27/2014 - In future terms, students will be directed to practice worksheets on dimensional analysis and scientific notation on the course website to allow targeted practice of areas of weakness. The concept of estimating answers and evaluating calculated results for physical feasibility will be stressed during in class problem solving.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		success in mastering necessary problem solving skills in chemistry. Though almost all students ultimately answered this series of questions correctly, the incorrect responses provide some insight into ways to improve student outcomes. In future terms, students will be directed to practice worksheets on dimensional analysis and scientific notation on the course website to allow targeted practice of areas of weakness. The concept of estimating answers and evaluating calculated results for physical feasibility will be stressed during in class problem solving.	
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Comprehension of chemical reactivity and quantitative relationships in chemical equations - Students will be able to recognize basic patterns of chemical reactivity, express reactions in terms of balanced equations and be able to determine quantities of reactants and products in terms of moles, mass and volumes of solutions. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 03/30/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Performance on relevant homework exercises completed using Mastering Chemistry (online homework site) was assessed for all or selected sections of Chem 25 for the relevant term. Foothill performance was also compared to system data available for students that answered the specific problem from all institutions using the Mastering Chemistry system. **Assessment Method Type:** Departmental Questions **Target for Success:** At least 80% of students who completed the questions should be able tocomplete the selected exercises correctly. Foothill performance should be at least as good as the system data.	09/27/2014 - Students were required to complete two multi-part exercises on solubility and precipitation reactions (“PHET Simulation” and “Solubility and Precipitation Reactions”. The exercises included writing and balancing the relevant chemical equations, as well as predicting whether the solubility of the products would result in a precipitate as one of the products. The questions was answered correctly by 91 and 96% of the Foothill students compared with 79 and 88% correct response rates in the system database, indicating the target for success was met. The higher success on the second exercise is likely due to repetition of the concept within the homework assignment, since it one of the last problems in the homework assignment. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** none **GE/IL-SLO Reflection:** The scores were quite high for this exercise, indicating students are mastering the	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		concepts of precipitations reactions, solubility and how to interpret the information given in a solubility table. Incorrect answers suggested there was a slight learning curve in using the solubility table, but that students mastered the concepts with repetition within the exercise.	
Department - Chemistry (CHEM) - CHEM 30A - SURVEY OF INORGANIC & ORGANIC CHEMISTRY - Measurements and Equipment - Students will be able to use common laboratory equipment correctly and report measurements to the correct significant figures with proper units. Equipment includes Bunsen burners, beakers, graduated cylinders, thermometers, top loading balances, rulers and burets. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** The following problem for SLO#2 is used in the online homework grading system (Mastering Chemistry) for students enrolled in Chemistry 30A. These homework assignments are used as a pretest in preparation for course exams. Problem #90 from Chapter 1: Which choice best describes the uncertainty in the measurement 16.30 g? A. cannot be determined B. quantity is exact C. +/- 0.01 g D. +/- 0.10 g E. +/- 1.00 g **Assessment Method Type:** Pre/Post Test **Target for Success:** Students who are able to correctly answer this question have mastered SLO #2. Overall success is indicated by a minimum of 70% of students successfully completing this problem.	06/23/2014 - Data from the online homework for Chemistry 30A section 01 from Spring 2014 was used to assess this SLO. 100% of the 34 students enrolled in the course were able to correctly answer this homework problem in the online homework assignment. This shows that the target was met for this SLO. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	
Department - Chemistry (CHEM) - CHEM 30A - SURVEY OF INORGANIC & ORGANIC CHEMISTRY - Matter Classification - Students will be able to classify matter correctly. (Created By Department - Chemistry (CHEM))	**Assessment Method:** The following problem for SLO#1 is used in the online homework grading system (Mastering Chemistry) for all students enrolled in Chemistry 30A. These homework assignments are used in preparation for course examinations (pretest).		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Course-Level SLO Status: Active	Prelab #2, Classifying Matter: Classify the following as an element, compound or mixture: Vitamin D, salt water, oxygen, maple syrup, fruit salad, water, gold **Assessment Method Type:** Pre/Post Test **Target for Success:** Students who are able to correctly classify the substances given in this problem have mastered SLO #1. Overall success is indicated by a minimum of 70% of students successfully completing this problem.		
	Assessment Method: The following problem for SLO#1 is used in the online homework grading system (Mastering Chemistry) for all students enrolled in Chemistry 30A. These homework assignments are used in preparation for course examinations (pretest). Prelab #2, Classifying Matter: Classify each of the pure substances as an element or a compound. silicon, gold, gaseous ammonia **Assessment Method Type:** Pre/Post Test **Target for Success:** Students who are able to correctly classify the substances given in this problem have mastered SLO #1. Overall success is indicated by a minimum of 70% of students successfully completing this problem.	06/23/2014 - Data from the online homework for Chemistry 30A section 01 from Spring 2014 was used to assess this SLO. 84.8% of the 34 students enrolled in the course were able to correctly answer this homework problem in the online homework assignment. This indicates that our students are able to successfully classify matter. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	
Department - Chemistry (CHEM) - CHEM 30A - SURVEY OF INORGANIC & ORGANIC CHEMISTRY - Chemical Equations and Formulas - Students will be able to represent chemical changes correctly through balanced chemical equations with proper formulas for elements and compounds. (Created By Department -	**Assessment Method:** The following problem for SLO#3 is used in the online homework grading system (Mastering Chemistry) for students in all sections of Chemistry 30A. Mastering Chemistry homework problems are used in preparation for course examinations (pretesting).	06/23/2014 - Data from the online homework for Chemistry 30A section 01 from Spring 2014 was used to assess this SLO. 100% of the 34 students enrolled in the course were able to correctly answer this homework problem in the online homework assignment. This indicates that students are learning how to write chemical	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Chemistry (CHEM)) **Course-Level SLO Status:** Active	Chapter 5, Problem #7: Which is the correct equation for the reaction of magnesium with hydrochloric acid to produce hydrogen and magnesium chloride? A. 2 Mg + 6 HCl → 3 H2 + 2 MgCl2 B. Mg + HCl ->H + MgCl C. Mg + 3 HCl ->3 H + MgCl2 D. Mg + 2 HCl -> 2 H + MgCl2 E. Mg + 2 HCl -> H2 + MgCl2 *Note: formatting for subscripts and arrows did not copy over to TracDat **Assessment Method Type:** Pre/Post Test **Target for Success:** Students who are able to successfully answer this problem have mastered SLO #3. Overall success is indicated by a minimum of 70% of students successfully completing this problem.	formulas and chemical equations correctly. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Organic Compounds - Students will be able to name simple organic compounds and recognize and name functional groups in an organic compound. By recognizing a functional group, students will be able to determine general reactivity and write reactions to show that reactivity. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** The following question will be used in all Chem 30B courses as part of the assigned chapter homework in preparation for course examinations: Chapter 12, Problem #39: The name of the hydrocarbon with three carbon atoms and having only single bonds between carbon atoms is A. decane. B. ethane. C. propane. D. butane. E. methane. **Assessment Method Type:** Pre/Post Test **Target for Success:** Average student score 70% or higher.	06/23/2014 - For the 21 students enrolled in Chemistry 30B Section 03 at the start of Winter 2013, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Bio-molecules - Students will be able to describe the general structure of carbohydrates, fatty acids, amino acids and proteins, nucleotides and nucleic acids. Students will know the roles of these bio-molecules in the body. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All students will be assigned the following problem in homework in preparation for course exams. Chapter 25, Problem #22: The backbone of a nucleic acid molecule consists of A. alternating sugar and nitrogen base groups linked by amide bonds. B. alternating sugar and phosphate groups linked by phosphate ester bonds. C. complementary bases joined by hydrogen bonds. D. sugar molecules bonded from the #3 carbon of one molecule to the #5 carbon of the other by glycosidic linkages. E. alternating nitrogen bases and phosphate groups linked by amide bonds and strengthened by hydrogen bonds. **Assessment Method Type:** Pre/Post Test **Target for Success:** A student average of 70% or higher for this problem.	06/23/2014 - For the 21 students enrolled in Chemistry 30B Section 03 at the start of Winter 2013, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - DNA - Students will be able to describe DNA replication, transcription and translation. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All students will be assigned the following homework problem in preparation for course exam: Chapter 25, Problem #45: The process in which information from DNA is used to manufacture RNA is called A. replication. B. mutation. C. translocation. D. translation. E. transcription. **Assessment Method Type:** Pre/Post Test	06/23/2014 - For the 21 students enrolled in Chemistry 30B Section 03 at the start of Winter 2013, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Target for Success: Average student score of 70% or higher.		
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Common Metabolic Processes - Students will understand the chemistry of common metabolic processes. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All students will be assigned the following homework problem in preparation for course exam: Chapter 20, Problem #22: The common molecule produced from all foods at the second stage of catabolism is A. ADP. B. glucose. C. acetyl-SCoA. D. carbon dioxide. E. citric acid. **Assessment Method Type:** Pre/Post Test **Target for Success:** 70% or higher student average	06/23/2014 - For the 21 students enrolled in Chemistry 30B Section 03 at the start of Winter 2013, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014	
Department - Chemistry (CHEM) - CHEM 36 - SPECIAL PROJECTS IN CHEMISTRY - Analytic Instrumentation - Proficiently and independently operate analytical equipment found in both organic and inorganic chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36 - SPECIAL PROJECTS IN CHEMISTRY - Data Analysis - Become proficient in analyzing data from instruments in lab, and be able to adjust experimental variables to positively affect data. (Created By Department - Chemistry (CHEM))			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Start Date: 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36 - SPECIAL PROJECTS IN CHEMISTRY - Scientific Literature Search - Effectively utilize online journal databases and search engines to find scientific data that supports and compliments current research activities. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36X - SPECIAL PROJECTS IN CHEMISTRY - Analytic Instrumentation - Proficiently and independently operate analytical equipment found in both organic and inorganic chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36X - SPECIAL PROJECTS IN CHEMISTRY - Data Analysis - Become proficient in analyzing data from instruments in lab, and be able to adjust experimental variables to positively affect data. (Created By Department - Chemistry (CHEM))			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Start Date: 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36X - SPECIAL PROJECTS IN CHEMISTRY - Scientific Literature Search - Effectively utilize online journal databases and search engines to find scientific data that supports and compliments current research activities. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36Y - SPECIAL PROJECTS IN CHEMISTRY - Analytic Instrumentation - Proficiently and independently operate analytical equipment found in both organic and inorganic chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36Y - SPECIAL PROJECTS IN CHEMISTRY - Data Analysis - Become proficient in analyzing data from instruments in lab, and be able to adjust experimental variables to positively affect data. (Created By Department - Chemistry (CHEM))			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Start Date: 06/29/2011 **End Date:** 09/26/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36Y - SPECIAL PROJECTS IN CHEMISTRY - Scientific Literature Search - Effectively utilize online journal databases and search engines to find scientific data that supports and compliments current research activities. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Student Success - Students will master specific problem solving skills needed to succeed in Chemistry 1B and 1C. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/20/2013 **End Date:** 10/04/2013 **Course-Level SLO Status:** Active	**Assessment Method:** Students who completed Chemistry 70 during the WInter 2011, Spring 2011, Fall 2011, WInter 2012 and Fall 2012 quarter were asked to complete a survey. One of the questions asked was: Please choose the highest level of Chemistry you have successfully completed. Choices included Chemistry 1A, Chemistry 1B, Chemistry 1C **Assessment Method Type:** Survey **Target for Success:** A target of 75% for 1A and 56% for 1B. This was based upon a success rate of 75% in each course. Chemistry 1C is difficult to set a target for since a portion of students do not need Chemistry beyond 1B.	10/09/2014 - During the 2013-2014 academic year, Chemistry 70 was offered only fall quarter and during this quarter only 6 students registered for and then completed the course. Therefore, this was a small student population to sample from. Of the six students, 100% were successful in passing both Chemistry 1A and 1B during the year. Of the six, 66.7% passed 1C during the academic year. The two students who did not complete 1C are currently in progress; one of them received an incomplete during spring quarter and is working toward completion. **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** Support to offer the material used in Chemistry 70 at the PSME Center on a more flexible schedule in order to provide	10/11/2013 - Providing the materials used to a larger portion of the student population is recommended.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		the materials to a larger student population. The materials used would be best presented by a faculty member.	
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Study Strategies for College Level Science - The student will develop and apply effective study strategies and skills for the study of college level science. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Study strategies and skills discussed and applied in Chemistry 70 are designed to increase the success rate, defined as a grade of C or better, of students in college level science courses. To access the effectiveness of the Chemistry 70 curriculum, success rates in Chemistry 1A for the class at large were compared with success rates for students who were also concurrently enrolled in Chemistry 70. **Assessment Method Type:** Data **Target for Success:** A Chemistry 1A success rate for students enrolled in Chemistry 70 that exceeds the success rate of those not enrolled in Chemistry 70.		
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Problem Solving Skills for Chemistry 1A - The student will demonstrate competency in quantitative problem solving skills related to Chemistry 1A. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Average scores for each question were compared for the Chemistry 1A students at large and for for students who were also concurrently enrolled in Chemistry 70. The following questions were assessed. The questions included unit conversions and stoichiometric calculations. 1) A sample of the male sex hormone testosterone, C19H28O2, contains 3.68×10^21 atoms of hydrogen. a. How many atoms of carbon does it contain? b. How many molecules of testosterone does it contain? c. How many moles of testosterone does it contain? d. What is the mass of this		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	sample in grams? 2) The complete combustion of octane, a component of gasoline, proceeds as follows: (Reaction given) a. How many moles of are needed to burn 1.35 mole octaneof ? b. How many grams of oxygen are needed to burn 12.0 g of octane? c. Octane has a density of 0.692 g/mL at 20°C. How many grams of oxygen are required to burn 19.0 gallons of octane? 3) Tartaric acid, has two acidic hydrogens. The acid is often present in wines and precipitates from solution as the wine ages. A solution containing an unknown concentration of the acid is titrated with. It requires 22.65 mL of 0.1500 M solution to titrate both acidic protons in 60.00 of the tartaric acid solution. Calculate the molarity of the tartaric acid solution. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A higher average score for those students enrolled in Chemistry 70 compared to the Chemistry 1A students at large.		
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Student Success_1 - Students will master specific problem solving skills needed to succeed in Chemistry 1B and 1C. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 10/09/2014 **End Date:** 10/09/2014	**Assessment Method:** Students who completed Chemistry 70 during the Fall 2013 quarter were tracked through the Chemistry 1A, 1B, 1C sequence to monitor their success in completion of the sequence. **Assessment Method Type:** Case Study/Analysis **Target for Success:** A target of 75% for 1A and 56% for 1B. This was based upon a success rate of 75% in each course. Chemistry 1C is difficult to set a target for since a portion of students do not		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Course-Level SLO Status: Active	need Chemistry beyond 1B.		
Department - Chemistry (CHEM) - CHEM 9 - CHEMISTRY OF COOKING - Molecular Forces - Recognize the different intermolecular and intramolecular forces present in fatty acids, carbohydrates and proteins. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year	**Assessment Method:** A question similar to the following will be embedded in an exam: "Based on the structure of the following amino acids, determine which will mostly be found on the outside of a protein in aqueous solution. Of those, which will form the strongest bond with water?" **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70% is a reasonable benchmark for students to successfully identify the correct amino acids with polar side groups.		
Department - Chemistry (CHEM) - CHEM 9 - CHEMISTRY OF COOKING - Stoichiometry - Using the concept of the mole and molar ratio, calculate the amount of product formed for a given chemical reaction. (Created By Department - Chemistry (CHEM))	**Assessment Method:** A question similar to the following will be embedded in an exam: "The reaction between 1.0 g of baking soda and 10.0 mL of vinegar will yield how many moles of carbon dioxide?" **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70% is a reasonable benchmark for students to successfully answer this question. Stepwise analysis of students' calculations may give insight into comprehension is the solution is not completely correct.		
Department - Chemistry (CHEM) - CHEM 9 - CHEMISTRY OF COOKING - Calorimetry - Be able to understand the relationship between temperature and heat transfer as well as calculate energy change using heat capacity. (Created By Department - Chemistry (CHEM))	**Assessment Method:** A question similar to the following will be embedded in an exam: "For a 10-quart pot of water, how much energy is required to heat the water to 50 degrees Celsius from room temperature (25 degrees Celsius)?" **Assessment Method Type:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Exam - Course Test/Quiz **Target for Success:** 70% of students calculating the answer correctly is a reasonable benchmark for success. This question involves multiple unit conversions and allows for stepwise analysis of calculations.		

Unit Assessment Report - Four Column

Foothill College

Program (PSME - CHEM) - Chemistry AS

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Program (PSME - CHEM) - Chemistry AS - 1 - Knowledge of current theories and applications in the field of chemistry **SLO Status:** Active	**Assessment Method:** Standardized Achievement and Self-Report Tests: Students will be tested on six core topics in chemistry that correlate to topics used in later assessments (for example, the American Chemistry Society (ACS) General Chemistry Exam, or equivalent, and the ACS Organic Chemistry Chemistry Exam, or equivalent.) **Assessment Method Type:** Exam - Standardized **Target:** Students scoring in the 70 percentile compared to the nation.	07/21/2014 - 36 students took the 2012 version of the American Chemical Society's Standardized Exam in Organic Chemistry. Their average score was 51/70 (73%) which places the average in the 88th percentile according to published national norms. This class was an especially strong one and their performance demonstrates the success of our program in fostering this important learning outcome (the knowledge of current theories and applications in the field of chemistry). **Result:** Target Met **Year This Assessment Occurred:** 2013-2014 **Resource Request:** Ongoing support of existing program to ensure its continued effectiveness **GE/IL-SLO Reflection:** The complex and comprehensive nature of this standardized exam and the tremendous performance of our graduating chemistry students demonstrates demonstrates that students are learning to think critically and to apply analytic reasoning to complex problems. This directly supports Foothill's creative, critical and analytic thinking Institutional learning outcome.	
Program (PSME - CHEM) - Chemistry AS - 2 - An enhanced ability to research, assess and evaluate topics of interest. **SLO Status:** Active	**Assessment Method:** Students will be tested on six core topics in chemistry that correlate to topics used in later assessments (specifically Chem 1C or Chem 12A/B/C). Special end-of-quarter projects involving presentations on how current events relate to chemistry theory		

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	may also be utilized. **Assessment Method Type:** Exam - Standardized		
Program (PSME - CHEM) - Chemistry AS - 3 - An enhanced ability to communicate effectively, both orally and in writing. **SLO Status:** Active	**Assessment Method:** Evaluation of student's laboratory notebook that will contain safety information, step-by-step procedures and clear presentation of data. Additionally, lab reports will be assessed for clear, concise presentation of experimental findings. Group presentations of lab data may also be utilized. **Assessment Method Type:** Essay/Journal		
Program (PSME - CHEM) - Chemistry AS - 4 - Facility in the safe handling of chemicals and the execution of common laboratory techniques **SLO Status:** Active	**Assessment Method:** Laboratory safety quizzes will be administered at the beginning of the quarter; or a checklist of laboratory skills demonstrating successful completion of key experiments will also be recorded. **Assessment Method Type:** Observation/Critique **Target:** 80% success rate in passing both safety quiz and satisfying experiment checklist.		